
AUSTRALIAN CORALLOID FUNGI I – RAMARIA CAPITATA

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Abstract

The Australian species *Ramaria capitata* (Lloyd) Corner is fully described. Its history, currently known distribution and colour photographs are provided. The species *Ramaria ochraceosalmonicolor* (Cleland) Corner is fully discussed and reduced to a variety of *R. capitata*. The lectotype proposed by R.H.Petersen for *Ramaria ochraceosalmonicolor* is rejected and a new lectotype, which better conforms with the Cleland protologue, is proposed.

Key Words: fungi, systematics, *Ramaria*, Australia

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Introduction

Ramaria capitata (Lloyd) Corner was described over 80 years ago (Lloyd, 1922) and is widespread and relatively common in Australia. The authors now consider this species to be a "varietal complex" with considerable variation in both spore size and basidioma shape and colour and that earlier publications have increased rather than diminished the confusion over the species and its variants. This paper covers the taxonomic history and concept of *Ramaria capitata* together with its variety originally published as *Clavaria ochraceosalmonicolor* Cleland.

Ramaria capitata is unique in the genus *Ramaria* (Fr.) Bonord. in that during development of the basidioma, the apices commence as clustered, "rounded knobs" which then, in the majority of cases, rapidly inflate to become swollen and irregularly subglobose (Fawcett, 1939), or even capitate (Corner, 1950). In dried material, the desiccated apices are instantly recognisable because they have an "artificial, plastic"

appearance (frequently brownish magenta) and generally resemble small, undulate disks on top of and at right angles to the ultimate branches. During apical development, the top and sides of the swollen apex are at first sterile and covered with a trichodermal palisade of sinuate, hyphal elements (Petersen & Watling, 1989). As the sporocarp matures however, small numbers of sporulating basidia emerge amongst the palisade elements (Fawcett, 1939).

The closely adpressed and swollen apices are frequently so mutually crowded that they can form a fused surface. As a result, this may produce isolated cavities lined with sporulating basidia directly beneath the fused surface. Finally, a transient but very distinctive characteristic of the species is that the apical surface becomes sticky-viscid during its development, possibly due to an exudate from the palisade elements (Fawcett, 1939; Petersen & Watling, 1989). This viscosity is quite variable and it ranges from persistent to very evanescent or may be wholly absent.

Consequently, viscosity may or may not be noted by the observer depending upon local weather conditions, fruiting body maturity and the species variety.

Unravelling this varietal complex was made all the more difficult by mycologists and collectors who had provided descriptions based on small collections which were often immature. Our own observations indicate that this taxon is extremely variable in physical appearance and the inflated apices may not be evident in juvenile material, even though the trichodermal palisade is present. In mature fruiting bodies, the apices may cluster 'en masse' so that the entire surface of the fruiting body has a 'cauliflower' appearance, or they may cluster in 'small florets' so that a terraced or shelf-like surface appears and any variation in between these two extremes is possible. At least two colour varieties appear to exist: a pale to strongly coloured wholly yellow to yellow-orange variety which is usually (but not always) found in terraced form; and a variety with salmon-pink to apricot-pink branches and light buff to yellowish or ochre-yellow to orange apices which is usually (but not always) found in 'cauliflower' form. There does not appear to be any correlation between colour and spore size. All of the varieties possess the sterile, apical, trichodermal palisade and have spore lengths of 8.0–15.1 (17.5) μm .

Materials and Methods

Ninety-five collections from PERTH, AD, MELU, UNSW, HO, BRI, USO, E, TENN and PDD form the basis of this study. Specimen samples were examined under an Olympus CX40 research light microscope (with drawing tube) using both ammoniated congo red and cotton blue in lactic acid as the mountants. Congo red was the preferred initial stain for all tissues, while cotton blue (with the sample pre-heated in the mountant) was used to provide accurate observations of the spore wall and its structures. Colours are referenced to the Royal Botanic Gardens Edinburgh colour chart (Henderson *et al.*, 1969). The distribution charts were developed using DMAP (Morton, 2005). At this early stage, the distribution charts are more a record of where collecting has taken place than the true range of the

taxon. Chemical tests: KOH, 5% potassium hydroxide solution; IKI, Lugol's iodine solution; reactions noted on fresh material. Q's are omitted for basidia because the basidial lengths appear to vary considerably with fruiting body maturity and sampling location on the fruiting body. Even the basidial means should be accepted cautiously.

The history and concepts of *Ramaria capitata* var. *capitata*

Ramaria capitata (Lloyd) Corner was first described as *Clavaria capitata* by Lloyd (1922) based on Victorian material collected and forwarded to him by E.J. Semmens. Lloyd's sense of humour led him to publish, for the same species and in the same article, the name *Capitoclavaria capitata* (Lloyd) Lloyd under the authorship of his fictitious "Professor McGinty", however this name is invalid (ICBN, Art. 34.1).

Lloyd's description was minimal and he erroneously concluded that the fertile area of the fungus was restricted to the apical swellings. Fortunately, Semmens split his collection and sent most of the material to S.G.M. Fawcett who lodged it in MELU. This isotype collection not only holds a much larger fragment, it also contains many details missing from the holotype collection such as date, location, substrate and a reasonably full description. Both fragments confirm the swollen to capitate apices. Semmens' own notes record the "gelatinous mammillate caps" and indicate that the colours were "whitish, pale flesh colour" suggesting that there may have been a pinkish or more probably [given S.G.M.Fawcett's (1939) descriptions – see below] a very pale cream to orange-coloured tint to the type collection. He also indicated the overall appearance of the fruiting body as: "Much resembling a cauliflower entering the seeding stage." suggesting that his collection did not exhibit a completely even and closed apical surface but was rather broken into smaller "floret" or shelf-like terraces. This interpretation of Semmens' description is also supported by both the holotype and isotype specimens.

McLennan (1932) published introductory notes on Australian coralloid fungi with keys to the

species. *Clavaria capitata* is omitted but *Clavaria ochraceosalmonicolor* is included and defined as: "cauliflower-like, light ochraceous salmon, tips a warm buff". McLennan was uncertain if the South Australian species occurred in Victoria.

Fawcett (1939) discussed Lloyd's type description and retained the taxon as *Clavaria capitata* Lloyd. She provided a concise description based not only on the documents in Semmens' MELU isotype collection, but also on information obtained personally from Semmens together with additional collections of her own. The fruiting body was described as "Maize Yellow to Pale Orange Yellow" with semi-translucent apices that were paler than "Honey Yellow"; her photographs confirmed that the mature fruiting body often exhibits a "terraced appearance". Fawcett recorded that although the apices are at first sterile, they may produce basidia when the fruiting body is fully mature.

In his monograph, Corner (1950) transferred the species to *Ramaria capitata* (Lloyd) Corner, although he saw no material prior to his publication. Willis (1957) was the first Australian mycologist to use the name of *Ramaria* at genus level, and the new combination of *Ramaria capitata* appeared in Australian literature for the first time in his key (Willis, 1958). Corner (1966) examined both the type and a second collection of *R. capitata* and recorded much longer spores (–19 µm) than those found by Fawcett (1939) (–13 µm). Petersen & Watling (1989) reported a maximum spore length of 15.1 µm for *Ramaria capitata*. One Victorian collection (MEL2031605) had several spores reaching 16–17.5 µm but the remainder were less than 14 µm. It is likely that Corner similarly found a small area of the fruiting body in which some unusually large spores had been produced. Corner (1970) provided no additional information relevant to Australian studies.

Published illustrations of *Ramaria capitata* include: the black and white photographs of Fawcett (1939) with both 'terraced' and 'cauliflower' forms, and the colour images of Shepherd & Totterdell (1988) (as *Ramaria aurea*) and Fuhrer (2005) (very pale form).

Both of these recent images display the 'terraced' form of the fruiting body that was present in the type collection.

The history and concepts of *Ramaria capitata* var. *ochraceosalmonicolor*

This taxon has been both confused with other species and misidentified almost since it was first described by Cleland (1931), and Cleland himself contributed to the confusion. Cleland used the colours of Ridgway (1912), and his type description (with some dimensional and minor details omitted) is as follows:

"Compact, cauliflower-like [...] from a thick pallid base dividing into stout branches [...] these again dividing three or four times to end in blunt prong-like processes capped by several blunt teeth a few mm. long, [...] branches with longitudinal rugae. Colour Light Ochraceous Salmon (XV), Ochraceous Salmon (XV), Light Ochraceous Buff (XV) or Apricot Buff (XV) [...] when young Capuchin Orange (III), the tips yellower."

Until recently, no illustration of this taxon attributable either to Cleland or his artists was believed to exist. Its appearance was therefore open to wide interpretation and any Australian species of *Ramaria* with pinkish branches and yellow apices attracted the name of *R. ochraceosalmonicolor*. Because this frequently ignores Cleland's description of "compact, cauliflower-like", the species epithet has been applied to taxa which display an open coralloid structure; e.g., Willis (1957), MacDonald & Westerman (1979) and Bougher & Syme (1998). Fuhrer (2005) shows an open coralloid taxon, which is most likely to be *Ramaria anziana* R.H.Petersen. The black and white image in Young (2005) is close to the correct concept.

An illustration of the species is now known to exist in Cleland (1935, p265, figure 59) under the name of "*Clavaria australiana* Clel." The watercolour original (Fig. 1) shows details lost during publication and clearly displays the pinkish cinnamon colour of the branches and their swollen, yellowish buff apices. The collection used to produce this watercolour by Miss R. Fiveash has been located (AD-C



Figure 1. *Ramaria capitata* var. *ochraceosalmonicolor* from the original watercolour by Miss R. Fiveash. Cleland's notes on the reverse side indicate that the branches were "Pinkish Cinnamon XXIX" and tips were "Cinnamon Buff XXIX". The inflated, knob-like apices are clearly visible on the watercolour. Courtesy of Botanic Gardens of Adelaide and State Herbarium.

000422) and, apart from minor distortion through drying, the material conforms precisely to the fruiting body depicted in the watercolour. The specimen has warted spores and therefore cannot be *Clavaria australiana*, which has striated spores. The material also displays trichodermal palisades on the apices and is undoubtedly a variety of *Ramaria capitata* with pinkish branches.

Only seven of Cleland's collections labelled "*Clavaria ochraceosalmonicolor*" are considered to be relevant when defining what Cleland (1931) intended in his type description. With the exception of the MELU specimen, these Cleland collections (Table 1) have the words "Type" or "Cotype" marked on each herbarium packet in Cleland's own handwriting, have precisely the geographical locations indicated by Cleland in his type description, and were made prior to publication of his paper which included the type description of *Clavaria ochraceosalmonicolor*. Unfortunately, there are no Cleland notes extant explaining what he meant by 'Type' and 'Cotype', and Cleland (1931) did not nominate a holotype collection.

Cleland's field notes enclosed with these six 'types' confirm that Cleland's type description is a composite of the notes from two different taxa. Consequently, it is impossible to know

which parts of his type description can be applied to an individual 'type' specimen unless either its field notes support that part of the type description or the specimen can be positively identified by alternative means.

Petersen (1969) saw only three 'type' collections (ADW15964, ADW15966 and ADW15967) so that his overall conclusions for the identity of this taxon are erroneous. He appears to have followed traditional procedures and nominated collection ADW15964 as the lectotype presumably because it was the first chronological collection under Cleland's new species name and it came from Mt Lofty, the first geographical location in Cleland's list. However, Petersen's lectotype nomination cannot be maintained for several reasons.

Re-examination of this collection (ADW15964; Petersen, 1969) shows that the apices of the material are awl-shaped and lack both capitate swellings and trichodermal palisades. The material is in a very poor and fragmented state, but sufficient remains to be certain that the structure of the fruiting body was open coralloid, not compact. The spores measure 8.3-11.2 x 4.0-5.0 (-5.8) μm , which although a little shorter is more or less in agreement with Cleland's own measurements (8.5-13 x 3.7-5 μm). Cleland's field notes state that the

Table 1. Cleland's collections of *Clavaria ochraceosalmonicolor* in chronological order, and their current determinations.

| AD-C/MELU Number | Label and Notes | Identification |
|------------------|--|--|
| 000455/ADW15964 | Type. Kew No 71, Mt Lofty, 16 June 1917 | <i>Ramaria anziana</i> R.H.Petersen |
| 000463/ADW15966 | Cotype. Mt Lofty, 25 April 1924 | <i>Ramaria anziana</i> R.H.Petersen |
| 000467/ADW15963 | Cotype. MacDonnell Bay, 29 May 1925 | <i>Ramaria anziana</i> R.H.Petersen |
| 000462/ADW15967 | Cotype. Mt Lofty, 25 July 1925 | <i>Ramaria capitata</i> (Lloyd) Corner |
| 000468/ADW15965 | Cotype. Willunga Hill, 12 May 1928 | <i>Ramaria capitata</i> (Lloyd) Corner |
| 000465/ADW15961 | Cotype. Second Valley For. Res., 6 June 1930 | <i>Ramaria capitata</i> (Lloyd) Corner |
| MELU 7117F | Encounter Bay, 23 May 1932 | <i>Ramaria capitata</i> (Lloyd) Corner |

fruiting body colours are "pinky fawn" and that there is "rosy pink staining below".

Cleland's collection (ADW15964) is believed to be a collection of *Ramaria anziana* with slightly longer spores. Because the fragments include a small but stout stipe, it might also be a short spored form of *Ramaria samuelsii* R.H.Petersen, but since Cleland did not note the grooved branches described by Petersen (1988), this seems unlikely. Petersen & Watling (1989) have already recorded a collection of *R. anziana* with a spore length measuring 8.3-11.5 x 3.6-4.3 µm and Cleland's 'cotype' collection (ADW15966, in excellent condition) from the same location in April 1924 is also believed to be *Ramaria anziana*, although it exhibits even larger spores that measure 10.1-12.2 x 4.3-5.4 µm. Cleland describes it as "branches light ochraceous salmon [...] the tips of the branches yellowish", and the dried material shows the short, falsely fasciculate stipe. Finally, collection ADW15963 contains the notes "ultimate branches short, prong-like, tapering fingerlike; Capuchine orange to Ochraceous salmon" and it has spores measuring 7.2-9.4 (-10.4) x 4.3-5.8 µm. It also displays the slender, falsely fasciculate stipe. All of these three collections have an open coraloid structure not a compact 'cauliflower like' structure, none is described as "cauliflower like" in the relevant field notes provided by Cleland and all three lack a trichodermal palisade on the apices. These three 'type' collections are considered identical to (or are varieties of) *Ramaria anziana* R.H.Petersen.

Cleland's next three 'cotype' collections (ADW's 15967, 15965 and 15961) all contain material that exhibits capitate apices covered with a sterile trichodermal palisade. All three collections still display the compact, cauliflower floret formation of *Ramaria capitata* and contain hand-written field notes by Cleland. For each individual specimen, the included field notes contain the words "cauliflower like" and describe the branches as "Ochraceous Salmon XV". The field notes with collection ADW15967 include the branch surface descriptor of "longitudinal rugae". These three collections show that Cleland altered his species concept over time and the taxon he associated with the epithet of "*ochraceosalmonicolor*" in the period June 1917 to May 1925 is quite different from that for the period July 1925 to June 1930. This collection sequence also confirms that Cleland (1931) used data from the field notes in all six 'type' collections to form his compound 'type' description.

If the lectotype (ADW15964) nominated by Petersen (1969) is retained, *Ramaria anziana* R.H.Petersen becomes a synonym of *Ramaria ochraceosalmonicolor* (Cleland) Corner. There are however, excellent reasons to reject Petersen's lectotype because it does not conform with Cleland's protologue. The protologue requires that the lectotype must be "compact, cauliflower like", have salmon pink branches with longitudinal rugae and display yellow apices and the 'type' collections now identified as *Ramaria capitata* so conform. While *Ramaria anziana* does have salmon pink

branches and yellow apices, it does not produce either the compact, cauliflower like structure or branches with distinctive longitudinal rugae nor do any of the 'type' collections identified as *Ramaria anziana* have 'cauliflower like' in their field notes. For these reasons, the authors reject the Petersen lectotype (ADW15964) and select collection AD-C00465/ADW15961 (Second Valley Forest Reserve) as the lectotype because it conforms with the protologue and the Petersen lectotype does not. Additional positive aspects are that the re-selected lectotype is in excellent condition and contains ample material.

Collection MELU 7117F strongly supports the above lectotype re-selection. Cleland obtained this specimen from Encounter Bay in 1932 and forwarded it to S.G.M.Fawcett as an exemplar collection of *Clavaria ochraceosalmonicolor* Cleland. The apices are capitate and the fruiting body has a compact, "cauliflower-like" surface structure. The apices are covered with a sterile trichodermal palisade, and the material has been confidently identified as *Ramaria capitata*.

Finally, the additional notes given by Cleland (1935) for *Clavaria ochraceosalmonicolor* also support re-selection of the lectotype to conform with a variety of *Ramaria capitata*. Cleland noted that a more yellow to yellow-orange form of the species was also present in the same localities as his described taxon and stated that it too was "similarly cauliflower like, of the same size, base whitish, main branches stout and rugose and [...] dividing into several small knob-like projections". There is little doubt that the form he was describing was *Ramaria capitata* var. *capitata*.

Fawcett (1940) described the "cauliflower-like mass" formed by "*Clavaria ochraceosalmonicolor* Clel." and also provided an excellent black and white photograph (Plate 7, fig. 4) which conforms very well with the illustration provided in this paper (Fig. 5). She described the branches as "Cinnamon Buff or Pinkish Buff" with the apices similar in colour in fresh material but becoming "near Honey Yellow" as the fruiting body dries. This corresponds reasonably well to the watercolour original that provided the basis for the black and white image in Cleland (1935)

and given the variations that are now known to occur in this taxon, her description reasonably fits the colours given in the Cleland protologue. Fawcett (ibid.) also noted that the apices remain dry and do not fuse. Her statement that the apices become "hemispherical knobs" is contradicted by her own photograph (Plate 7, fig.4), which clearly shows the flattened, capitate apices produced in this taxon. Unfortunately, Fawcett supplied no details on the microscopic structure of the apices.

Although Corner (1950) transferred the species to genus *Ramaria* his description is essentially a collation based on the material provided in Cleland (1931, 1935) and Fawcett (1940). In his introduction, Corner (1950, p. 19) suggested that "*Ramaria ochraceosalmonicolor* is said to connect it (*Ramaria capitata*) with the normal state of the genus" which indicates that Corner was aware that *R. ochraceosalmonicolor* had a similar structure to *R. capitata* but lacked the viscid apices of the latter. Unfortunately, Corner provided no reference for his statement. Using several characters, Corner (1966) separated *Ramaria capitata* and *R. ochraceosalmonicolor* respectively on the basis of the viscid or non-viscid apices, the yellow to orange or pinkish branches and the longer or shorter spores. It is important to note that Corner (1966) based at least part of his concept of *Ramaria ochraceosalmonicolor* on a collection from New Zealand made by D.A.Womersley. While we have not seen this collection, the six collections lodged at PDD (Auckland, NZ) as *Ramaria ochraceosalmonicolor* have all proven to be other taxa and so far there is no evidence that *R. ochraceosalmonicolor* occurs in New Zealand. Corner (1970) added no further information.

Conclusions on *Ramaria capitata* and its varieties

Ramaria ochraceosalmonicolor (Cleland) Corner is therefore reduced to a variety of *Ramaria capitata* in which the branches are salmon pink while the apices are light buff to yellow ochre or orange-yellow. It might be argued that Semmens' original description actually describes var. *ochraceosalmonicolor* because he indicated that the surface was

"whitish, pale flesh colour", however Fawcett (1939) was originally in contact with Semmens and is in no doubt that the material in question is yellow to orange-yellow and not the salmon pink of var. *ochraceosalmonicolor*. For this and the above reasons, we ascribe the epithet of var. *capitata* to the wholly yellow or orange-yellow variety, and var. *ochraceosalmonicolor* to the variety with salmon-pink branches.

Ramaria capitata (Lloyd) Corner, Ann. Bot. Mem. **1**: 562 (1950)

Clavaria capitata Lloyd, Mycol. Not. **66** [Mycol. Writ. **7**]: 1107 (1922)

Capitoclavaria capitata (Lloyd) Lloyd, Mycol. Not. **66** [Mycol. Writ. **7**]: 1107 (1922), as 'McGinty', nom. inval., Art. 34.1.

Holotype: Australia, Victoria, Ararat, 9 June 1918; USO 332696 (Lloyd 32595); isotype (MELU7061F).

Illustrations: Fuhrer (2005), pallid form; Shepherd & Totterdell (1988) as "*Ramaria aurea*"; Young (2005) as "*Ramaria ochraceosalmonicolor*".

Basidiomata 7–10 x 6–9 cm; overall shape obconical to ± stipitate hemispherical, the fruiting body having a strong resemblance to a cauliflower with either an almost completely closed, compact surface or a 'terraced surface' composed of individual 'cauliflower florets' at different levels; apices very pale cream-coloured to yellow, orange-yellow, orange-red or light buff (5E–6F), composed of clusters of 3–8 rounded 'knob-like' endings which at first are compacted but separate, these then extending and inflating to become capitate and may then marginally fuse to form a wholly closed surface with cavities beneath, usually with a watery or glistening appearance when the apices are fully swollen and capitate; viscosity extremely variable, present, absent or transient, the surface may be quite viscid-sticky to dry depending upon variety, weather conditions and fruiting body maturity; branches pallid cream coloured to yellow, orange-yellow, deep pink, salmon-pink to salmon-buff or buff (52), longitudinally finely but distinctly rugulose or sulcate and the

grooves usually becoming very distinct in dried material, cylindrical, often at first horizontal near the stipe and then becoming vertically oriented, major branches sometimes rather thick (0.8–1 cm); axils acute, "V-shaped", usually with a branch surface groove commencing at the base of the axil; stipe 2.5–5.0 x 1.0–1.5 cm, smooth to a little tomentose, white or with some pale buff tints, aborted branches sometimes present; flesh white, solid, often becoming very hard when dried, without any colour changes on cutting or bruising. Odour none or slightly 'fungous'; taste none. Rhizomorphs absent.

Macrochemical reactions on fresh material: KOH – ; IKI –.

Basidiospores 8.0-15.1 (-17.5) x (3.6-)4.0-6.0 (-6.5) µm, mean 9.0-11.0 x 4.5-5.5 µm, Q: 1.6-2.5(-2.7), mean Q: 1.8-2.2, broadly ellipsoid to cylindrical or lacrymoid, often with a single, large inclusion but otherwise granular, hilar appendix prominent, often curved, rounded or truncate, ornamentation of scattered, low warts and ridges, profile moderately uneven and appearing as if the spore had been sprinkled with sugar granules, spore wall often weakly cyanophilic in cotton blue but warts strongly so; basidia (55-)60-80 x 8-12 µm, mean 65.0 x 10.0 µm, 4-spored, clamps absent; sterigmata up to 7 µm long, narrowly long-conical but may be a little incurved; trama composed of thin-walled, often inflated hyphae 3.5-13 µm diam., clamps absent; ampulliform septa present, 7-15(-18) µm diam., often with delicate stalactitic ornamentation; gleoplerous hyphae sometimes absent, if present then straight or contorted and 1.5-4.0 µm diam.; apices covered with a trichodermal palisade consisting of smooth, sinuous, slender, sometimes branched, hyphal elements 60–90 x 2–8 µm, the palisade at first sterile and the basidia limited to the branch surface beneath the swollen apex, however at least some basidia appearing in the trichodermal palisade at maturity. (Fig. 2.)

Habit: solitary or gregarious on soil (often sandy) amongst leaf litter. Habitat: in coastal heath, open eucalypt woodland or closed wet eucalypt forest.

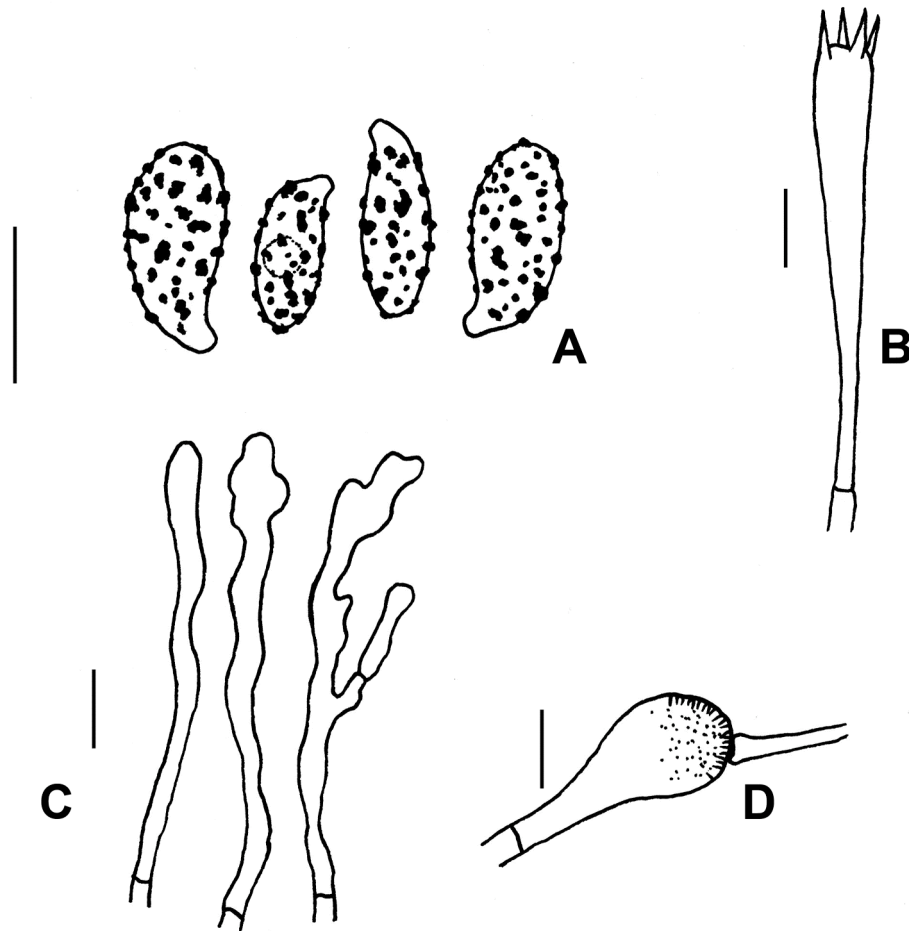


Figure 2. *Ramaria capitata* (holotype). A. basidiospores; B. basidium; C. trichodermal palisade elements; D. ampulliform septum. Scale bars = 10 µm.

During the examination of herbarium collections, *Ramaria capitata* has been located under a variety of names including: *R. flava* (MELU 7083F, 7093F), *R. pallida* (MELU 7123F), *R. flavobrunnescens* (MELU 7086F), *R. formosa* (MELU 7102F) and *R. aurea* (PERTH 05647932). At least some of these MELU collections and determinations are thought to be the basis for publications in which European names were erroneously given to Australian taxa.

Both the shape and size of the basidiospores vary considerably and this is reflected in the mean ranges for both the length and the width. Two common features of these basidiospores are first, the presence of a large curved apiculus and second, spore wall decorations consisting of large numbers of small warts so that under a light microscope the spore appears as if it has been dusted with sugar granules.

Key to the varieties

1. Basidiomata wholly pallid to cream-coloured, pale buff, or yellow to orange-yellow var. *capitata*
1. Basidiomata with salmon-pink to apricot-pink branches var. *ochraceosalmonicolor*



Fig. 3. *Ramaria capitata* var. *capitata* from Western Australia displaying the terraced structure and yellow to orange-yellow colours found in this variety. The capitate apices are encrusted with debris indicating viscosity. © R.M.Robinson

Ramaria capitata (Lloyd) Corner var. ***capitata***

Basidiomata wholly pallid cream, pale buff, pale to dark yellow or orange-yellow; frequently in 'terraced form'.

Viscosity usually very evident and persistent. (Fig. 3, distribution map: Fig. 4)

Note: The distribution map (Fig. 4) indicates the taxon occurs on the NSW/Qld border in the Lamington National Park. No material is held for this collection, however an excellent photograph has been examined which provides positive proof that this variety occurs at the location.

Material Examined

Queensland: Mt. Mee, 27° 04' 00"S, 152° 41' 00"E, 26 May 2005, N.A.Fechner & A.M.Young (s.n.), (BRI). **New South Wales:** Hawkesbury River, 33° 30' 00"S, 151° 10' 00"E, 16 Jun.

1912, J.B.Cleland (s.n.), (ADC000479); Milson Island, 33° 30' 00"S, 151° 10' 00"E, May 1913, J.B.Cleland (s.n.), (ADC000230), same location and collector, 4 May 1913, (ADC000425); Location unknown, 5 Nov. 1991, collector unknown, TENN050170; Cumberland State Forest, 33° 45' 00"S, 151° 01' 00"E, 15 Jun. 1980, A.M.Young (Y468, BRIP25069), (BRI); Mt. Haystack, 33° 31' 00"S, 150° 24' 00"E, 20 May 1980, A.M.Young (Y363, BRIP24958), (BRI); location unknown, 5 Nov. 1991, collector unknown, (TENN 050170); Mt. Haystack, 33° 31' 00"S, 150° 24' 00"E, 10 Jun. 1978, A.M.Young (Y356, BRIP24951), (BRI); Gibraltar Range National Park, 29° 29' 00"S, 152° 17' 00"E, 20 Jun. 2006, A.M.Young & N.A.Fechner (s.n.), (BRI). **Victoria:** Ararat, 37° 17' 00"S, 142° 55' 00"E, 9 Jun. 1918, E.J.Semmens (USO 332696, holotype; MELU 7061F, isotype), same location and collector (106), Jun. 1918, (ADC000483); Creswick, 37° 25' 00"S, 143° 53' 00"E, 10 Jun. 1960, E.J.Semmens (s.n.), (MEL2031605);

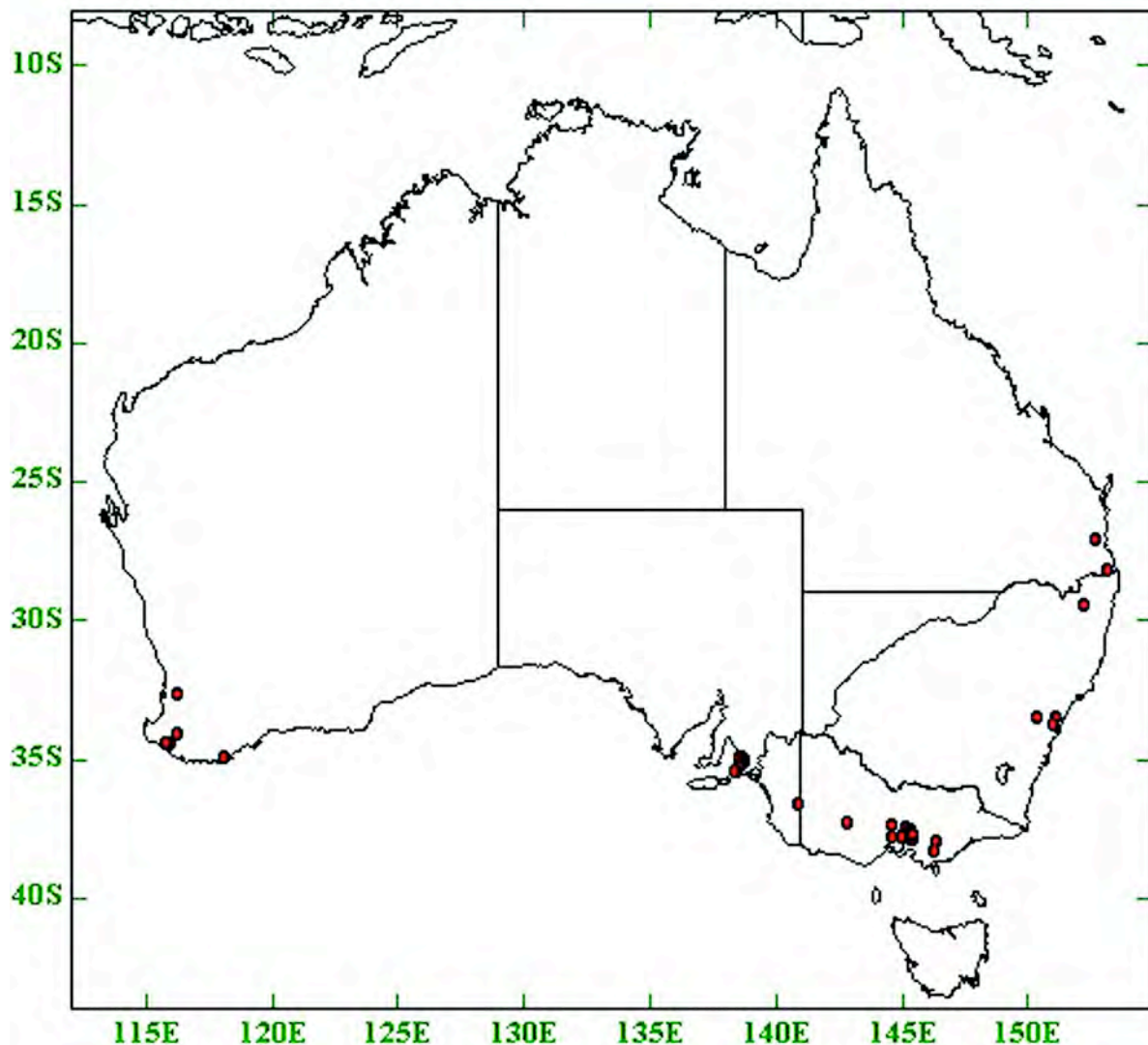


Figure 4. Currently known distribution of *Ramaria capitata* var. *capitata*.

South Yarra, 37° 50' 00"S, 144° 59' 00"E, undated, E.I.Turner (s.n.), (USO 333328); Kinglake West (Yea Rd.), 37° 28' 00"S, 145° 14' 00"E, 12 Jun. 1977, R.H.Petersen, G.Weste & H.Swart (Petersen 41224), (TENN 41224); Kallista, 37° 53' 00"S, 145° 22' 00"E, Apr. 1935, S.G.M.Fawcett (s.n.), (MELU 7093F); Cockatoo, 37° 56' 00"S, 145° 29' 00"E, May 1936, J.H.Willis (s.n.), (MELU 7123F), same location and collector, 6 Jun. 1936 (MELU 7060F); Towrong Reservoir, 37° 23' 00"S, 144° 36' 00"E, S.G.M.Fawcett (s.n.), (MELU 7062F); Kinglake, 37° 34' 00"S, 145° 21' 00"E, May 1936, S.G.M.Fawcett (s.n.), (MELU 7063F); Erica, 37° 57' 00"S, 146° 22' 00"E, 6 Jun. 1936, D.McLennan (s.n.), (MELU 7083), same date and location, E.McLennan (s.n.),

(MELU 7116F); Yarra Glen, 37° 39' 00"S, 145° 22' 00"E, Apr. 1935, P.S.Lang (s.n.), (MELU 7086F); Wooriyallock, 37° 46' 00"S, 145° 31' 00"E, May 1936, R.T.Patton (s.n.), (MELU 7102F); Durdidwarrah, 37° 48' 00"S, 144° 41' 00"E, Jun. 1936, S.G.M.Fawcett (s.n.), (MELU 7118F, 7119F); Bonang Rd nr. Orbost, 37° 23' 04"S, 148° 38' 54"E, 8 May 2005, K.R.Thiele (KRT3006), (MEL); Lower Glenelg, 38° 05' 00"S, 141° 20' 00"E, A.C.Beaglehole (6345), (MEL2031606); Mount Arapiles, 36° 45' 00"S, 141° 51' 00"E, 14 May 1969, A.C.Beaglehole (30658), (MEL1054224). **South Australia:** Adelaide, 34° 55' 00"S, 138° 36' 00"E, Jun. 1977, collector unknown, (TENN 41240); Mylor, 35° 03' 00"S, 138° 46' 00"E, 23 Jul. 1967, L.D.Williams (3087), (ADC-32836); Mt.

Lofty, 34° 59' 00"S, 138° 42' 00"E, 16 Jun. 1917, J.B.Cleland (s.n.), (ADC000503), same location and collector (19 Jun. 1920, ADC000459; 23 Jun. 1938, ADC000493; 17 Jul. 1914, ADC000487; 11 Jun. 1927, ADC000494; 9 Jul. 1921, ADC000464; 1 Jul. 1922, ADC000489; 8 Jun. 1931, ADC000495); Kuitpo, 35° 13' 00"S, 138° 42' 00"E, 17 May 1921, J.B.Cleland (s.n.), (ADC000490); Bangham (Forest Reserve), 36° 36' 00"S, 140° 55' 00"E, J.B.Cleland (s.n.), (ADC000491); Yinnar, 38° 19' 00"S, 146° 19' 00"E, date unknown, E.Askby (s.n.), (ADC000457); Willunga Hill, 35° 17' 00"S, 138° 34' 00"E, 29 May 1933, J.B.Cleland (s.n.), (ADC000460); Adelaide, 34° 55' 00"S, 138° 36' 00"E, 11 Jun. 1927, J.B.Cleland (s.n.), (ADC000478); Mt. Lofty, 34° 59' 00"S, 138° 42' 00"E, 13 Jul. 1952, C.G.Hansford (s.n.), (ADC000418); Myponga, 35° 27' 00"S, 138° 26' 00"E, Jun. 1944, H.M.Cooper (s.n.), (ADC000273); Echunga, 35° 06' 00"S, 138° 47' 00"E, 12 Jun. 1939, J.B.Cleland (s.n.), (ADC000395).

Western Australia: Winnejup Forest Block, 34° 04' 30"S, 116° 19' 34"E, 5 Jun. 2002, R.M.Robinson & R.H.Smith (FC59), (PERTH 05647932); Pemberton, 34° 27' 00"S, 116° 02' 00"E, 10 Apr. 1971, A.M.Young (Y36), (PERTH 00934143, BRIP24552/BRI); Kennedy Forest Block, 32° 40' 19"S, 116° 16' 46"E, 13 Jul. 2004, R.M.Robinson & R.H.Smith (FC752), (PERTH 06641776); Flybrook Forest Block, 34° 28' 35"S, 115° 51' 20"E, 16 May 1998, R.M.Robinson (FF78), (PERTH 04578031); Flybrook Forest Block, 34° 28' 35"S, 115° 51' 20"E, 3 Jun. 1998, R.M.Robinson (FF235), (PERTH 04579542); Two Peoples Bay Nature Reserve, 34° 59' 04"S, 118° 10' 59"E, 20 May 1992, K.Syme & M.Hart (KS490/92), (PERTH 05439906). There is reason to suspect that at least some of the Victorian collections sheltering under the MELU numbers are likely to be var. *ochraceosalmonicolor*, however none of the MELU collections contain field notes relevant to colour and without this, the separation of the varieties is impossible.

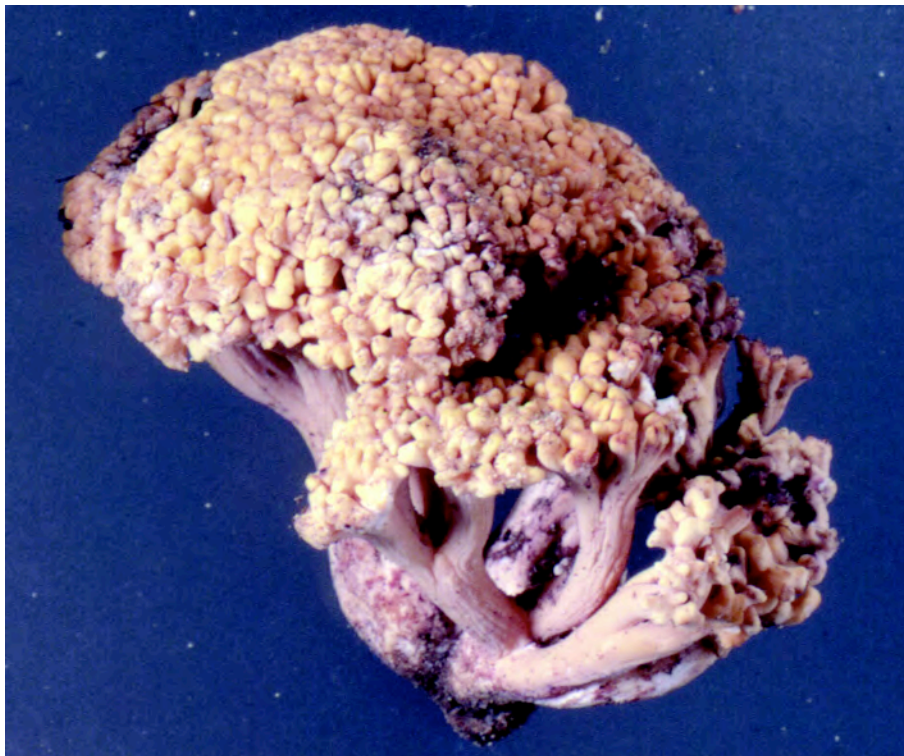


Fig. 5. *Ramaria capitata* var. *ochraceosalmonicolor* from New South Wales displaying the closed 'cauliflower' structure that is frequently encountered in this variety. The yellowish buff apices have fused to form an almost closed surface and the branches are pink tinted and longitudinally sulcate. © A.E.Wood.

Ramaria capitata (Lloyd) Corner var. ***ochraceosalmonicolor*** (Cleland) A.M.Young & N.A.Fechner, comb. nov. et stat. nov.

Clavaria ochraceosalmonicolor Cleland, *Trans. & Proc. Roy. Soc. South Australia* **55**, 160 (1931).

Ramaria ochraceosalmonicolor (Cleland) Corner, *Ann. Bot. Mem.* **1**, 611 (1950).

Lectotype here designated: Australia, South Australia, Second Valley Forest Reserve, 6 Jun. 1930, (AD-C 000465/ADW 15961); rejected lectotype: South Australia, Mt. Lofty, 16 Jun.

1917, (AD-C 000455/ADW 15964) sensu Petersen (1969).

Other illustrations: Cleland (1935), page 265, Figure 59 (as *Clavaria australiana* Clel.).

Basidiomata with salmon-pink to apricot-pink branches and buff to yellowish buff or orange (may be reddish tinted) apices; frequently in closed 'cauliflower' form. Viscidity absent or very transient and may not be observed. (Fig. 5, distribution map: Fig. 6.)

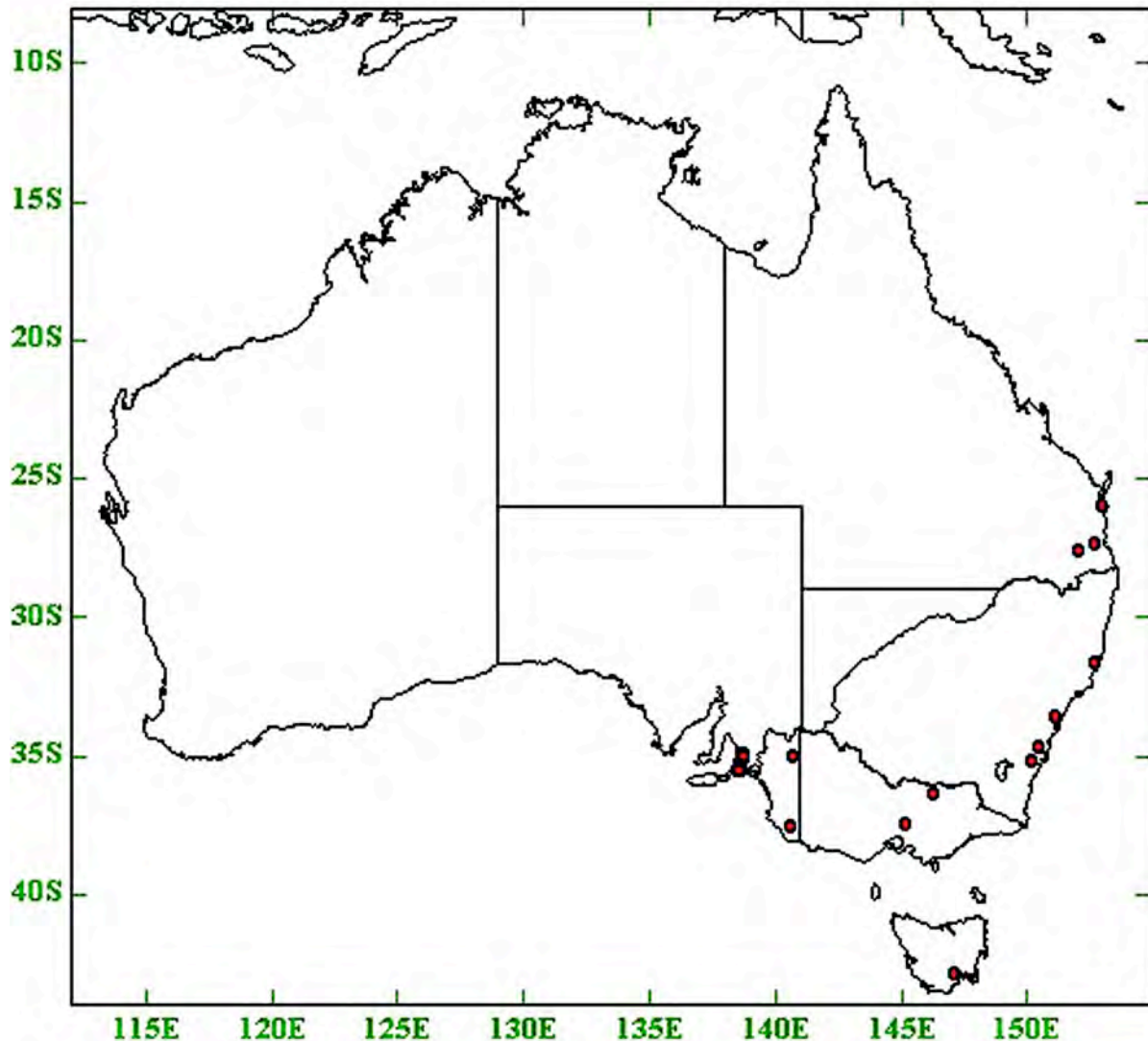


Fig. 6. Currently known distribution of *Ramaria capitata* var. *ochraceosalmonicolor*.

Material Examined

Queensland: Cooloola NP, 26° 02' 06"S, 153° 01' 28"E, 1 Jul. 2005, A.M.Young & N.A.Fechner (s.n.), (BRI); Helidon Falls, 27° 35' 00"S, 152° 05' 00"E, 7 Jun. 1986, G.Scott (s.n.), (BRI, AQ646421); Mount Glorious, 27° 20' 00"S, 152° 46' 00"E, 21 Jun. 1989, A.M.Young (Y1472), (BRI). **New South**

Wales: Kuringai Chase NP, 33° 38' 00"S, 151° 08' 00"E, 13 May 1978, A.M.Young (Y354, BRIP24949), (BRI); Kangaroo Valley, 34° 43' 00"S, 150° 27' 00"E, 9 Jun. 1919, J.B.Cleland (s.n.), (ADC000484); Terrigal, 33° 26' 00"S, 151° 26' 00"E, 7 Jun. 1914, J.B.Cleland (s.n.), (ADC000429); Kendall, 31° 37' 00"S, 152° 42' 00"E, 9 May 1918, J.B.Cleland (s.n.), (ADC000402). **ACT:** Jervis Bay, 35° 12' 00"S, 150° 12' 00"E, 11 May 1991, A.E.Wood *et al.* (91/23), (UNSW 91/23). **Victoria:** Road to

Yea nr. Kinglake West, 37° 28' 00"S, 145° 14' 00"E, 12 Jun. 1977, R.H.Petersen, G.Weste & H.Swart (Petersen 47388), (TENN 47388); Wangaratta, 36° 21' 00"S, 146° 18' 00"E, Apr. 1956, M.Ferris (34), (ADC53226). **Tasmania:** Growling Swallet, 42° 41' 00"S, 146° 30' 00"E, 17 Feb. 2005, G.Gates & D.Ratkowsky (14/2005), (HO); Myrtle Forest near Collinsvale, 42° 52' 00"S, 147° 09' 00"E, 3 Jan. 2006, G.Gates & D.Ratkowsky (GGDR1/2006), (HO). **South Australia:** Mt. Lofty, 34° 58' 00"S, 138° 42' 00"E, 25 Jul. 1925, J.B.Cleland (s.n.), (AD-C 000462/ADW15967); same collector and location [16 Jun. 1917, (ADC000455 – lectotype sensu R.H.Petersen (1969), rejected); 25 Apr. 1924, (ADC000463); 25 Jul. 1925, (ADC000462); 17 Jul. 1914, (ADC000485); 9 Jul. 1921, (ADC000422); 27 Jun. 1921, (ADC000276)]; Willunga Hill, 35° 17' 00"S, 138° 34' 00"E, 12 May 1928, J.B.Cleland (s.n.), (AD-C 000468/ADW 15965); Second Valley Forest Reserve, 35° 33' 00"S, 138° 33' 00"E, 6 Jun. 1930, J.B.Cleland (s.n.), (lectotype, AD-C 000465/ADW 15961), same location and collector [5 Jun. 1930, (ADC000466)]; Encounter Bay, 35° 35' 00"S, 138° 40' 00"E, 23 May 1932, J.B.Cleland (s.n.), (MELU 7117F); Basket Range & Norton Summit, 34° 56' 00"S, 138° 45' 00"E, 22 Jun. 1977, R.H.Petersen, P.H.B.Talbot *et al.* (RHP47390), (TENN 47390); Aldgate, 35° 03' 00"S, 138° 45' 00"E, 25 Apr. 1946, J.B.Cleland (s.n.), (ADC000426); Willunga Hill, 35° 17' 00"S, 138° 34' 00"E, 23 May 1931, J.B.Cleland (s.n.), (ADC000461), same location and collector [12 May 1928, (ADC000468), 6 Jun. 1930, (ADC000481)]; Echunga, 35° 06' 00"S, 138° 47' 00"E, 12 Jun. 1939, J.B.Cleland (s.n.), (ADC53227); Encounter Bay, 35° 33' 00"S, 138° 36' 00"E, 23 May 1932, J.B.Cleland (s.n.), (ADC000488); Kalangadoo, 37° 33' 00"S, 140° 40' 00"E, 28 May 1928, J.B.Cleland (s.n.), (ADC000492A); Bridgewater, 35° 00' 00"S, 138° 46' 00"E, 13 Jun. 1954, E.Wollaston (53), (ADC32742); MacDonnell Bay, 35° 04' 00"S, 140° 43' 00"E, 29 May 1925, J.B.Cleland (s.n.), (ADC000467); Kuitpo, 35° 13' 00"S, 138° 42' 00"E, Sep. 1972, J.H.Warcup (297), (MEL2024795).

A number of New Zealand collections previously determined as *Ramaria ochraceosalmonicolor* have also been examined. The results below indicate that

Ramaria capitata var. *ochraceosalmonicolor* has not so far been shown to occur in New Zealand.

PDD29998 (Auckland, NZ; under *Leptospermum*) = *Ramaria* aff. *australiana* (Cleland) R.H.Petersen

PDD86032 (One Tree Hill, NZ) = *Ramaria samuelsii* R.H.Petersen

PDD28507 (Auckland, NZ; under *Leptospermum scoparium*) = *Ramaria samuelsii* R.H.Petersen

PDD28506 (Auckland, NZ; under *Leptospermum scoparium*) = *Ramaria samuelsii* R.H.Petersen

PDD29264 (Goldies Bush, NZ; under *Leptospermum scoparium*) = *Ramaria lorithamnus* (Berk.) R.H.Petersen.

PDD29265 (Piha Valley, NZ; *Leptospermum scoparium*) = *Ramaria* sp. indet.

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We wish to thank Dr Richard Robinson of Western Australia for his generosity in providing the image of *Ramaria capitata* var. *capitata*, and Mr Graham Bell of the State Herbarium of South Australia for his considerable assistance in obtaining approval for our use of the Miss R. Fiveash watercolour. The helpful cooperation of the State Herbarium of South Australia in permitting the republishing of the Fiveash watercolour is also acknowledged. A very large debt of gratitude is also acknowledged to Dr Peter Buchanan and Mr Eric McKenzie of Herbarium PDD in Auckland, New Zealand who obtained and provided access to specimens from overseas herbaria as well as unstinting use of their research facilities during our stay. This paper was produced under an ABRS grant for investigations into the taxonomy of genus *Ramaria* in Australia.

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