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TEORIA E MÉTODOS EM ANTRACOLOGIA. 3. VALIDADE AMOSTRAL [1]

(Com 19 figuras)

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RESUMO: Este artigo dá continuação a uma série de textos sobre a metodologia antracológica adaptada às regiões tropicais. Discute-se essencialmente a validade amostral, com base na análise de curvas de saturação e de curvas de Gini-Lorenz. O estudo destas últimas sendo muito pouco difundido, é apresentado o embasamento teórico desta abordagem, sua utilização nas regiões temperadas da Europa e sua aplicação para a vegetação tropical. É apresentada também uma validação da interpretação paleoecológica dos dados a partir de análises estatísticas, com exemplos dos resultados que podem ser obtidos e de sua aplicação a formas de vegetação atual e aos dados antracológicos.

Palavras-chave: Validade amostral. Curvas de saturação. Curvas de Gini-Lorenz. Diversidade vegetal. Ecologia.

ABSTRACT: Theory and methods in anthracology. 3. Sampling validity.

This paper presents a suite to a series of articles on the anthracological methodology in the tropics. Sampling validity, based on the analysis of saturation and Gini-Lorenz curves, is discussed. The study of the latter being still rare, we present the theoretical embasement of this approach, its use in temperate regions and its application to the tropical vegetation. Validation of palaeoecological interpretation based on statistical analyses are also presented, with examples of the results that can be obtained from its application to present vegetation and to anthracological data.

Key-words: Sampling validity. Saturation curves. Gini-Lorenz curves. Plants diversity. Ecology.

INTRODUÇÃO

A reconstituição do ambiente passado a partir da antracologia depende de uma boa amostragem e da determinação sistemática, a mais precisa possível, dos fragmentos de carvão. Um problema importante a resolver, para garantir a fiabilidade desta reconstituição, é definir o número mínimo de fragmentos a analisar. Este número depende das formações vegetais presentes na área de estudo e da riqueza taxonômica da amostra estudada, a qual depende tanto da diversidade florística no local e no período estudados quanto, no caso de amostras arqueológicas, da duração de ocupação do sítio analisado.

Como não existia, até o presente, nenhum estudo metodológico sobre este tema em zona tropical, procurou-se definir o efetivo mínimo da amostra antracológica e verificar a validade das análises por diferentes metodologias (SCHEEL-YBERT, 1998, 2002). A construção de curvas de saturação é o método mais classicamente empregado para a definição do mínimo amostral, em várias disciplinas. No entanto, o estudo de curvas de concentração de Gini-Lorenz pode fornecer uma abordagem complementar muito interessante. Sendo o estudo destas últimas muito pouco difundido, será apresentada uma discussão sobre o embasamento teórico desta abordagem, sua utilização em regiões temperadas da Europa e sua aplicação para a vegetação tropical.

Discutir-se-á, também, a validação da interpretação paleoecológica dos dados a partir de análises estatísticas, especialmente a análise fatorial de correspondência, com exemplos dos resultados que podem ser obtidos a partir de sua aplicação a formas de vegetação atual e aos espectros antracológicos.

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RESULTADOS E DISCUSSÃO

Curvas de saturação

O efetivo mínimo de uma amostra a analisar pode ser definido a partir da análise de curvas de saturação, seja construindo-as sistematicamente à medida que se estuda a amostra (SALGADO-LABOURIAU & SCHUBERT, 1976, 1977; VICENTINI, 1993; PARIZZI, 1993; RIBEIRO, 1994), seja aplicando de forma padronizada os resultados de estudos anteriores, nos quais tenha sido determinado o tamanho ideal da amostra (SMART & HOFFMAN, 1988; CHABAL, 1991). Note que a primeira opção é mais rentável no caso de análises palinológicas do que para a antracologia, em virtude dos métodos de análise, que são diferentes.

Vários autores de estudos antracológicos realizados em regiões mediterrâneas e temperadas, nas quais a diversidade florística é muito menor do que a de regiões tropicais, consideram que 250 a 400 fragmentos por amostra são necessários para se obter uma imagem representativa da vegetação circundante ao sítio (CHABAL, 1982, 1988; BADAL-GARCIA, 1990; FIGUEIRAL, 1990; GRAU-ALMERO, 1990; HEINZ, 1990; RODRIGUEZ-ARIZA, 1992; SOLARI, 1993).

Em regiões tropicais, não existe praticamente nenhuma estimativa do efetivo mínimo da amostra antracológica. THOMPSON (1994), em um trabalho realizado na Tailândia, propõe o estudo de 50 fragmentos por amostra, e afirma que amostras de 20 a 30 fragmentos são consideradas aceitáveis por vários autores (MILLER, 1985; JOHANNESSEN & HASTORF, 1990; NEWSON, 1991; SCARRY & NEWSON, 1992). Esses números, no entanto, são excessivamente baixos e não devem ser levados em consideração, pois não permitem a apreciação das variações de freqüência relativa entre os *taxa* ao longo do tempo, nem a realização de análises estatísticas.

Os resultados obtidos a partir do estudo antracológico de sítios arqueológicos do litoral sudeste do Estado do Rio de Janeiro (SCHEEL-YBERT, 1998) mostraram que uma estabilização nítida do patamar da curva de saturação é muito dificilmente alcançada (Fig.1).

No entanto, mesmo no que se refere a estudos da vegetação atual, esta estabilização é muito rara. Ela praticamente nunca é verificada em florestas tropicais, devido à sua grande riqueza florística, e pelo fato de que uma importante porcentagem de espécies destas comunidades apresenta populações de baixa densidade (SÁ, 1993; KURTZ & ARAÚJO, 2000). Uma baixa densidade de indivíduos de cada espécie por área é uma consequência mesmo da grande diversidade biológica da vegetação tropical (JANZEN, 1970). De fato, a maior parte das espécies encontradas em estudos da vegetação de Mata Atlântica apresenta valores muito baixos e semelhantes para os parâmetros fitossociológicos[3], o que traduz uma fraca contribuição de cada uma delas à estrutura da comunidade (KURTZ & ARAÚJO, 2000).

A estabilização do patamar das curvas de saturação também é muito rara no caso de análises palinológicas em meio tropical (J.P.YBERT, comunicação pessoal).

Em estudos do Quaternário recente, os palinólogos brasileiros consideram que a contagem de no mínimo 300 palinomorfos é estatisticamente válida para obter uma representação fiável da vegetação passada, o número máximo sendo definido pela estabilização relativa da curva de saturação (LEDRU, 1991; VICENTINI, 1993; PARIZZI, 1993; RIBEIRO, 1994).

Por analogia, pode-se considerar que o número mínimo de fragmentos de carvão a serem estudados pelo antracólogo não deve diferir muito destes valores, em especial levando-se em conta o fato de que a população representada pelo espectro palinológico (*taxa* lenhosos, herbáceos, epífitas etc.) é maior do que nos estudos antracológicos (sobretudo *taxa* lenhosos).

A análise das curvas de saturação construídas para o Sambaqui do Forte, no litoral sudeste do Estado do Rio de Janeiro (Fig.1), mostra que, apesar da maior parte não apresentar patamares nítidos, uma única curva se apresenta em franca ascensão e sem nenhuma inflexão (nível 130-140, 68 fragmentos). Em vários casos, inclusive para certas amostras com menos de 100 fragmentos, as curvas apresentam inflexões nítidas e às vezes mesmo patamares (p.ex., níveis 0-10 e 10-20, 70 fragmentos). Por outro lado, todas as curvas construídas para amostras de mais de 200

[3] Número de indivíduos, freqüência absoluta, freqüência relativa, dominância relativa, índice de valor de importância, índice de valor de cobertura etc.

OBITUARY: OBED DAVID EVANS

Obed David Evans, who died on 26th July 1975, was born 86 years earlier in Sydney, New South Wales. In fact his birthplace was symbolic of his future career for it was on the old Shepherd's Darling Nursery in Bourke Street, long since submerged below the bricks and mortar of Redfern, that Obed first saw the light of day. Shepherd's was probably the oldest plant nursery in New South Wales, having been established on a land grant made by Governor Darling over 60 years previously. It was here that Obed gained the love and knowledge of plants which no doubt helped him obtain an appointment as Laboratory Attendant in the newly formed Botany School at Sydney University in 1916.

Although it seems that he was not actually appointed Curator of the John Ray Herbarium at the University until 1924, he had started long before that to build up this collection. It is thus largely his supervision that has made it the largest herbarium collection in any Australian University. His characteristic strong rounded hand appears on several thousand beautifully preserved and annotated specimens mounted on the azure blue ledger paper that Kew had ordained as the only satisfactory sheet for plant collections throughout the British Empire.

This, however, was not his only contribution to the University. He was also Chief Laboratory Attendant and as such he had the responsibility for the day-to-day organization of the courses given in the Botany School. This involved maintaining the equipment, directing the laboratory staff and collecting material for the classes. At first this last duty was relatively easy and a trip on the tram out to La Perouse with a black metal vasculum—standard equipment for a botanist at the time—usually secured a satisfactory haul. There were times, however, when journeys further afield were necessary. Sackfuls of *Macrozamia* cones were obtained twice a year from the sandhills around Woy Woy to illustrate the Glaswegian botany taught at that time at Sydney: all the senior staff had been pupils of Bower with a consequent and definite bias towards life-history studies. This bias resulted in his being sent to Queensland to collect material of *Bowenia* for research in the school.

Once, after collecting *Prostanthera sieberi* near Waterfall, the smell from that labiate completely cleared the railway carriage in which he travelled back to Sydney —and the guard let him know why in no uncertain terms.

As the courses extended their scope and collecting away from public transport became necessary, Obed acquired a push-bike, eventually affixing a small petrol motor which gave some assistance up the hills with which the Sydney area abounds. The effect, after a successful collecting trip, must have been rather like a somewhat inefficiently motorized version of Birnam Wood. Eventually, very close to his retirement, he could make use of a car which the Department purchased, second-hand, from one of its Professors.

Retirement from such work was bound to alter his life. He took up part-time work with the Botany School at the University of New South Wales, assisting to develop a teaching and reference herbarium. He made frequent short collecting trips as well as organizing material from other sources.

At first he also toyed with the idea of running a small nursery but the University of Sydney gave him a grant in 1952, so that he could use his considerable knowledge of the native flora to assist in writing a student's key to the flowering plants of the Sydney region. This had been begun by a number of staff members under Professor N.A. Burges' Chairmanship about 1948. In the event it was N.C.W. Beadle and Obed Evans who did the bulk of the work on it until a disastrous fire at the University of New England destroyed a large part of the manuscript. R.C. Carolin helped finish a number of keys subsequently and rewrote some of those destroyed in the fire.

Obed Evans was a modest man, in keeping with his religious outlook, but in one matter one could detect a small amount of pride. In 1957 when he was awarded a B.Sc. degree by the University which he had served so well for so long, for his work on the Handbook of the vascular plants of the Sydney district and Blue Mountains, he always insisted that one understood the degree was not honorary but awarded after examination by thesis.

This, however, was not the end of Obed's career for now he had started on another course. In April 1959 he took up an appointment as a part-time Botanist at the National Herbarium of New South Wales, with the specific duty of contributing to the Flora of New South Wales. He continued in this position until 30th June 1971 and prepared manuscripts for several families for the Flora as well as several research papers arising out of his work. Some of these have been published (see bibliography) while others are being worked up in the light of more recent knowledge and will be published in due course under the names of Evans and relevant co-authors.

Formal taxonomic revision was a new departure for Obed and he approached it humbly but with his usual meticulous care and determination to do a good job. His work at the Herbarium was all on monocotyledonous families, particularly those, such as Restionaceae and Cyperaceae, with very small floral parts. His eyesight remained keen and he was able to carry out the necessary microscopic examinations to the last. He also became interested in cultural experiments on the duckweeds (Lemnaceae) and published a paper on variation in this extremely difficult group. In the Restionaceae he used stem anatomy to very good effect in distinguishing species and genera.

Obed worked closely with one of us (LJ) during these years and the association was a happy one throughout. Though modest and disinclined to become involved in theoretical or evolutionary questions, he never objected to such matters being discussed in joint papers. He was amenable to suggestions but would stick firmly to his opinion when he had carefully arrived at it. Despite his advanced years, he carried out a considerable amount of field work during his time at the Herbarium and was always conscious that the specimens with which he was dealing were merely representatives of the living populations in nature.

A devoted family man, Obed Evans was a member of a small evangelical church and his religious beliefs were strongly held. In both academic and herbarium spheres he often found himself in company in which a secular outlook was manifest. However, because of his obviously sincere and generous attitudes and the unobtrusive but firm way in which he lived by his principles, his beliefs were universally respected and he seemed to be happy in any civilized company. Likewise he was respected as a man and held in great affection by all who knew him. He became well known as a professional botanist at a much later stage in life than might be reasonably expected. Not only will Obed be remembered by generations of students of the Botany Department of the University of Sydney, but his contributions to knowledge will survive through his publications.

R.C. Carolin.
L.A.S. Johnson.

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Mr Evans also prepared the following two lists of which some duplicate typescript copies were circulated, although they cannot be regarded as publications:

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THE LINDSAEOID FERNS OF THE OLD WORLD VII. AUSTRALIA AND NEW ZEALAND

K.U. KRAMER and MARY D. TINDALE

(Received June 1975)

ABSTRACT

Kramer, K.U. (Botanic Gardens and Institute for Systematic Botany of the University of Zürich, Switzerland) and Mary D. Tindale (National Herbarium of New South Wales, Royal Botanic Gardens, Sydney, Australia) 1976. The Lindsaeoid Ferns of the Old World VII. Australia and New Zealand. Telopea 1 (2): 91–128, Plates VII–X.—A taxonomic revision of the genus *Lindsaea* (14 species) for Australia and New Zealand (3 species) is provided. *Chlorolindsaea* Tindale & Kramer sect. nov. is described.

INTRODUCTION

Although the fern flora of Australia is relatively well known, no modern comprehensive treatment for the continent is available. There are, however, modern floras (for some States and portions of States) that include pteridophytes e.g. J.M. Black's Flora of South Australia, pt. 1, ed. 2 (1960), J.H. Willis' Handbook to Plants in Victoria, Vol. 1. ed. 2 (1972) and M.D. Tindale in Beadle, Evans and Carolin's Flora of the Sydney Region (1972). Five families have been completed in the series "Pteridophyta of South Eastern Australia" which is being published in the Flora of New South Wales (formerly Contributions from the New South Wales National Herbarium, Flora Series). The latter series may be used for identifying pteridophytes in southern Queensland, New South Wales, Victoria and Tasmania. There is also a "Census of the Pteridophyta of Western Australia" by G.G. Smith (1966). The works dealing with the flora of the State richest in ferns and fern-allies, namely Queensland, are now very much out-of-date (F.M. Bailey, 1874, 1881, 1892, 1902) but a modern handbook is being prepared at the Queensland Herbarium.

The data on pteridophytes of New Zealand are readily available in modern floras: Crookes & Dobbie (ed. 6, 1963) and Allan's Flora of New Zealand (Vol. 1, 1961).

The present paper deals with the Lindsaeoid ferns of Australia and New Zealand, based on the study of specimens from a considerable number of herbaria all over the world cited by their standard abbreviations. In addition there have been some field studies of the Australian species by the second author.

Several species are represented by a single record from north-eastern Queensland. It is to be expected that further collections of these taxa and probably some Malaysian species may be made sooner or later in the moister parts of tropical Australia. The reader who fails to succeed in identifying collections from the latter area is advised to resort to the key in the senior author's account of this fern group for Flora Malesiana (Kramer 1971) and to communicate his conclusions to one of the present authors.

PHYTOGEOGRAPHIC NOTES

The assortment of Lindsaeoid ferns in Australia is not particularly large. The most striking fact is that only the genus *Lindsaea* is represented, neither *Tapeinidium* nor *Sphenomeris* having been found. The former is abundantly represented in

New Guinea, several species occurring at low elevations, and extends to Melanesia; its absence from Queensland (and from New Caledonia) is not readily explained. This is even more the case with *Sphenomeris*, represented by four species in New Caledonia and by the ubiquitous *Sphenomeris chinensis* in nearby New Guinea.

Of the fourteen species known at present from Australia, four are widespread in South Eastern Asia-Oceania, namely *L. repens*, *L. ensifolia*, *L. walkerae* and *L. obtusa*. *L. pulchella* var. *blanda* extends to Malaysia as a whole but *L. media* only to New Guinea, whereas *L. trichomanoides* is confined to New Zealand and Australia. *L. dimorpha* is found in New Caledonia and Australia, while *L. linearis* occurs in both of these countries as well as New Zealand. The four remaining species are endemic: *L. brachypoda*, *L. fraseri*, *L. incisa* and *L. microphylla*, not an impressive number of the total. As *Lindsaea* is essentially a genus of forest-floor plants or epiphytes of dense, moist forests, it is not surprising that only a small number of species reach Australia, and that the locally more widespread taxa either prefer open habitats or are rather euryoecious. Some of the uncommon species such as *L. fraseri*, *L. incisa* and *L. dimorpha* also grow in open, sometimes swampy situations.

There are three species in New Zealand, the two taxa mentioned above and the endemic *L. viridis*, a taxonomically isolated plant placed here in a monotypic section.

The picture of the variety and distribution of the Australian Lindsacoids is rather different from that given by Posthumus (1938). At that time some species had not yet been recorded from Australia, records of others (*L.* "*davallioides*", *L.* "*cultrata*") were due to misidentifications, and still others were reported from areas where they do not really occur, e.g. *L. microphylla* from New Zealand and New Caledonia.

CYTOTAXONOMY

All available data on the cytotaxonomy of the Lindsacoid ferns have been assembled in the introductory paragraph on the senior author's treatment of the group for Flora Malesiana. The counts applying to species from the area under discussion may here be quoted again: *L. viridis:* n = ±88 (Brownlie 1961); *L. trichomanoides* ("*cuneata*"): n = ±42 (ibid., 1957a); *L.* "*concinna*" (= *brachypoda?*): n = 47 (Manton in Kramer 1957); *L. linearis:* n = 34 (Brownlie 1957b).

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The authors express their gratitude to the Directors and Curators of the herbaria who put their material generously at their disposal as well as to Mr R.J. Chinnock for lending specimens from his own collection. The senior author wishes to thank the Director of the Flora Malesiana under whose auspices most of his work was carried out.

The second author wishes to convey her thanks to the Public Service Board of New South Wales for granting an official tour to Great Britain and the Continent. This enabled her to have discussions with the senior author in Zürich, as well as to examine types and other collections of *Lindsaea* in European herbaria.

The authors also wish to acknowledge a grant from the Australian Biological Resources Study Interim Council for the provision of a herbarium Assistant, Miss N. McIntyre, who has been of considerable help in the later stages of this project. In accordance with the terms of this grant all material collected for this revision has been placed in the National Herbarium of New South Wales, as the second author is a member of that staff.

Our thanks are due to Mr R.C. Coveny for making special collections of *Lindsaea* and to Miss N. McIntyre for checking the latitudes and longitudes of a large number of the localities in which specimens were collected. We are also grateful to Miss C.L. Payne for the preparation of the maps.

TAXONOMIC TREATMENT

For general notes on the *Lindsaea* group of ferns see Kramer (1957, 1968, 1970, 1971). Species already described in other papers but occurring in Australia have been quoted in the text, so that the revision would be as complete as possible. These descriptions cover Australian material, although few specimens were available in some taxa, e.g. *L. repens* and *L. pulchella*.

A very considerable portion of the herbarium work was undertaken by the senior author. Specimens of *Lindsaea* in the following herbaria were examined by K.U. Kramer:— B, BISH, BM, BO, BRI, B-WILLD, E, GH, HBG, K, LAE, L, MICH, NSW, P, PR, SING, S-PA, U, US, W and Z; whereas M.D. Tindale saw material in the following herbaria:— AD, BM, BRI, CANB, CBG, E, G, GOET, HO, JCT, K, L, MEL, NT, NSW, PERTH, P, S, UPS and the private collection of R.J. Chinnock.

LINDSAEA

Dryander in J.E. Smith in Mém. Acad. Sci. Turin 5: 401 (1793): Trans. Linn. Soc. London 3: 39 (1797). The name is often misspelled "*Lindsaya*".

As to the terminology employed, the reader is reminded that the term "pinnule" is always used in this paper for an ultimate free division of a compound leaf, regardless of whether the leaf is once or more times compound.

The following description of the genus *Lindsaea* is cited from Kramer in Fl. Males. Ser. 2, 1 (3): 198 (1971):—

"Small to medium-sized, terrestrial, epilithic, scandent, or epiphytic ferns with a Lindsaeoid protostele, the xylem with an internal phloem strand, or in some small epiphytes open. Scales variable in shape, mostly entire. *Lamina* rarely simple, mostly once or twice pinnate, sometimes more dissected, to decompound, anadromous; ultimate divisions various, most often dimidiate, sometimes partly or entirely equal-sided, rarely cuneate and dichotomously divaricate. Veins free, connivent, or anastomosing without free included veinlets. *Sori* terminal on the veins, bi- to plurinerval, less often uninerval, mostly very close to the margin. Indusium short, roundish, ovate, or hippocrepiform and then free at the sides, or more elongate, and laterally free or adnate, rarely fugacious. Biecllular filiform paraphyses present in some, probably in all species. Spores trilete or (very rarely in the Old World species) monolete."

TYPE SPECIES: *Lindsaea trapeziformis* Dryander (neotropical).

DISTRIBUTION: About 150 species, two-thirds of which occur in the Old World but few in continental Africa; extending north to Japan, south to Australia (Tasmania) and east to the Marquesas.

ARTIFICIAL KEY TO THE SPECIES OF *LINDSAEA* IN AUSTRALIA AND NEW ZEALAND

1. Fertile lamina simply pinnate or rarely with an odd pinnate pinna in *L. brachypoda*. Fertile pinnules entire or shallowly incised.
    2. Rhizome long-scandent, epiphytic, with a strongly dorsiventral stele.
        3. Rhizome (1·5–) 2–3 mm in diam., persistently scaly, or, when eventually scaleless, usually not polished. Larger pinnules at least 1·5 cm long .. *L. repens* 13.
        3.* Rhizome not over 1·2 mm in diam., soon largely scaleless and polished. Larger pinnules not over 12 mm long ..... *L. pulchella* 14.

2.* Rhizome terrestrial, short-, or occasionally more long-creeping; stele radially symmetric or nearly so.

4. Pinnules dimidiate or cuneate.

5. Veins anastomosing. Full-grown plants rarely with sterile leaves ..... *L. obtusa* 11.

5.* Veins free, except as joined by the receptacle. Sterile leaves nearly always present beside fertile leaves.

6. Petiole and rachis dark ..... *L. linearis* 8.

6.* Petiole and rachis stramineous to medium brown.

7. Fertile pinnules dimidiate, entire or rarely crenate. Sterile pinnules crenate ..... *L. brachypoda* 9.

7.* Fertile pinnules cuneate-flabellate or subdimidiate, entire or the lower ones cleft. Sterile pinnules cleft and crenate. . *L. dimorpha* 7.

4.* Pinnules neither dimidiate nor cuneate (or cuneate at the base only).

8. Veins free, except as joined by the receptacle ..... *L. walkerae* 12.

8.* Veins anastomosing.

9. Basal pinnules in full-grown plants 2 × or at most 3 × as long as wide; terminal pinna or lobed leaf-apex in all plants 0·2–1 cm long ..... *L. fraseri* 3.

9.* Basal pinnules in full-grown plants 3 × to 10 × as long as wide; in juvenile plants where the basal pinnules are sometimes 2 or 3 × as long as wide then the large, free or almost free, terminal pinna is 2–10 cm long ..... *L. ensifolia* 4.

1.* Fertile lamina more than once pinnate, or, if only truly once pinnate, at least the basal pinnules incised beyond the middle.

10. At least some veins of larger pinnules anastomosing.

11. Mature plants with bipinnate leaves and a conform terminal pinna. All pinnules dimidiate ..... *L. obtusa* 11.

11.* Mature plants with bipinnate or partly tripinnate leaves, without a conform terminal pinna. Many pinnules dimidiate, with narrow, stalk-like bases. Apices of pinnae small, rhombic or triangular ..... *L. media* 2.

11.** Lamina not fully bipinnate, or in the few cases where this is so, the pinnules decurrent at the base, connected by narrow wings, and not truly dimidiate. . see 9.

10. Veins free, except as joined by the receptacle.

12. The lowermost pinnules cleft, with 2 or 3 divisions, the others simple. Fertile lamina linear, simply pinnate or subbipinnate at the base. Sterile leaves always present besides, difform, their pinnules cleft and crenate ..... *L. dimorpha* 7. (bis)

12.* Most or all primary divisions deeply incised or one to several times pinnate. No distinctly difform sterile leaves present. Lamina variously dissected.

13. Lamina linear, not over 1·5 cm wide. Rachis stramineous ..... *L. incisa* 6.

13.* Lamina not linear, or, if so, broader than 1·5 cm and/or the rachis darker.

14. Petiole and at least the basal part of the (primary) rachis reddish brown or atropurpureous to black.

15. Primary rachis abaxially obtusely carinate. Secondary rachises abruptly pale. Spores monolete. Indusium basally not concave, more than 0·5 mm wide ..... *L. viridis* 10.

15.* Primary rachis abaxially bi-angular, often obtusely so, ± sulcate. Secondary rachises in fully bipinnate leaves gradually paler. Spores trilete. Indusium of longer sori basally concave, up to 0·5 mm wide ..... *L. trichomanoides* 5.

14.* Petiole (except the extreme base) and rachis mostly stramineous to light brown. Spores trilete.

16. Ultimate free or almost free divisions cuneate-flabellate ..... *L. microphylla* 1.

16.* At least the larger ultimate divisions distinctly dimidiate . . . free-veined forms of ..... *L. media* 2. (bis)

A. SUBGENUS LINDSAEA

1. SECTION SCHIZOLOMA

Section **Schizoloma** (*Gaudichaud*) *Kramer**

1. Lindsaea microphylla *Swartz* in J. Bot. (Schrader) (1800)[2]: 79 (1801); F. Mueller, Fragm. 5: 119 (1865–66); F.M. Bailey, Handb. Ferns Queensland: 19 (1875); Bentham, Fl. Austral. 7: 721 (1878); F.M. Bailey, Fern World Australia: 40 (1881); F.M. Bailey, Lithogr. Ferns Queensland: Pl. 54 (1892); F.M. Bailey, Queensland Fl. 6: 1955 (1902); F.M. Bailey, Compr. Cat. Queensland Pl.: 641 (1913); Domin in Biblioth. Bot. 20 (85[1]): 84 (1913); Wakefield, Ferns Victoria & Tasmania: 26, with fig. (1955); Brownlie in Trans. Roy. Soc. New Zealand 87: 196 (1959); Willis, Handb. Fl. Victoria 1: 23 (1962); Tindale in Beadle, Evans & Carolin, Handb. Vasc. Pl. Sydney Distr.: 61 (1963); Tindale in Beadle, Evans & Carolin, Fl. Sydney Region: 66 (1972); non Presl (1825).

Synonymy: *Adiantum microphyllum* (Swartz) Poiret in Lamarck, Encycl. Suppl. 1: 140 (1810), non Swartz (1788), nec. auct. al. *Odontosoria microphylla* (Swartz) J. Smith, Hist. Fil.: 264 (1875). *Schizoloma microphyllum* (Swartz) Kuhn, Chaetopt.: 346 (1882). *Sphenomeris microphylla* (Swartz) Tardieu-Blot in Amer. Fern J. 48: 34 (1958).

Lindsaea microphylla Swartz var. *gracilescens* Domin in Biblioth. Bot. 20 (85[1]): 85 (1913). Syntypes: Katoomba Falls, Blue Mountains, New South Wales, *Domin 184*, 1910 (PR), Blue Mountains *Domin 183* (PR).

Stenoloma lindsayoides Fée, Gen. Fil.: 330, Pl. 27 bis A, fig. 5 (1852), *epith. nov. superfl.*

Holotype: Without date or locality, (S), consisting of one fertile frond.

Distribution†: Eastern Australia: Queensland (Cook, Leichhardt, Burnett and Moreton Districts), New South Wales (North and Central Tablelands, North, Central and South Coast) and Victoria. Fig. 1 (p. 97).

Habitats: In wet or dry sclerophyll forests or in thick scrub or more rarely in exposed positions above rain forest ravines, on hillsides and in moist gullies, commonly in rock crevices or under rock ledges, often in sandy or alluvial soil, mostly associated with sandstone but sometimes on shales or granite, sea level to 1100 m.

Rhizome shortly creeping, 1–2 mm in diam.; scales honey-coloured to light reddish brown, almost acicular, the greater part biseriate, the base bi- or triseriate, the apical $\frac{1}{3}$ or $\frac{1}{4}$ uniseriate, up to 2·5 mm long. *Leaves* clustered; petioles (stipes) stramineous to light reddish brown or mottled, with darker base, or sometimes darker with age, 4–15 cm long, very much shorter than the lamina, adaxially broadened and shallowly sulcate, the adaxial face often laterally surpassing the lateral faces, abaxially obtusely bi-angular to subterete. *Lamina* narrowly oblong, c. 10–50 cm long, (2–) 4–6 cm wide, 2–6 × as long as the petiole, mostly pale or bright green or olivaceous when dry, herbaceous, bipinnate + deeply pinnatifid. *Major pinnae*, c. 10–20 on each side, the lower subopposite, especially the larger strongly ascending, the lower ones up to 6 cm apart, the upper ones gradually closer, all subcontiguous to contiguous by their ascending position, ovate to triangular in outline; primary rachis stramineous, in structure like the petiole (stipe). *Primary*

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* The publication of the genus *Hymenotomia* Gaudichaud in Freycinet, Voyage Bot.: 379 (1826), cited, e.g., by Christensen (Ind. Fil., 1906) is in the authors' opinion invalid. Under *Schizoloma* (as genus) Gaudichaud said: "La troisième section, peut-être digne aussi de former un genre, hymenotomia, réunirait les lindsaea mycrophylla [sic], media, decomposita, &c., caractérisés par les tiges . . ., des nervures entièrement dichotomes; des tégumens marginaux, membraneux, dentés ou laciniés comme le bord des folioles, &c. . . ." However, on p. 381 *L. microphylla* is cited under *Lindsaea*, not under *Schizoloma*. *L. microphylla* therefore cannot be the type of *Hymenotomia*, as stated by Christensen (l.c.) and others, e.g., Domin (1913, as subgenus). Gaudichaud's classification of species, and the conditional "réunirait", show, in the authors' opinion, that he did not really accept a taxon *Hymenotomia*, in any rank, and it was never validly published.

† There is also a dubious record from the Northern Territory (without specific locality) by Dämel (HBG). *L. microphylla* has been incorrectly reported from New Zealand and New Caledonia by Posthumus (1938) and others, due to confusion with other species.

pinnae with a stalk of a few mm, their rachis basally stramineous, greenish above; major pinnae 3–10 cm long, c. 1·5–3 cm wide, 2–3 × as long as wide; one or two basal pairs of pinnae often slightly reduced; upper pinnae gradually and strongly reduced, confluent into a pinnatifid leaf-apex. *Secondary pinnae* of major primary pinnae c. 4–8 to a side, alternate, somewhat ascending, variously cleft, pinnatifid, or pinnate + pinnatifid, from base to apex gradually of simpler structure, the basal ones shortly (a few mm) petiolulate, the upper subsessile, the pinnate ones with 2–4 (rarely more) pinnules; terminal segment (pinnule) of primary and secondary pinnae cuneate-flabellate. *Ultimate divisions* cuneate-flabellate, usually distinctly asymmetric, of very variable size, the major fertile ones often 2–3 mm long and wide, sometimes a little wider than long, joined by basal wings or free, entire or variously cleft, usually evenly broadened from base to apex, less often subspathulately broadened at the sorus; lateral margins straight or faintly convex, outer margin truncate, erose. *Veins* free, once or twice forked. *Partly or entirely sterile leaves* not rarely present, their segments as a rule larger than the fertile, apically unevenly crenate-dentate. *Sori* single or paired along the outer margin of the ultimate segments, occupying (1–) 2–4 vein-ends; indusium pale, laterally adnate or not and convex, pale, thin, c. 0·5 mm wide, its strongly erose edge equalling or almost equalling the margin, bulging but scarcely reflexed at maturity. *Spores* honey-coloured, smooth, trilete, with prominent ridges, c. 25–29 μm across as seen from the tetrad side, at right angles to it often rather elongate and with long ridges and observed from that side not rarely seemingly monolete.

AUSTRALIA: Queensland: **Cook District:** between Cairns and Herberton, *Wild* (BRI 59316); Stannary Hills, *Bancroft 202*, 1908 (BRI). **Leichhardt District:** Blackdown Tableland, 12 miles [c. 19 km] SSE. of Bluff, 2200 ft [c. 670 m] alt., above North Scarp, in open eucalypt forest on sandy soil with numerous rock outcrops, in shade of sandstone boulders, *R.W. Johnson 951*, 9.1959 (CANB, BRI, NSW); Blackdown Tableland, 23° 05′ S, 149° 00′ E, c. 32 km SE. of Blackwater, camp-site on Mimosa Creek, alt. 600 m, in damp crevices in sandstone very close to water's edge in open *Eucalyptus* forest, *Henderson 622*, *Andrews & Sharpe* 4.1971 (BRI, CANB, NSW), *Simmonds* 9.1937 (BRI 59319); Carnarvon Range, on scree slope on Clematis sandstone near mouth of gorge, *Butler* 1.1960 (BRI 25261); Carnarvon National Park, in Gorge 1 mile [1·6 km] W. of entrance to Gorge, on sandstone slope below high cliffs among rocks, sheltered shady site under tall *Eucalyptus maculata* forest, *Briggs 2149a*, 8.1968 (NSW); Isla Gorge, c. 18 miles [c. 29 km] SW. of Theodore, 25° 09′ S, 149° 57′ E, dissected plateau of sandstone in moist gully, *Everist 8062*, 9.1968 (BRI, CANB, NSW). **Burnett District:** "Broomia", near Mundubbera, *Young* 9–10.1926 (BRI 59304). **Moreton District:** Nambour, in gully, *Kenny* 10.1906 (BRI 84653); Maroochie, *F.M. Bailey* 7.1879 (BRI 59310); Cruickneck, Glasshouse Mts, under rocks on middle slopes, *Goy* 5.1935 (BRI 59318); Glasshouse Mountains area, 50 miles [c. 80 km] N. of Brisbane, near Gun-Gun, in sandy rock crevices in open forest, *Schodde 296*, 12.1956 (CANB, NSW, AD, L); Crows Nest, North Darling Downs, *C.T. White* 10.1921 (BRI 59313), *Kenny* 10.1921 (BRI 59315); Taylor Range, near Brisbane, c. 700 ft [c. 215 m] alt., amongst *Themeda australis* in open *Eucalyptus* forest, rocky mountain slopes, *Hubbard 3758* (BRI, K, L); Moreton Bay, *Mueller* (BM); Helidon-Ravensbourne, *Hockings* 8.1963 (BRI 51812); Mt Gravatt, Brisbane, *Manski* 9.1958 (BRI 12669); Brisbane River, *Dietrich* 1863–65 (L, BM); Chermside, near Brisbane, at the bottom of the dry gully on ridge of Ordovician shales, in open *Angophora woollsii* woodland, *Melville 3404 & S.T. Blake*, 3.1953 (K, NSW, BRI); Wellington Point, *F.M. Bailey NSW P2678*, 6.1892 (NSW); Canungra, on dry hillsides, rather rare, *C.T. White 7818*, 8.1931 (BRI); Binna Burra, Lamington National Park, 2600 ft [c. 800 m] alt., *Dickson NSW P5499*, 9.1947 (NSW); Springbrook, alt. 2000 ft [c. 600 m], under rock on hillside in dry *Casuarina* forest, *Goy & L.S. Smith 234*, 1.1938 (BRI); Mt Maroon, on summit between north peak and south peak, alt. c. 900 m, in moist soil under overhanging rock on edge of gully, *Everist 7107*, 3.1962 (BRI, NSW); Tambourine Mountain, *Shirley NSW P2677*, 12.1915 (NSW); Mt. Barney slopes, 3500 ft [c. 1070 m] alt., growing under rocks, frequent, on granite, *Constable NSW P6546*, 11.1952 (NSW), alt. c. 1000 ft [c. 300 m], in crevice beneath an overhanging rock, in rather damp situation, *Everist 1369*, 10.1935 (BRI).

New South Wales: **North Coast:** North Obelisk, 1 mile [1·6 km] WSW. of Urbenville, frequent among rocks on steep hillside, alt. 650 m, *Constable 6641*, 12.1965 (NSW, U); near Tuntable Falls, 5 miles [c. 8 km] NE. of Nimbin, 28° 34′ S, 153° 17′ E, in grey heavily leached forest soil at edge of wet sclerophyll forest, common, alt. 150 m, *Coveny 4502 & Rodd*, 9.1972 (BM, LE, NSW, PERTH, U); Drake, *Boorman NSW P2692*, 10.1901 (NSW); Barcoongere State Forest, c. 17 miles [c. 27 km] N. of Coffs Harbour, *McGillivray 25*, 3.1965 (NSW); Port Macquarie, *Boorman NSW P2687*, 6.1915 (NSW); The Rapids, Ellenborough River, *Watts NSW P2684*, 4.1915 (NSW); Kendall, *F.M. Bailey NSW P1653*, 9.1929 (NSW); c. 1 mile [c. 1·6 km] S. of "Hutt" at Ferny Creek, W. of Wallis Lake, *Salasoo 3310*, 1.1967 (NSW). **Northern Tablelands:** Lookout Point, Gibraltar Range, 30 miles [c. 48 km] NE. of Glen Innes, occasional on rocky granite hillside, 3360 ft [c. 1025 m] alt., *Constable NSW P7391*, 4.1956

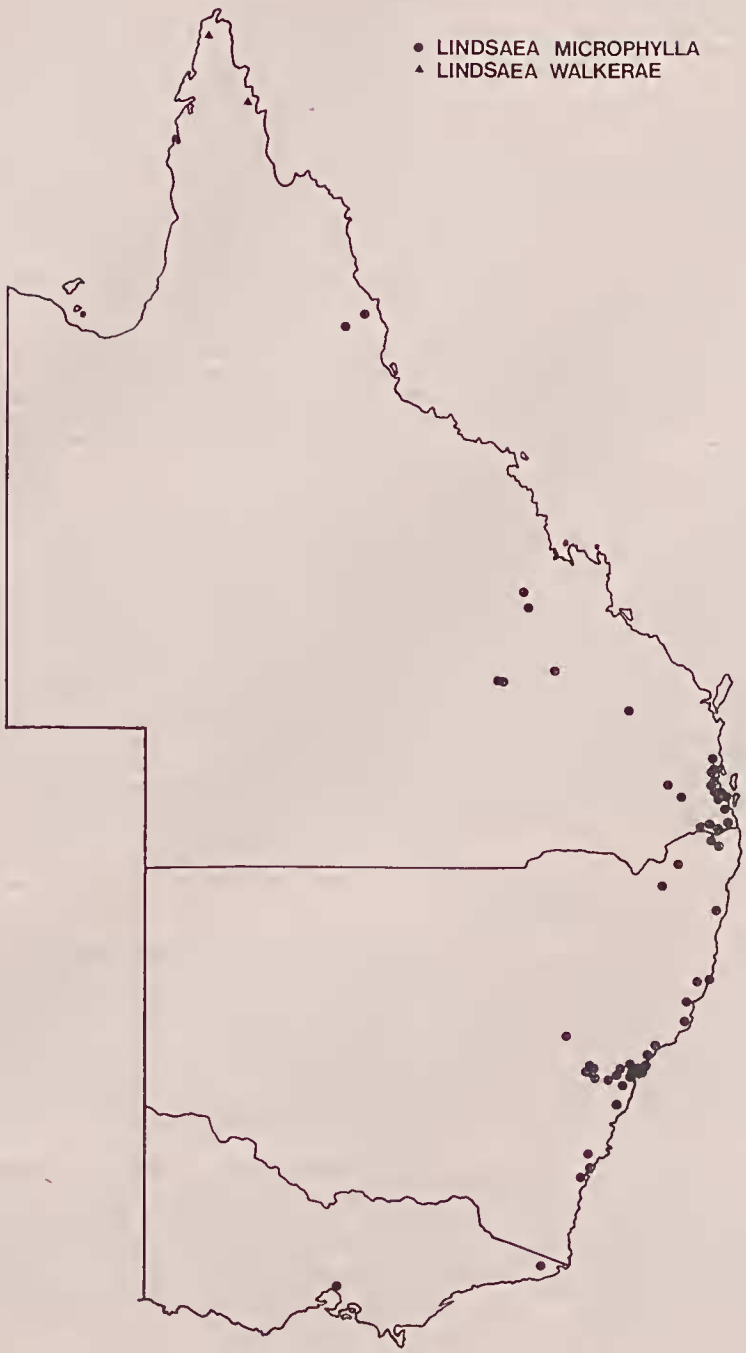

Fig. 1. Map of Eastern Australia (excluding Tasmania) showing the distribution of *Lindsaea microphylla* and *L. walkerae*.

(NSW, U). Central Coast: near Lake Macquarie, *Lomont 291*, 10.1887 (BM); Flat Rock, near Pearl Bay, *Helms NSW P2681*, 10.1900 (NSW); Somersby, on steep sandy slope leading to rain forest, *Chippendale NSW P6561*, 8.1953 (NSW); Bobbin Head, c. NE. of Hornsby, alt. 500 ft [c. 150 m], on moist rock face, in shallow soil, *Constable NSW P7152*, 8.1948 (NSW); Berowra, *Boorman NSW P6070*, 6.1905 (NSW, B, K, W, Z); Fish Ponds, Hornsby, alt. 150 ft [c. 46 m], growing under rocks, sandstone, *Constable NSW P6264*, 1.1950 (NSW); Kinka Reserve, Duffy's Forest, 33° 40′ S, 151° 12′ E, *Hain 100*, 8.1970 (CBG); Davidson Park, St Ives, off Douglas St., in sand between sandstone boulders, 33° 44′ S, 151° 11′ E, *Pulley JP 510*, 8.1970 (CBG); Oxford Falls, *Pichi-Sermolli 6136* (Pic-Ser); Brookvale, *Staer* 7.1910 (P); Gordon, *Kaspiew 1025*, 2.1959 (L); Cheltenham, sandstone, *Ford NSW P5506*, 3.1948 (BM, L, NSW); Castle Cove, in sandstone gully in dry sclerophyll forest, *C.L. Wilson 495*, 3.1957 (NSW); Castle Crag, sandstone, scrub forest in crevice of boulder, *Tindale NSW P6499*, 2.1948 (NSW); Argyle to Parramatta, *Hügel* (W); Fig Tree, Parramatta River, *Boorman NSW P2685*, 8.1914 (NSW); Sydney, *Brenning 785* (B, MICH), *U.S. Expl. Exped.* (B, GH, K); near Sydney, *Robertson* (E), *Cuttlar 153* (E); Port Jackson, *R. Brown 83* (E), *R. Brown* (P), *F. Bauer* (W), *Mossman 71* (HBG, W); Cumberland Co., *Alkin* (Z); Botany Bay, *Mossman 671* (B); *Mossman 71* (E, P); Botany Bay and Port Jackson, *Mossmon 671* (E); Sutherland, *Camfield NSW P1583*, 1.1895 (NSW); Springwood, *Constable NSW P1139*, 2.1947 (NSW), 750 ft [c. 225 m] alt., *Constable NSW P7147*, 2.1949 (BM, BO, K, L, LAE, NSW, U), *Podenzana* 1891–93 and 8.1902 (BM); Woodford, *Bäuerlen NSW P1634*, 7.1899 (NSW); Mulgoa, *Rupp NSW P2694*, 9.1915 (NSW); National Park, *Constoble NSW P8117*, 5.1960 (BM, K, NSW, U); Garie Beach, National Park, occasional on sandstone hillside, *Constable NSW P7485*, 9.1955 (NSW); National Park, near Sydney, *Melville 3753* (K); road to Avon Dam, alt. 900 ft [c. 275 m], beside dry watercourse in thick scrub, *Constoble NSW P226*, 7.1947 (NSW, Pic-Ser); Nepean Dam, Bargo, frequent amongst sandstone rocks, *Constable NSW P6689*, 11.1953 (NSW, SING). Central Tablelands: Cudgegong River, below Mt Cudgegong, occasional in dry sclerophyll forest with thick understory, *T. & J. Whaite 3271*, 8.1969 (NSW); Mt Irvine, in moist sandy soil, *Haigh NSW P148*, 7.1942 (NSW); Coal Creek, Mt Wilson, on rocky sandstone hillside, *Constable NSW P5312*, 12.1948 (NSW); Mt Victoria, *Weber* (HBG); Hazelbrook, Blue Mountains, terrestrial on bank on hillside in sandy soil, in dry sclerophyll forest, sandstone, *Tindale NSW P9376*, 4.1966 (NSW); Erskine Creek, King's Tableland, 18 miles [29 km] SE. of Wentworth Falls, locally frequent on sandstone hillside near creek, *Constable NSW P7409*, 5.1956 (L, NSW, U); 2 miles [3·2 km] S. of Queen Victoria Homes, King's Tableland, Wentworth Falls, on moist bank near edge of road, sandstone, 2850 ft [c. 870 m] alt., *Constable 4236*, 6.1963 (NSW); above Minnamurra Falls, alt. 2200 ft [c. 670 m], in an exposed position in rain forest ravine above the stream, *Judd NSW P7159*, 5.1955 (NSW). South Coast: Budawang Range, on The Castle, on damp sandstone shelf below the second cliff line, 35° 17′ S, 150° 12′ E, *Pulley & Telford BR 576*, 6.1971 (CBG); Yadboro State Forest, Kalianna Ridge track towards The Castle, 35° 18′ S, 150° 11′ E, *Canning* 2.1968 (CBG 2264); near Nelligen, *Gauba* 8.1953 (CBG 1717); Nelligen-Runnyford, in forest, *Phillips* 3.1961 (CBG 1887); Araluen Valley, 10 miles [c. 16 km] NW. of Moruya, 35° 50′ S, 150° 00′ E, alt. 250 m, in wet sclerophyll forest in dense undergrowth, *van Balgooy 1640*, 8.1971 (L).

Victoria: Karlos Creek, Mt Drummer, *Wakefield NSW P2676*, 12.1940 (NSW); Melbourne, *Lucas NSW P2688* (NSW).

The leaf architecture, the scales of the rhizome, and some soral characters of *L. microphylla* are strongly reminiscent of the genus *Sphenomeris*, where it has been placed by some authors. The fact that the indusium is at least sometimes laterally free as well as the distinct affinity with some species in section *Schizoloma*, e.g., *L. media* (see also below), and the lack of affinity with any species of *Sphenomeris*, show that its natural place is in *Lindsaea*, although it is undoubtedly close to the common source of the two genera, which is also phytogeographically interesting.

Two specimens in the Queensland Herbarium are probably hybrids of *L. microphylla*. One specimen viz. *L.S. Smith 324* from Mt Gravatt near Brisbane, is approximately intermediate between *L. microphylla* and *L. media* and its spores are abortive. The other, *S.T. Blake 4820* from Beerburrum, Moreton District, Queensland, has characters of both *L. microphylla* and *L. ensifolia* ssp. *agatii*. Its spores are also abortive. These intermediates strengthen the conclusion that *L. microphylla* is a member of *Lindsaea* section *Schizoloma*.

2. Lindsaea media *R. Br.*, Prodr.: 156 (1810); F.M. Bailey, Handb. Ferns Queensland: 18 (1874); Kramer, Fl. Males., Ser. 2, 1 (3): 208, fig. 20 (1971).

Synonymy: *Schizolomo medium* (R. Br.) Kuhn, Chaetopt.: 346 (1882). *Schizolomo ensifolium* (Swartz) J. Smith var. *medium* (R. Br.) Domin in Biblioth. Bot. 20 (85[1]): 78 (1913).

Lindsaea flabellulata Dryander var. *multipinnulata* F.M. Bail. in Queensl. Agric. J. 29: 349, Pl. 36 (1912). LECTOTYPE: Hinchinbrook Island, North Kennedy District, Queensland, *H. Tryon* 1912 (BRI 59253). SYNTYPES: Cook District, Thursday Island, *J. Douglas* 6.1893 (BRI 59254) and Cardwell, North Kennedy District, Queensland, *K. Broadbent* (BRI 59252).

Lindsaea subtripinnata Copeland in J. Arnold Arbor. 24: 441 (1943). HOLOTYPE: Tarara, W. Div., Papua, *Brass 8491* (MICH). ISOTYPES: (BO, GH, L).

HOLOTYPE: North Coast, Island G 2 (Australia), *R. Brown 82*, 18–24.ii.1803 (BM). ISOTYPES: (K, E). Possible ISOTYPES: (P, U).

MISAPPLIED NAMES: *Lindsaea trichomanoides* auct. non Dryander; ? F. Mueller, Fragm. 5: 118 (1965–66). *Lindsaea orbiculata* auct. non (Lam.) Mett. ex Kuhn; Domin in Biblioth. Bot. 20 (85[1]): 82 (1913). *Lindsaea cuneata* auct. non (Forst. f.) C. Chr.; Domin, l.c. 83. *Lindsaea tenera* auct. non Dryander; F. Mueller, l.c. 119.

DISTRIBUTION: Papua and Australia (Cook, North Kennedy, Port Curtis and Moreton Districts of Queensland as well as a very dubious record from New South Wales). Fig. 2 (p. 100).

HABITATS: Terrestrial or amongst boulders, often in rich alluvial soils along the banks of streams, in densely shaded situations or in open grassy sites, in low scrub, in savanna forests, in eucalypt or *Casuarina* forests, in semi-deciduous mesophyll vine-forests, on the margins of gallery woods or in rain forest undergrowth, in soils derived from sandstone, volcanic or a mixture of granite and metamorphic rocks, from sea level to c. 500 m alt.

Rhizome rather shortly creeping, c. 1–1·5 mm in diam., rather thinly and deciduously paleaceous; scales yellow, ovate-triangular, with a short, uniseriate, unthickened apical portion, up to 6-scriate at the base, to c. 1 mm long. *Leaves* clustered to c. 0·5 cm apart; petioles (stipes) stramineous or fawn-coloured, adaxially bi-angular below, channelled above, abaxially terete below, upward gradually obtusely or acutely bi-angular or flattened, 10–40 cm long, equalling or mostly longer than the lamina. *Lamina* herbaceous or chartaceous, olivaceous, brownish, or medium to dark green when dry, 10–30 cm long, 4–17 cm wide, 2–3 × as long as wide, triangular or oblong, bipinnate or bipinnate + pinnatilobate or + pinnatifid, rarely tripinnate at the base. *Primary rachis* adaxially deeply sulcate, abaxially flattened and bi-angular. *Pinnae* spreading or slightly, rarely more strongly ascending, the major pinnae c. 4–10 to a side, most or all subopposite, the largest basal pinnae 2·5–10 cm long, 12–18 mm wide, not narrowed at the base, rather evenly narrowed in the upper half or throughout; upper pinnae gradually and evenly reduced, no conform terminal pinna present. *Secondary rachises* adaxially flattened, bi-angular, the greater part with a green margin. *Basal pinnules* on both sides of the lower pinnae at least of large leaves usually pinnatilobate to pinnatifid or rarely pinnate, with few tertiary divisions. *Ultimate free pinnules* variable in size and shape, largely depending on the degree of dissection and on their place in the lamina but always distinctly dimidiate-subflabellate; larger ones trapezoidal, subquadratic, subsessile, the larger undissected pinnules up to 5 × 3·5 to 10 × 6 mm, if dissected the larger ones with incisions on both sides, the smaller only on the anterior side. *Upper pinnules* reduced, not strongly so in paucijugate pinnae, the terminal segment then obliquely rhombic, obtuse, free or almost so, to 5 mm long, more strongly reduced in plurijugate pinnae, the upper pinnules denticuliform, confluent into a narrow pinnatifid pinna-apex. *Juvenile plants* with paucijugate laminas with a few patent, paucijugate-pinnate pinnae at the base. *Upper and outer margin* of the sterile pinnules sharply dentate but obscurely or mostly distinctly crose in the fertile pinnules. *Veins* immersed, usually not evident, 1–3 × forked, c. 0·5 mm apart, free, connivent, or sporadically and irregularly anastomosing; leaves of adult plants hardly ever without any anastomoses, but often many pinnules, especially smaller ones, quite free-veined. *Sori* continuous except as interrupted by the incisions of the margin; indusium pale, erose to deeply and irregularly incised, almost reaching to slightly exceeding the margin, 0·3–0·5 mm wide, neither reflexed nor concealed at full maturity. *Spores* medium brown, trilete, smooth, c. 25 μm.

AUSTRALIA: QUEENSLAND: **Cook District:** Lockerbie, 10 miles [c. 16 km] WSW. of Somerset, 10° 47′ S, 142° 28′ E, abundant on outer edge of gallery woods on banks of stream, alt. 30 m, *Brass 18411*, 4.1948 (BRI, K, L, CANB); Scrubby Creek, Cape York Peninsula,

Fig. 2. Map of Queensland showing the distribution of *Lindsaea media* and *L. fraseri*

Whitehouse (BRI 59295); Cockatoo Creek, Cape York Peninsula, *Whitehouse* 1943 (BRI); Cape Grenville, on creeks in volcanic country, 11° 58′ S, 143° 14′ E, *Young 37*, 7.1923 (BRI); Ducie River, Gulf side of Cape York Peninsula, 12° 01′ S, 142° 00′ E, *Whitehouse* 2.1943 (BRI 59300); Aylen Hills, Portland Roads, 12° 36′ S, 143° 25′ E, *Brass 18945*, 5.1948 (L); Junie Creek, in rain forest, 12° 40′ S, 143° 15′ E, *Dockrill 584*, 10.1972 (BRI); Iron Range, 12° 42′ S, 143° 18′ E, gregarious locally amongst grasses in savanna-forest, alt. 50 m, *Brass 19127*, 6.1948 (BRI, CANB, L, K); Kennedy Rd., 13 miles NNE. of Pascoe River Crossing, 12° 45′ S, 143° 05′ E, *Gittins* 8.1965 (BRI 85585); Tozer Range, 0·5 miles [0·8 km] E. of Mt Tozer, 12° 47′ S, 143° 13′ E, common in rain forest undergrowth, *Brass 19468*, 7.1948 (CANB, BRI, K, L); Leo Creek, Upper Nesbit River, 13° 33′ S, 143° 28′ E, gregarious locally in very dense shade in rain forest undergrowth, 420 m alt., *Brass 19931*, 8.1948 (BRI, CANB, L); Lankelly Creek, on western fall of Mellwraith Range, approx. 13° 55′ S, 143° 15′ E, alt. approx. 200 m, in semi-deciduous mesophyll vine-forest along stream on alluvial soils derived from a mixture of granite and metamorphic rocks, some sclerophyll emergents—*Melaleuca argentea* and *Eucalyptus pellita*, permanent waterhole in creek at this point, *Webb & Tracey 9653*, 10.1969 (BRI); Kennedy River, 14° 29′ S, 143° 57′ E, in spring at branch of river, *Hann* 1890 (BRI) juvenile specimen; Altanmoui, 14° 35′ S, 144° 35′ E, in low scrub, under sandstone boulders, *Hyland 6326*, 7.1972 (BRI); Rossville, 15° 45′ S, 145° 16′ E, *Percival* 5.1973 (BRI 165027); Shipton's Flat, 15° 47′ S, 145° 14′ E, gregarious on dry shady banks of a stream, 275 m alt., *Brass 20012*, 9.1948 (BRI, CANB, K, L); Parrot Creek, c. 1 mile [c. 1·6 km] S. of Shipton's Flat, in open forest, c. 185 m alt., *L.S. Smith 14329*, 5.1969 (BRI); Mossman area in open grassy forest, 16° 02′ S, 145° 02′ E, *Percival* 8.1972 (BRI 165030); Pebbly Beach, 16° 37′ S, 145° 03′ E, *Dockrill NSW P8681* (U); Barron Falls (Kuranda), 16° 50′ S, 145° 39′ E, alt. 1071 ft [326 m], common above the falls on steep grassy slope with *Schizoloma fraseri* (i.e. *Lindsaea fraseri*), *Goy 397*, 7.1938 (BM, BRI); Black Mountain Rd., near Kuranda, frequent in colonies in *Casuarina* open forest, c. 1200 ft [c. 488 m] alt., *Flecker* 8.1967 (BRI 84725); Cairns, *Warburg 19266 pp.* (B); Yarrabah, *Messmer NSW P2883*, 7.1952 (NSW, U), *Domin 162, 169 and 174* (PR); Fitzroy Island, 16° 56′ S, 146° 00′ E, *J. MacGillivray* 6.1848 (K), *C. Moore* 1879 (P); Walsh's Pyramid, 17° 08′ S, 145° 49′ E, *Bellenden Ker Expedition* 1889 (BRI 59298); Bellenden Ker Ranges, *S. Johnson 62*, 1891 (P). **North Kennedy District:** Goold Island, *J. MacGillivray* 5.1848 (K); Rockingham Bay, *Mueller* 9.1877 (K), *Hill 38*, 1845 (BM), *ex Herb. Mueller* (P); Ingham Range, 18° 03′ S, 146° 01′ E, on steep shady creek banks and rich soil, *Percival* 7.1973 (BRI 165007); Wallaman Falls, 60 miles [c. 97 km] NW. of Ingham, 18° 35′ S, 145° 50′ E, amongst rocks in *Eucalyptus* forest on edge of gorge, *Vessey & Fox 85*, 8.1963 (BRI, JCT); between Cleveland Bay and Rockingham Bay, *Hill 38*, 1.1866 (K). **Port Curtis District:** Percy Isles, in dry thickets, *A. Cunningham* 6.1829 (K); Rosedale, North Coast Line, 24° 38′ S, 151° 55′ E, *Dovey 420*, 12.1931 (BRI). **Moreton District:** Moreton Bay, Glasshouses, 26° 54′ S, 152° 54′ E, *F. Mueller* 1857 (K).

New South Wales: A specimen marked "New South Wales", without further data (GH).

Described long ago, this species has almost fallen into oblivion. Herbarium material was mostly identified as *L. orbiculata* (or *L. flabellulata*), *L. tenera*, or as a variety of *L. ensifolia* or *L. heterophylla*. The affinity is, in our opinion, with *L. microphylla*, *L. ensifolia* var. *agatii* and perhaps also with *L. orbiculata*.

A collection from Tozer Range, C.Y.P., *Brass 19468* (L), has cuneate, largely sterile, sharply dentate pinnules and probably represents a shade form, as it was collected in rain forest.

A specimen from Port Essington, N. Australia (probably collected by R. Brown) *38* (K) with subbipinnate leaves and free veins, has strongly erose pinnules and more intramarginal sori than *L. media*. It has been determined as *L. flabellulata*, and is not unlike *L. orbiculata* var. *commixta*, but, as this species does not occur in or near Australia, it is better regarded as an aberrant form of *L. media*.

3. Lindsaea fraseri *Hooker*, Sp. Fil. 1: 221, Pl. 70B (1846); F. Mueller, Fragm. 5: 118 (1865–6); Bentham, Fl. Austral. 7: 721 (1878); F. M. Bailey, Fern World Australia: 40 (1881); F.M. Bailey, Lithogr. Ferns Queensland: Pl. 56 (left) (1892); F.M. Bailey, Queensland Fl. 6: 1955 (1902); F.M. Bailey, Compr. Cat. Queensland Pl.: 641 (1913); Tindale in Rec. Amer.-Austral. Sci. Exp. Arnhem Land 3: 177 (1958).

Synonymy: *Schizoloma fraseri* (Hooker) Fée, Gen. Fil.: 108 (1852); F.M. Bailey, Handb. Ferns Queensland: 20, fig. a, b (1874). *Schizoloma ensifolium* Swartz var. *fraseri* (Hooker) Domin in Biblioth. Bot. 20 (85[1]): 80, fig. 15, 8 (1913). *Schizolegnia fraseri* (Hooker) Alston in Bol. Soc. Brot., 2ª sér., 30: 24 (1956).

LECTOTYPE: Stradbrook (Stradbroke) Island, Queensland, *Fraser 171* (K). ISOTYPE?: ? Nov. Hollandianum, *Fraser* 1829 (K).

A specimen collected by *G.L. Davis NSW P7556* at Noosa Heads, Wide Bay, Queensland, in August 1956 (NSW) is a good match for the lectotype which is here designated for the first time.

DISTRIBUTION: Australia (Wide Bay and Moreton Districts of Queensland). Fig. 2 (p. 100).

HABITATS: In *Melaleuca* swamps, in sclerophyll forests or grassy forests or in wallum near the sea.

Rhizome rather long-creeping, ferrugineous, 1–2 mm in diam.; scales honey-coloured, almost acicular, approximately the apical $\frac{1}{3}$ uniseriate, the greater part biseriate, up to 4-seriate at the base, to 2 mm long. *Leaves* not close, c. 0·5–1 cm apart; petioles (stipes) stramineous with a darker base, or darker with age, quadrangular and $\pm$ sulcate, c. 4–25 cm long, c. $\frac{1}{4}$–$\frac{2}{3}$ of the length of the lamina. *Lamina* very narrowly lanceolate to linear, c. 17–35 cm long, 1·5–3·5 cm (usually 2–3 cm wide), usually widest just above the base, gradually narrowed to the apex, simply pinnate (or if quite or basally sterile a few pinnae at or just above the base, or less often some lower fertile pinnules, subpinnate or pinnate). *Pinnules* c. 12–20, often c. 18 on each side, at least the basal ones subopposite; texture herbaceous or chartaceous, colour yellowish green to olivaceous when dry. *Rachis* sulcate as in the upper part of the petiole (stipe). *Pinnules* spreading, or more often at least the larger ones distinctly ascending, the lower ones remote, several times their width apart, the upper closer but scarcely contiguous. *Major pinnules* of full-grown plants lanceolate or subhastulate with subcordate base, $\pm$ asymmetrical, very obtuse, c. 12–20 mm long, 5–15 mm wide, about as long as wide to c. 3 × as long, with a petiolule c. 1 mm long; smaller pinnules, most or all pinnules of sterile leaves, and pinnules of pinnate pinnae rhombic, suborbicular-flabellate, or subreniform-flabellate, about as long as wide or wider than long, with transitions between the two extreme shapes. *Upper pinnules* gradually reduced but not denticuliform; terminal pinnule rhombic-lanceolate, c. 0·5–1 cm long, superficially crenate-lobate, free or slightly connected with 1 or 2 reduced pinnules; terminal pinnules of pinnate pinnae often larger and more obtuse. *Margin of sterile pinnules* crenate-dentate but entire or with occasional shallow incisions in the fertile. *Veins* immersed, evident at least in transmitted light; larger pinnules with a stramineous, nearly percurrent costa, this gradually less distinct as the pinnules become smaller and/or less elongate. *Lateral veins* close, c. 0·3–0·5 mm apart, 1–3 × forked, ending in the teeth of the sterile margin, rather to quite regularly anastomosing in larger pinnules, irregularly in smaller pinnules, free or nearly so in the smallest, with a single series of very elongate areoles. *Sori* continuous around the pinnule-apex, or interrupted by an occasional incision; indusium pale or greenish, entire or subentire, 0·5–0·6 mm wide, equalling the margin or nearly so, not reflexed and scarcely bulging at maturity. *Spores* abortive in the samples examined by the authors.

AUSTRALIA: QUEENSLAND: Wide Bay District: Inland from Happy Valley on eastern side of Fraser Island, 25° 05′ S, 153° 15′ E, in sclerophyll forest, *Baxter 903*, 5.1967 (BRI); "Boonaroo", Maryborough, wallum near the sea, *Clemens* 10.1948 (K). Moreton District: 2 miles [3·2 km] S. of Buderim Mountain, 26° 43′ S, 153° 03′ E, grassy forest, *C.L. Wilson 660*, 5.1957 (BRI); Mooloolah and Maroochy Rivers, *C.T. White* 4.1916 (BRI 59588); Glasshouse Mountains, 26° 54′ S, 152° 54′ E, *F.N.C. Excursion* 9.1909 (BRI 59580), *F.M. Bailey?* 7.1879 (BRI 59578); Bribie Island, N. end of Moreton Bay, alt. c. sea level, in a very peaty soil from decaying vegetation and sand, growing under a shade of ti-trees and tall reeds, in dense ti-tree swamp, in water (not at all seasons, as it grows near the edge of swamps) and with a damp steamy atmosphere, *G.K. Jackson 34*, 8.1931 (K), *Clemens* (UC); Brisbane River, Moreton Bay, shaded woods, *A. Cunningham 185*, 1828 (K); Kedron, Brisbane 27° 25′ S, 153° 00′ E, *Simmonds* 5.1888 (BRI 59587); Wellington Point, 27° 29′ S, 153° 15′ E, *C.T. White* 11.1914 (BRI 59536, 59576–7, 59586); Dunwich, 27° 30′ S, 153° 24′ E, *F.M. Bailey?* 3.1892 (BRI 59581); Cleveland, *Mueller* (K); Moreton Bay, *Fitzallan* (K), *Fraser 98* (BM); Russell Island, *C.T. White* 9.1913 (BRI 59582); Tambourine Mountain, *Domin 167* (PR).

This species is morphologically close to *L. media* on the one hand and to *L. ensifolia* ssp. *agatii* on the other: juvenile specimens cannot always be readily distinguished. The abortive spores suggest an F_1-hybrid, presumably between these two species. It is interesting that sterile, apparently not full-grown specimens are often bipinnate or subbipinnate, whereas fertile ones are simply pinnate or rarely subbipinnate.

It was previously considered that *L. fraseri* extended to the Northern Territory (see Tindale in Specht (1958) page 177) based on a rather puzzling specimen collected by *Specht 451* at South Bay, Bickerton Island in the Gulf of Carpentaria. N.T., 6.1948 (BRI, K, L, LAE, NSW, US). This material is somewhat intermediate between *L. fraseri* and *L. ensifolia* Swartz ssp. *ensifolia* but is perhaps closer to the latter.

L. fraseri probably does not occur north of the Wide Bay District in Queensland. There are two doubtful records, viz. Rossville, Cook District, *Pereival* 5.1973 (BRI) which is a poor specimen, and Dulhunty River, W. (Gulf) side of Cape York Peninsula, Cook District, *Whitehouse* 1943 (BRI) which may be juvenile material of *L. media*.

4. Lindsaea ensifolia *Swartz* in J. Bot. (Schrader) (1800): 77 (1801); F. Mueller, Fragm. 5: 118 (1865–6); Bentham, Fl. Austral. 7: 721 (1878); F.M. Bailey, Fern World Australia: 40 (1881); F.M. Bailey, Lithogr. Ferns Queensland: Pl. 57 (1892); F.M. Bailey, Queensland Fl. 6: 1955 (1902); F.M. Bailey, Compr. Cat. Queensland Pl.: 641 (1913); Tindale in Rec. Amer.-Austral. Sci. Exp. Arnhem Land 3: 176 (1958); Kramer in Acta Bot. Neerl. 15: 579 (1967); Kramer in Blumea 15: 564 (1968); Brownlie, Fl. Nouvelle-Calédonie 3: 126 (1969); Kramer in Blumea 18, 1: 170 (1970); Kramer in Fl. Males. 2, 1 (3): 211 (1971).

Synonymy: *Schizoloma ensifolium* (Swartz) J. Smith in J. Bot. (Hooker) 3: 3 (1841); F.M. Bailey, Handb. Ferns Queensland: 20 (1874) as *S. ensifolia*; Domin in Biblioth. Bot. 20 (85[1]): 74–77 (1913). *Schizolegnia ensifolia* (Swartz) Alston in Bol. Soc. Brot., 2[a] sér., 30: 24 (1956).

For further synonymy see Kramer in Fl. Males., ser. 2, 1 (3): 211–212. As indicated previously (Kramer (1967) l.c.) there are two subspecies in the Pacific zone and Eastern Malesia but they are not sharply distinct and intermediates occur where they overlap in distribution.

Holotype: Mauritius, unknown collector (S-PA).

KEY TO THE SUBSPECIES OF *L. ENSIFOLIA* IN AUSTRALIA

1. Upper pinnules scarcely or not abbreviated; terminal pinnule large, free or nearly so, entire or rarely hastate at the base ..... *L. ensifolia* ssp. *ensifolia*

1.* Upper pinnules ± gradually reduced, confluent into a lobed or pinnatifid leaf-apex; lamina sometimes bipinnate or subbipinnate, rarely even subtripinnate at the base ..... *L. ensifolia* ssp. *agatii*

a. L. ensifolia ssp. **ensifolia**, see Bailey (l.c. 1892), Pl. 57 (right).

Distribution: Africa to S. China, S. Japan, Melanesia, Micronesia, Hawaii and Australia (northern Western Australia, the northern region of the Northern Territory and the Cook, Port Curtis, Wide Bay and Moreton Districts of Eastern Queensland).

Habitats: Terrestrial or in rock crevices, frequently in sandy alluvium near fresh-water streams or on the margins of *Melaleuca*, mangrove or cyperaceous swamps, in monsoon forests or in low-lying sandy areas in dry sclerophyll forests, on cliffs near the sea or in moist shaded gorges, often associated with sandstone.

The following description of ssp. *ensifolia* by the senior author is cited from Fl. Males. 2, 1 (3): 212 (1971):

"*Rhizome* sometimes short-creeping, (1–)1½–2(–2½) mm ϕ; scales light reddish brown, narrowly triangular, to 2 mm long, to 5-seriate at the base, about the apical ⅓ uniseriate. Leaves to 2 cm apart. *Petioles* c. 10–35 cm long, ½–1 times as long as, rarely longer than the lamina,

stramineous to reddish brown, rarely darker, abaxially at least upward bi-angular and sometimes also sulcate, if dark not or hardly pale-margined. *Lamina* very variable, c. 15–45 cm long, mostly once pinnate, rarely simple, very rarely subbipinnate; if simple lanceolate, c. 10 by 1½–3 cm, or linear, c. 10 cm by 3–10 mm. Pinnate lamina with the rachis like the upper part of the petiole, abaxially sharply bi-angular and mostly also sulcate. *Lateral pinnae* one odd one to 12 to a side, most often in 2–8 pairs, not contiguous, spreading to strongly ascending, the larger ones usually subpetiolulate, lanceolate to linear, ± evenly narrowed from base to apex, subacute to acuminate, 10–22 cm long, 4–25 mm wide, 4 to over 25 times as long as wide (the great variability at least in part due to the presence of juvenile yet fertile plants), the base broadly to narrowly cuneate, the basiscopic side usually slightly longer and narrower. Texture herbaceous to chartaceous, rarely thicker; colour dark green or olivaceous when dry. *Sterile leaves* (not common) with fewer, relatively broader pinnae; sterile margin (in fertile pinnae often present at the apex) serrate, less often subentire. *Upper pinnae* little reduced, in large leaves c. ¼ the size of the lower ones; terminal pinna conform, with asymmetric base, of the size of the larger lateral ones, free or slightly connected with 1 or 2 not lobe-like upper pinnae. Costa stramineous, not carinate. Areoles of veins ¼–1½(–2) mm wide. *Indusium* entire, 0·4–05 mm wide, strongly reflexed and concealed at maturity. Spores light yellow, c. 25–28 µm."

AUSTRALIA: Northern Territory: Wessel Islands, 11° 11′ S, 136° 44′ E, rare in monsoon forest in damp soil, *Latz 3229*, 9.1972 (NT 36751), *Latz 3228*, 9.1972 (NSW); Trepang Bay South, Cobourg Peninsula, in moist soil near base of *Melaleuca* sp., in swamp areas, 11° 14′ S, 131° 56′ E, *Letts NT 8312*, 10.1960 (NSW); 3·1 miles [5 km] S. of Raffles Bay, common near small stream, 11° 20′ S, 132° 24′ E, *Chippendale NT 8206*, 7.1961; Yirrkala, Arnhem Land, 12° 12′ S, 136° 47′ E, growing at edge of a freshwater marsh, *Specht 881*, 8.1948 (BRI, NSW); Oenpelli, Arnhem Land, 12° 18′ S, 133° 04′ E, at edge of dry watercourse on top of sandstone scarp, *Specht 1093*, 9.1948 (BRI, NSW); Mindil Beach, Darwin, common on shelves of rock face near beach, 12° 26′ S, 130° 49′ E, *Chippendale NT 4467*, 5.1958 (NSW); Port Darwin, *Holtze NSW P891* (NSW); Darwin, *Bleeser 652* (B); 2 miles [3·2 km] S. of East Alligator River Crossing, sandy alluvium near creek, 12° 27′ S, 132° 56′ E, *Byrnes 2186*, 6.1971 (NSW); 13 miles [c. 21 km] SE. of Darwin, common in small area on creek bank, *Chippendale NT 4446*, 5.1958 (NSW, BRI); Howard Springs area, 16 miles [c. 26 km] SE. of Darwin, infrequent, in monsoon forest, 12° 28′ S, 131° 03′ E, *Chippendale NT 6171*, 5.1959 (NSW); Delissaville, Cox's Peninsula, Arnhem Land, at water's edge of freshwater stream, 12° 31′ S, 130° 44′ E, *Specht 116*, 3.1948 (NSW, BRI); South Bay, Bickerton Island, in the Gulf of Carpentaria, 13° 45′ S, 136° 06′ E, in crevice above waterhole in sandstone hills, *Specht 451*, 6.1948 (NSW, K, L, LAE, US, BRI 59560 and 24392); Jasper Gorge, Victoria River district, 16° 02′ S, 130° 45′ E, *Beauglehole 46701 & G.W. Carr 2922*, 7.1974 (NT, AD, NSW); Tallaputta Gorge†, 30 miles [c. 48 km] W. of Haast Bluff, in masses in shaded moist gorge in a small area, *Chippendale NT 3569*, 7.1957 (BRI, K, NSW), Talipata Gorge, 23° 22′ S, 131° 22′ E, common on ledges of rock face of grotto, permanently damp from dripping water, *Henshall 11906*, 12.1974 (NSW); Kings Canyon, George Gill Range, c. 24° 16′ S, 131° 32′ E, along rock faces, upper gorge, *Beauglehole 26719*, 7.1968 (NT, AD, NSW), terminal segment slightly lobed.

Queensland: **Cook District:** Cape York, *Dämel 2* (P, U); *Dämel* (B, K), *F. Mueller* (GH); near Nine Mile Scrub, Bamaga, at the tip of Cape York Peninsula, 10° 54′ S, 142° 23′ E, in swampy places, *Webb & Tracey 6446*, 7.1962 (BRI); 3 miles [4·8 km] from Point Archer towards Cooktown, 15° 36′ S, 145° 18′ E, in low-lying sandy area in dry sclerophyll forest, *Wrigley & Telford NQ 1319*, 6.1972 (CBG); Bailey's Creek, N. of Daintree River, 16° 13′ S, 145° 28′ E, on mangrove swamp margin, *Wrigley & Telford NQ 955*, 6.1972 (CBG). **Port Curtis District:** Rosedale, 24° 38′ S, 151° 55′ E, *Dovey 421*, 12.1931 (BRI). **Wide Bay District:** Fraser Island, 25° 15′ S, 153° 10′ E, *C.T. White* 10.1921 (BRI 59547). **Moreton District:** Beerwah-Glasshouse Mts trace, 26° 51′ S, 152° 58′ E-26° 54′ S, 152° 54′ E, *Phillips* 8.1961 (CBG 1912); Moreton Island, 27° 04′ S, 153° 23′ E, in swamp approx 2 km ENE. of Bulwer, sedgeland dominated by *Gahnia sieberana* and Cyperaceae, soil a peaty sand, growing at margin of swamp, *Durrington 338*, 3.1973 (BRI); Stradbroke Island, 27° 35′ S, 153° 28′ E, *C.T. White* 9.1913 (BRI 59544), *C.T. White* 4.1917 (BRI 59545), *Percival* 7.1972 (BRI 16500).

Western Australia: *Northern Province:* **Hann District:** Osborne Island, Bonaparte Archipelago, 14° 19′ S, 126° 00′ E, *P.G. Wilson 11130*, 6.1973 (PERTH); Lawley River, 14° 40′ S, 125° 54′ E, *Gardner 1462**, 7.1921 (PERTH, NSW); Boonagaree Island, Prince Frederick Harbour, prob. 15° 05′ S, 125° 10′ E, *P.G. Wilson 11392**, 7.1973 (PERTH); Unwin's Island, Brunswick Island, Brunswick Bay, 15° 18′ S, 124° 48′ E, freshwater stream, *P.G. Wilson 11439*, 7.1973 (PERTH); Charnley River, near FAB 33, 16° 20′ S, 125° 16′ E, *Fitzgerald 1402*, 8.1905 (PERTH). **Fitzroy District:** King's Sound, 16° 50′ S, 123° 25′ E, *Froggatt NSW P2337*, 1888 (NSW); Derby, 17° 18′ S, 123° 38′ E, *Froggatt NSW P2386**, 1886–7 (NSW). **Ord District:** Cave Range, near Kununurra, c. 15° 31′ S, 128° 50′ E, in sand at foot of cliff, near spring,

† Tallaputta and Talipata are alternative spellings for the names of a gorge at the western end of the Macdonnell Ranges, N.T.

* Somewhat intermediate with ssp. *agatii*.

Beard 4304, 6.1965 (PERTH); ± 6·5 km W. of King River, S. side of Cockburn Range, Kimberleys, c. 15° 55′ S, 128° 06′ E, *Beauglehole 47234 & G.W. Carr 3356*, 7.1974 (NSW, PERTH); in gorge near Thompson's Springs, 42 miles [c. 68 km] SW. of Kimberley Research Station, 16° 01′ S, 128° 57′ E, tufted plant 1 ft [0·3 m] high growing in wet places, *Perry 2955*, 7.1952 (CANB, BRI, NSW, US); Thompson's Springs, Argyle, Ord River, wet shady spots, 16° 01′ S, 128° 57′ E, *Gardner 7378*, 6.1944 (PERTH); near overflow of Lake Argyle Creek Area, Kimberleys, *Beauglehole 46877 & G.W. Carr 3118*, 7.1974 (NSW, PERTH). Uncertain District (Hann/Fitzroy?): ± 200 km E. of Derby, Galvins Gorge, Kimberleys, *Beauglehole 47929 & G.W. Carr 4151*, 7.1974 (CANB, NSW, PERTH).

L. ensifolia ssp. *ensifolia* is common in the Northern Territory and northern Western Australia as well as occurring in Queensland. There are a few records of *L. ensifolia* ssp. *agatii* from the northern part of the Northern Territory and a large number from Queensland. Although the latter subspecies has not been recorded from Western Australia, some specimens show a tendency towards ssp. *agatii*.

b. L. ensifolia ssp. **agatii** (*Brackenridge*) *Kramer* in Acta Bot. Neerl. 15: 579, 573, fig. 1C, D (1967); Kramer in Blumea 18 (1): 170 (1970).

Synonymy: *Schizoloma agatii* Brackenridge in U.S. Expl. Exped. 16: 216, Pl. 30, fig. 1 (1854). Type: *U.S. Expl. Exped. s.n.*, Fiji (US?, not seen). Isotype: (K).

Schizoloma ensifolium (Swartz) J. Smith var. *heterophyllum* (Dryander) Domin f. *rhomboideum* Domin in Biblioth. Bot. 20 (85[1]): 77, fig. 14, 3 (1913). Holotype: Yarraba, Queensland, *Domin 170* (PR). *Schizoloma ensifolium* (Swartz) J. Smith var. *heterophyllum* (Dryander) Domin f. *angustipinnum* Domin in Biblioth. Bot. 20 (85[1]): 78 (1913). Syntypes: Yarraba, by Waterfall Creek, N. Queensland, *Domin 164* (PR), Yarraba, *Domin 163* (PR). *Schizoloma ensifolium* (Swartz) J. Smith var. *intercedens* Domin in Biblioth. Bot. 20, (85[1]): 80 (1913). Holotype: Yarraba, N. Queensland, *Domin 173* (PR).

Misapplied Names: *Lindsaea ensifolia* Swartz as in F.M. Bailey, Lithogr. Ferns Queensland: Pl. 57 (left), (1892). *L. heterophylla*, *L. ensifolia* var. *heterophylla*, *Schizoloma heterophyllum* or *Schizoloma ensifolium* var. *heterophyllum* auctt. as to Australian plants.

Distribution: Ambon, Timor and New Guinea, northwards and eastwards to Micronesia, New Caledonia, Tonga and Samoa, Australia (the northern region of the Northern Territory and eastern Queensland (Cook, North Kennedy, Port Curtis, Wide Bay and Moreton Districts)).

Habitats: Terrestrial or amongst rocks, usually near streams or in swamps, in lowland rainforest, in mixed xerophytic or poor eucalypt forest, in savanna woodland or *Melaleuca* woodland, sometimes on sandy flood banks, usually in peaty loam or sandy soil.

The following description of *L. ensifolia* ssp. *agatii* by the senior author is cited from Fl. Males. 2, 1 (3): 211–212 (1971):

"*Rhizome* not very shortly creeping, 1½ mm thick; scales as in ssp. *ensifolia*. Leaves ½–1 cm apart. *Petioles* stramineous to reddish brown, quadrangular, often sulcate. *Lamina* often lanceolate, with c. 8–15 pinnae to a side, sometimes subbipinnate to fully bipinnate. *Pinnae* often rather strongly ascending, the major ones c. 5–10 cm by 4–7 mm, 10–15 times as long as wide, the lower ones sometimes subauriculate at base, chartaceous or firmly herbaceous, acute or subacute, not rarely some lower (but not necessarily the lowermost) pinnatifid or pinnate, their segments usually rhombic or obovate, rarely prolongate-rhombic to lanceolate, up to c. 12 to a side, decurrent and often wing-connected, the basal ones often broader. Apices of pinnatifid or pinnate pinnae with a long undivided segment. *Upper primary pinnae* gradually and strongly reduced, the uppermost ones less than ¼ the size of the lower ones, terminal segment confluent with some reduced upper pinnae or lobed at the base. Veins in smaller secondary pinnules irregularly anastomosing; often only one row of areoles present. *Sterile margin* serrate. *Sori* continuous except as interrupted by incisions of the pinnae, in small pinnules of bipinnate leaves occupying only their outer margin. Indusium often with an irregular edge, occasionally slightly exceeding the margin. Spores light brown, c. 26 μm."

AUSTRALIA: Northern Territory: Giddy River, 12° 22′ S, 136° 42′ E, erect and sprawling rhizomatous fern, infrequent in peaty loam, in rain forest fringing creek, *Latz 2903*, 6.1972 (BRI); Darwin, 12° 38′ S, 130° 50′ E, *Posthumus 3841* (BO), *Holtze* (BM, US), *Schomburgk* (K).

Queensland: Cook District: Jardine River, c. long. 142° 21′ E, amongst grass in sandy tea-tree savanna-forest, *Brass 18919*, 5.1948 (K); Newcastle Bay, 2·5 miles [4 km] S. of Somerset, Cape York Peninsula, *Brass 18714* (K, L); Skardon River, Cape York Peninsula, 11° 45′ S,

142° 02′ E, *Whitehouse* 1943 (BRI 57575); Dulhunty River, W. (Gulf) side of Cape York Peninsula, 12° 00′ S, 142° 08′ E, *Whitehouse* 3.1943 (BRI 59574), *Whitehouse* 1943 (BRI 59584); Temple Bay, *Young 38 & 45*, 7.1923 (BRI); Brown's Creek, Pascoe River, gregarious in semi-shade on sandy flood banks, alt. 60 m, *Brass 19605*, 7.1948 (BRI, CANB, K); Tozer Gap, Tozer Range, edges of gully fringing rain forest, alt. 100 m, *Brass 19381*, 6.1948 (BRI, CANB); Claudie River, in savannah woodland, 12° 45′ S, 143° 15′ E, *Dockrill 499*, 10.1972 (BRI); Cape Bedford, 75 km S. of Cooktown, 15° 14′ S, 145° 21′ E, *Poland 85* (B); Isabella Falls, 27 miles [43·5 km] from Cooktown, 15° 18′ S, 145° 00′ E, fringing forest beside creek, *Wrigley & Telford 1377A*, 5.1972 (CBG); Mt Cook, 15° 30′ S, 145° 16′ E, 15° 30′ S, 145° 16′ E, along edge of boulder, *L.S. Smith 10580*, 8.1959 (BRI); Rossville, in sandy soil, savannah, *Messmer NSW P6470*, 7.1952 (NSW); Bailey's Creek area, c. ¼ mile [0·4 km] E. of sawmill (c. 7·5 miles [c. 12 km] ENE. of Daintree), c. 16° 13′ S, 145° 28′ E, in somewhat swampy lowland rain forest on grey soil, alt. c. 50 ft [c. 15 m], *L.S. Smith 11517*, 10.1962 (BRI); Daintree River, 16° 17′ S, 145° 27′ E, *Brass 2178*, 2.1938 (BRI). *Peuzke* 1882 (MEL); Kuranda, on hillside near coffee plantation, *Watts* 7–8.1913 (BRI 59543); Black Mountain Road, near Kuranda, sporadic in grass of *Casuarina* open forest, 16° 49′ S, 145° 39′ E, *Fleeker* 8.1967 (BRI 84890A); Kuranda-Saddle Hill Road, NW. of Cairns, in rain forest margin, *Wrigley & Telford NQ 52*, 5.1972 (CBG); Yarrabah Mission, Cairns district, *Messmer NSW P2389*, 7.1952 (NSW), Mt Bellenden-Ker, 17° 16′ S, 145° 51′ E, *Podenzana* (BM); Allumbah (Herberton district), *Waller NSW P888*, 11.1909 (NSW); 1 mile [c. 1·6 km] W. of Crawford's View, Palmerston Highway, c. 40 miles [c. 65 km] W. of Innisfail, in rain forest near creek in sheltered gully, fronds to c. 6 m long and rachis c. 12 cm diam. at base with pale green, swollen base of rachis and base of pinnae, no trunk, broad ± conical base, *Briggs 1955*, 8.1968 (NSW). **North Kennedy District:** Sugarcane Creek, between Tully and Mission Beach, in *Melaleuca viridiflora* woodland, common ground fern, *Webb & Traeey 8162*, 1962 (BRI); towards mountains S. of Tully, growing amongst grass on a *Casuarina* ridge in open forest, *Vessey* 9.1963 (JCT P253); Rockingham Bay, *Bancroft* (E), *F. Mueller* (K); Kennedy, in poor swampy areas, 18° 12′ S, 145° 58′ E, *Pereival* 7.1972 (BRI 165006); S. of Cardwell, in poor *Eucalyptus* forest near mangrove swamps, *Vessey* 3.1962 (BRI 35969); Palm Islands (c. 30 miles [c. 48 km] E. of Ingham), 18° 42′ S, 146° 36′ E, *Bancroft* (BRI 59549); Kelly's Gully, Mt Fox, 18° 49′ S, 145° 50′ E, *Clemens* 9–12.1949 (BRI 20178, K, MICH); Birthday Creek Falls, Paluma Range, alt. 2600 ft [c. 800 m], in wet sclerophyll (forest) fairly open, *Vessey* 4.1963 (JCT P256). **Port Curtis District:** Byfield, near Keppel Bay, common in sandy soil in savannah forest, *C.T. White 8171*, 9.1931 (BRI), common in sandy land in mixed xerophytic forest, *C.T. White 8028*, 9.1931 (BRI). **Wide Bay District:** Inland from Happy Valley on eastern side of Fraser Island, 25° 15′ S, 153° 15′ E, in sclerophyll forest, *Baxter 911*, 5.1967 (BRI). **Moreton District:** Wappa Falls, South Maroochy River, NW. of Nambour, 26° 34′ S, 152° 57′ E, among rocks in the open, *L.S. Smith 10544*, 5.1959 (BRI); Bribie Island, *Clemens* (MICH), *C.T. White* 1.1913 (BRI 59537); Moreton Bay, *F. Mueller* (K); Moreton Island, 27° 10′ S, 152° 25′ E, *Simmonds* 4.1892 (BRI 59566, K); Stradbroke Island, *Hill* (K); Brisbane River, *Dietrich* (B); Wellington Point, 27° 29′ S, 153° 15′ E, *Wedd*, 10.1891 (BRI 59570); Eight Mile Plains, 27° 35′ S, 153° 06′ E, *Williams* (BRI 59571); Nerang Creek, 28° 03′ S, 153° 17′ E, *Schueider* (BRI 59541).

The following specimens are considered to be intermediates between ssp. *ensifolia* and ssp. *agatii:* Katherine Gorge National Park, N.T., in rock crevices at bottom of cliff, *Byrnes NB 690*, 5.1968 (BRI, NSW); Wide Bay District, Queensland, Double Island Point, near stream, *Clemens* 10.1946 (K); East Coast (of Australia), *R. Brown* (E); Mt Fox, Queensland, *D.A. Smith & L.S. Smith* (BRI, K). A specimen collected at Noosa, Wide Bay District, Queensland, in a swampy area near the sea by *D.A. & L.S. Smith* in July 1943 (BRI 59561) is closer to ssp. *agatii.*

Material with abortive spores collected at Beerburrum, Queensland, by *S.T. Blake 4820* (BRI) is a possible hybrid between *L. ensifolia* and *L. media.*

A possible hybrid between *L. microphylla* and *L. ensifolia* ssp. *agatii* was collected by *L.S. Smith 324* on 15.ii.1938 at Mt Gravatt, near Brisbane, Queensland, growing in shade at foot of a large boulder in a very shallow gutter (BRI). The spores of this specimen are abortive.

5. Lindsaea trichomanoides *Dryander* in Trans. Linn. Soc. 3: 43, Pl. 11 (1797); J.D. Hooker, Handb. New Zealand Fl.: 359 (1864); Bentham, Fl. Austral. 7: 720 (1878); F.M. Bailey, Fern World Australia: 40 (1881); Thomson, Ferns & Fern Allies New Zealand: 52, Pl. 11 a, b (1882); Field, Ferns New Zealand: 78, Pl. 19, 1 (1897); Cheeseman, Man. New Zealand Fl.: 958 (1906); Kramer in Acta Bot. Neerl. 6: 146 (1957), in obs.; Crookes & Dobbie, New Zealand Ferns, ed.

6: 148, photo 149 (1963); Tindale in Beadle, Evans & Carolin, Handb. Vasc. Pl. Sydney Distr.: 61 (1963); Tindale in Beadle, Evans & Carolin, Fl. Sydney Region: 66 (1972); probably not of F. Mueller, Fragm. 5: 118 (1865–6).

SYNONYMY: *Adiantum trichomanoides* (Dryander) Poiret in Lamarck, Encycl. Suppl. 1: 140 (1810). *Schizoloma trichomanoides* (Dryander) Kuhn, Chaetopt.: 346 (1882).

Adiantum cuneatum Forster f., Prodr.: 84 (1786), non Langsd. & Fischer (1810). *Lindsaea cuneata* (Forster f.) C. Christensen, Ind. Fil.: 392 (1906); Ewart, Fl. Victoria: 38 (1931); Dobbie & Crookes, New Zealand Ferns, ed. 5: 152, photo 153 (1952); Wakefield, Ferns Victoria & Tasmania: 28, with fig. (1955); Allan, Fl. New Zealand 1: 58 (1961); Willis, Handb. Fl. Victoria 1: 23 (1962), *nom. illeg.*, non Willdenow (1810). LECTOTYPE (here designated): New Zealand, *Forster* (GOET). SYNTYPES: New Zealand, *Forster 298* (BM), *Forster* (UPS).

Lindsaea lessonii Bory in Duperrey, Voy. Bot. 1: 278, Pl. 37, fig. 2 (1828). *Lindsaea trichomanoides* Dryander var. *lessonii* (Bory) Hooker, Handb. New Zealand Fl.: 359 (1864); Thomson, Ferns & Fern Allies New Zealand: 52 (1882); Field, Ferns New Zealand: 79, Pl. 19, 3 (1890); Cheeseman, Man. New Zealand Fl.: 959 (1906); Crookes & Dobbie, ed. 6, New Zealand Ferns, ed. 6: 150, photo 151 (1963); Allan, Fl. New Zealand 1: 59 (1961). *Lindsaea cuneata* (Forster f.) Christensen var. *lessonii* (Bory) Crookes in Dobbie & Crookes, New Zealand Ferns, ed. 5: 154 with plate (1952); Allan, Fl. New Zealand 1: 59 (1961). HOLOTYPE: Bay of Islands, New Zealand, *Lesson s.n.* (P). ISOTYPE: (B).

HOLOTYPE: Dusky Bay, New Zealand, *Menzies* (BM). ISOTYPES: (B-WILLD, E).

DISTRIBUTION: Rare and localized in Australia but recorded from New South Wales (Central Coast and Central Tablelands), Victoria (Wilson's Promontory) and Tasmania (Gordon River); reports from Queensland refer to other species. Fairly abundant in the North Island of New Zealand and local in the South Island; sea level to 750 m alt. Incorrectly reported from the Pacific Islands by Dobbie & Crookes (l.c.), Posthumus (1938), and others, probably due to confusion with such species as *L. moorei* and *L. ensifolia* ssp. *agatii*.

HABITATS: In Australia this species is usually found amongst rock crevices in ravines or gorges in rain forests or dense forests above streams or rivers. In New Zealand it is terrestrial on dry shady banks or at the bases of trees in lowland to montane shrubland or in *Nothofagus*, Kauri (*Agathis australis*) or Broadleaf forests, *Dacrydium cupressinum* swamp forests or in podocarp-hardwood forests (*Podocarpus totara*, *Dacrydium kirkii* and *Phyllocladus glaucus*).

Rhizome shortly to rather long-creeping, ferrugineous or castaneous, c. 0·7–1·5 mm in diam.; scales reddish brown, elongate-triangular or lanceolate, apically very shortly unseriate, up to c. 14-seriate at or just above the base, up to 2 mm long. *Leaves* clustered to 1·5 cm apart, often irregularly spaced on the same rhizome; petioles (stipes) c. 7–22 cm long, $\frac{2}{3}$–$1\frac{1}{2}$(–2) × as long as the lamina, slender, reddish brown or more often castaneous, with or without a narrow pale margin, ± lustrous, quadrangular, usually scarcely sulcate except adaxially. *Lamina* herbaceous or less often chartaceous, dark green or olivaceous when dry, oblong or triangular-oblong, c. 10–20 cm long, 2–6 cm wide, $2\frac{1}{2}$–4(–5) × as long as wide, at least at the base pinnate + deeply pinnatifid, not rarely bipinnate, less often at the base bipinnate + more or less deeply cleft or pinnatifid; primary rachis like the petiole (stipe), upward gradually paler. *Major pinnae* c. 5–12, often 6–8, on each side, most or all but the uppermost subopposite, spreading or (especially when fully pinnate) ascending; the basal major pinnae a few cm apart, the upper gradually closer, contiguous or non-contiguous; basal pinnae with a petiolule of 1 to a few mm in length, the upper gradually subsessile; lowest pinnae sometimes not larger or even slightly smaller than the pair or pairs just above them. *Secondary rachises*, if any, basally reddish brown, upward gradually stramineous and marginate, abaxially rounded. *Larger pinnae* triangular, deltoid, oblong, or oblong-lanceolate, subobtuse to acuminate, 2–8 cm long, 1–2 cm wide, in the least dissected form at least on the basico-anterior side with one quite free or almost free flabellate pinnule and crenate-serrate-lobate above it, in the more strongly dissected forms with more, up to c. 6 major pinnules to each side, their shape and size depending on the degree of dissection of and their place in the lamina; smaller segments spathulate-cuneate, usually asymmetric, the outer margin rounded, not rarely erose or even minutely apiculate, often 4–5 mm long, 2–3 mm wide at the sorus, 1–1·5 mm wide at the base, the sides nearly straight; coarser segments (pinnules) flabellate-obovate, very obtuse, 5–8 cm long, 3–6 cm wide, widest above the middle, with very convex, usually erose

outer margin; larger pinnules cleft. All possible intermediates found between the extremes, but strongly and relatively slightly incised leaves do not usually occur together on the same rhizome. *Upper segments* gradually confluent into the lobed-crenate pinna-apex; upper (primary) pinnae gradually reduced and of simpler structure, confluent with the lanceolate, lobed, obtuse to acute, well-developed leaf-apex. *Apical parts of less divided pinnae* with an abaxially ± elevated stramineous costa, otherwise the ultimate divisions not costate. *Veins* immersed, evident, 1–3 × forked in the larger divisions, simple in the smallest, subpinnately branched in upper pinnae of scarcely divided leaves, lax, 1–1·5 mm apart, free, ending well within the margin. *Sori* short and approximately straight in smaller divisions, long and basally strongly concave along the outer margin of coarser ultimate divisions, usually on 1–4 (occasionally on up to 8) vein-ends, occurring up to the pinna-apices; receptacle mostly laterally surpassing its supporting veins. *Indusium* pale or brownish, subentire to slightly erose, 0·3–0·5 mm wide, falling short of the margin by less than its width to very nearly reaching it, bulging to ± reflexed at maturity. *Spores* hyaline, trilete, c. 25 μm (see Harris 1955, 105). n = ± 42 (Brownlie 1957a).

NEW ZEALAND: North Island: Bay of Islands, *Cunningham 214*, 5.1838, *Cunningham 212* (K), *Raoul* 1843 (P); near the Keri-Keri, deep woods, *Cunningham* (E); Waipoua Kauri Forest, 500 ft [c. 150 m] alt., in podocarp-hardwood forest (*Phyllocladus glaucus*, *Dacrydium kirkii*, *Podocarpus totara*), growing on open track, terrestrial fern, *Varekamp 80*, 12.1953 (L); Trounson Kauri Park, North Auckland, *Sledge 53 A* (K); Kawau, Hauraki Gulf, *Lyall* 12.1848 (E), Hauraki Gulf, *Lyall* (E); Waitakere, *Luerssen 2403* (P); Birkdale, Auckland, *Hynes* 12.1952 (BM), *Meebold 5255* (BISH); Auckland, *Mackay* 10.1855 (E), *Hynes* (BM, U), *Kirk* (GH), *Powell 28* (B), *Schwartz 385* (B), *Hauttain 36, 37* (BRI 59367), *Dubue* 1861 (E); University of Auckland property, Swanson, Auckland, *Mason* 1.1950 (L); South Auckland, Bush Reserve, Twilight Road, between Brookby and Cleveden, growing in moss (*Leucobryum*) at base of kauri, *Chinnock P114*, 11.1971 (Herb. Chinnock); Titirangi, between Rotorua and Tauranga-Mangarewa Gorge, growing on shaded bank in Broadleaf forest, *Chinnock P335*, 4.1972 (Herb. Chinnock); Hunua Ranges, *Moore* (MICH); Pirongia Mt, Waitako, *Cheeseman* 1.1879 (E); Bay of Plenty, *Cunningham 212* (K); Ngongotaha, *Prince* (GH); Ngongotaha Mountain, near Rotorua, *Chase, Leland & Tilden 115*, 11.1909 (B, BISH, BM, E, GH, K, US); Waipa-Taupo, *Hochstetter 28* (W); Rotorua, *Holtum* (SING); Palmerston North, *Zotov* 1931 (BM); Manawatu, Wellington Province, *Craig* (BRI 59368); Wellington District, Akatarawa Range, 3 km below the Akatarawa Road Summit on the Hutt Valley side, 40° 58′ S, 175° 07′ E, growing as base of *Nothofagus* tree, *Chinnock P201*, 5.1972 (Herb. Chinnock); in the neighbourhood of Wellington, *Ralph 5*, 1849–52 (BM, E, W), *Ralph 45*, 1849 (B, BM); Wellington, *Honkey* (E), *Logan* (B, K); Butterfly Creek, behind Eastbourne, growing on dry clay slope under *Nothofagus* in open situation, 41° 19′ S, 174° 54′ S, *Chinnock P183*, 4.1972 (Herb. Chinnock); Massacre Bay, *Lyall 67* (K). South Island: Queen Charlotte Sound, *Home* (BM); Wahi Punami, *Nelson, Ranift* 1886 (E); Picton, collector? 18/4 (E); in forest round Westport, in deep shade, *Green* 11.1877 (P); *Green 6*, 1878 (BM); *Green* 6.1879 (LE), *Green* 6, 5.1875 (E); Lower Buller Gorge, Westland, 41° 50′ E, 171° 40′ E, 700 ft [c. 215 m] alt., *Lambrechtsen 14*, 3.1964 (L); Greymouth, *Helms* 1870 (B, HBG, L, P, W); Banks Peninsula, *Raoul* (L); Akaroa, *Comte* 1855 (P); Milford Haven, Milford Sound, *Lyall* 3.1851 (E); Waitaki, *Sinclair* (K); Otago, *Macgregor* 1870 (E), *Dubue* (E).

AUSTRALIA: New South Wales: North Coast: near Port Macquarie, *Dobson* 1883 (MEL). Central Tablelands: Blue Mts, no collector (K), *Woolls* 5.1874 (MEL). Central Coast: Kurrajong, *Fletcher NSW P6071*, 9.1886 (NSW); Bulli, *Hamilton NSW P2700*, 1899 (NSW); head of Cordeaux River, W. of Mt Kembla, *Harper NSW P2968*, 2.1911 (NSW); above Minnamurra Falls, alt. 2200 ft [c. 670 m], in rock crevices, in rain forest ravine, above stream, *Judd NSW P7163*, 5.1955 (NSW); above Minnamurra Falls, 3 miles [4·8 km] W. of Jamberoo, 2000 ft [610 m] alt., in moist sheltered gorge in rain forest, in well-drained soil, *Judd NSW P7994*, 11.1956 (NSW); Broger's (Brogher's) Creek, near Illawarra, *Bäuerlen* 1883 (MEL).

Victoria†: Wilson's Promontory, *Audas & St John* 10.1909 (P).

Tasmania: Gordon River, *Milligan 775*, 10.1846 (K, W), *Lea 775*, 1886 (BM); Gordon River, Macquarie Harbour, in dense forest, *Gunn 2057* 10.1846 (NSW, HO), *Gunn 2057* (K).

As it has been our policy to cite a high proportion of the specimens examined, it is obvious that *L. trichomanoides* has a rather limited distribution in Eastern Australia, whereas it is common in New Zealand.

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† According to Willis (l.c. 1962) 23, this species may be extinct in Victoria.

The great variability in degree of dissection of the fronds in this species has caused much comment but has had surprisingly few nomenclatural consequences. The less dissected form which was described as *L. lessonii*, has until very recently been upheld as a variety, but we do not consider it separable; nor do we accept the suggestion of Carse (cited by Dobbie & Crookes, l.c.), that there are two forms or varieties with intermediate hybrids.

It is unknown which factor is responsible for the degree of dissection but it is definitely not a matter of the age or size of the plant. If a polypoid series were involved, one would expect differences in the size of the spores but this was not found. In Australia, too, both the coarse and finely dissected forms have been collected.

Although a typical member of section Schizoloma, *L. trichomanoides* is somewhat isolated. Its closest relatives may be the New Caledonian *L. nervosa* and *L. rufa*.

6. Lindsaea incisa *Prentice* in J. Bot. 11: 295 (1873); F.M. Bailey, Handb. Ferns Queensland: 19 (1874); Bentham, Fl. Austral. 7: 721 (1878); F.M. Bailey, Fern World Australia: 40 (1881); F.M. Bailey, Lithogr. Queensland: Pl. 55 (1892); F.M. Bailey, Queensland Fl. 6: 1955 (1902); F.M. Bailey, Compr. Cat. Queensland Pl.: 641 (1913); Domin in Biblioth. Bot. 20 (85[1]): 85 (1913).

HOLOTYPE: not cited. A specimen from "near Brisbane" apparently the type (BM, dupl. ?? in K).

DISTRIBUTION: Eastern Australia (uncommon in the North Kennedy and Wide Bay Districts but common in the Moreton Bay District of Queensland; a single record from the North Coast of New South Wales).

HABITATS: Mostly at low elevations in somewhat shaded, moist situations, often growing amongst grasses and sedges, occurring beside streams, in sclerophyll forests and *Melaleuca* swamps.

Rhizome somewhat shortly to rather long-creeping, sparingly branched, 0·5–1 mm in diam.; scales lemon-coloured, almost acicular, largely biseriate, to 1 mm long, a short apical portion uniseriate. *Leaves* not clustered, 0·5–1 cm apart; petioles (stipes) stramineous with a darker base, slender, wiry, c. 0·2–0·3 mm in diam., quadrangular with flat or at least adaxially sulcate faces almost to the base, c. 2–8 cm long, very much shorter than the lamina. *Lamina* c. 25–30 cm long when full-grown but apparently slowly developing, usually collected when only basally mature, the apex then lost and the lamina much shorter; 0·5–1·5 cm wide, linear; rhachis stramineous, quadrangular, quadrisulcate. *Pinnules* subopposite or nearly so, c. 30–50 pairs, 0·5–2 cm distant, never touching, spreading, thinly herbaceous, light olivaceous when dry, their laminas presumably not in the same plane as the rachis when growing, sessile or very shortly petiolulate below the cuneate base, in outline suborbicular, semiorbicular, or the smallest upper ones subdimidiate; larger pinnules (pinnae) 5–7 mm long, 5–8 mm wide, very shallowly crenate to deeply cleft or sometimes truly pinnately or palmately compound, the ultimate divisions cuneate-flabellate, with convex, crenate outer margin, sometimes cleft, 2 to 4 per pinnule, 2–5 mm long, 2–6 mm wide; a few pairs of basal pinnules usually ± reduced; upper pinnules very gradually reduced and of simpler structure; leaf-apex (usually wanting in herbarium material) with a small cuneate-flabellate terminal segment; sterile leaves often present, not difform but often with broader divisions. *Veins* dichotomous in the pinnules or segments, 1–3 × forked, often c. 0·5 mm apart. *Sori* on (1–)2–4 vein-ends; indusium whitish, 0·5–0·7 mm wide, with an irregular free edge, reaching or somewhat exceeding the usually erose laminal margin, in short sori almost pouch-shaped, in longer sori usually with a convex base, not reflexed at maturity. *Spores* medium brown, trilete, smooth, c. 43 μm. Plate VII.

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