Saproamanita, a new name for both Lepidella E.-J. Gilbert and Aspidella E.-J. Gilbert (Amanitaceae, Amanitaceae)

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Abstract: The genus Amanita has been divided into two monophyletic taxa, Amanita, an ectomycorrhizal genus, and Aspidella, a saprotrophic genus. The controversies and histories about recognition of the two genera based on trophic status are discussed. The name Aspidella E.-J. Gilbert is shown to be illegitimate and a later homonym of Aspidella E. Billings, a well-known generic name for an enigmatic fossil sometimes classified as a fungus or alga. The name Saproamanita is coined to replace Aspidella E.-J. Gilbert for the saprotrophic Amanitas, and a selection of previously molecularly analyzed species and closely classified grassland species are transferred to it along with selected similar taxa. The type illustration for the type species, S. vittadinii, is explained and a subgeneric classification accepting Amanita subgen. Amanitina and subgen. A. vittadinii is proposed. Validation of the family name, Amanitaceae E.-J. Gilbert dating from 1940, rather than by Pouzar in 1983 is explained.

Key words: Agaricales
Agaricomycotina
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INTRODUCTION

The genus Amanita Pers. 1797 (nom. cons.), belonging to the Amanitaceae E.-J. Gilbert 1940 of the pluteoid clade (or suborder Pluteinae Aime et al.; Dentinger et al. 2016) as circumscribed by Matheny et al. (2006) and Justo et al. (2011), is simultaneously one of the most famous and infamous of all fungal and mushroom genera. It includes the classical and fairy tale toadstool, the fly agaric, Amanita muscaria (L.) Lam. 1783, also renowned for its hallucinogenic properties. Additionally, it includes the highly toxic, often fatal Death Angels and Death Caps in the properties. Additionally, it includes the highly toxic, often fatal Death Angels and Death Caps in the Amanita phalloides (Fr.) Link 1833 and A. virosa Bertill. 1866 species complexes. Added to these notorieties are the facts that several species are prized edible species and one spectacularly showy species, A. caesarea (Scop.) Pers. 1801, earlier known as Kaiserling, was named after the Roman Caesars who apparently relished it. Amanita is also iconic because of its recognisability as some possess a complete complement of agaric tissues, which has led to use of its morphological silhouette to label anatomical features for mushrooms, e.g. for A. virosa, the pileus, lamellae, stipe, annulus and volva all being present. These facts are not new; but cumulatively, as was the case for features previously defining Coprinus s. lat., (Redhead 2001, Redhead et al. 2001), they have imparted an emotional inertia to adopting segregate genera.

Several attempts to split off separate genera from Amanita were made or supported by some authors in the first half of the 20th century based upon morphological or anatomical characteristics (e.g. Clements & Shear 1931, Earle 1909, Gilbert 1925, 1940, Güssow & Odell 1927, Konrad & Mbaublan 1924–27, 1930, Murrill 1914, Singer 1936, Smith & Gruber 1949), but virtually all of these segregate genera, except Amanitopsis Roze 1876 (e.g. Groves 1962) were rejected and synonymized by authors in the latter half of the century and early 21st century (e.g. Bas 1969, Horak 2005, Ito 1959, Knudsen & Vesterholt 2012, Kühner & Romagnesi 1953, Moser 1983, Shaffer, 1968, Singer 1951, 1962, 1975, 1986, Smith et al. 1979) except for the type studies by Horak (1968) where most were re-described, illustrated and keyed as ‘distinct’ genera for comparative purposes, and Clements & Shear (1931) synonymized Lepidella E-J Gilbert 1925 with Lepiota. The name Amanitopsis itself was even successfully proposed for conservation against Vaginarius Roussel 1806 and Vaginata Gray 1821 (Hawksworth 1984, Rogers 1953, Wiersema et al. 2015). Amanitopsis, which was largely characterized by the absence of an annulus, was ultimately
placed in generic synonymy simply on the basis of anatomical and morphological features. However, taxa based on these separate genera were often recognized at subgeneric ranks albeit with modified circumscriptions.

Early molecular based phylogenetic analyses based upon DNA sequence data independent of the morphology at first provided strong support for a close relationship between the various subgeneric components of Amanita (Weiß et al. 1998, Drehmel et al. 1999, Moncalvo et al. 2000b) and Amanita was confirmed as closest to Limacella Earle 1909 among sampled taxa in a broader survey of agarics first reported at meetings (Moncalvo et al. 1996, 1997) and eventually published (Moncalvo et al. 2000a). However, specific inclusion of a suspected saprotrophic, prairie-inhabiting North American taxon by Moncalvo et al. (2002), identified as Amanita armillariiformis Trueblood & D.T. Jenkins 1990 (Redhead det., GenBank AF261437 & AF261436 = DACM 184734 & 216919), suggested that those two samples represented a distinct evolutionary lineage characterized by its trophic status and separated from an otherwise well-documented ectomycorrhizal genus Amanita. The family Amanitaceae sensu Moncalvo et al. (2002a) was recognizable as consisting of Amanita s. str. (Clade SS/117), including the sequestrate taxon Torrendia pulchella Bres. 1902, and which was distinguished from both the prairie inhabiting taxon identified as “A. armillariiformis”, and the genus Limacella (that also seemed to include the genus Catatrama Franco-Mol. 1991). Analysis of additional samples and species (Amanita vittadinii (Moretti) Vittad. 1826 from Italy [Neville 99.10.23.06], Amanita nauseosa (Wakef.) D.A. Reid 1966 from North Carolina, and A. armillariiformis from USA were investigated by Vilgalys, Ganley, Drehmel & Moncalvo (unpublished) at Duke University in 2007 that supported the recognition of a non-mycorrhizal clade. This preliminary investigation suggested that the A. armillariiformis samples from Alberta, Canada used in the Moncalvo et al. (2002) publication differed from A. armillariiformis as represented by a paratype and two other Orson K. Miller collections (OKM 18830 & OKM18505) [VTMH 646, 3502, 3503]. Subsequently Justo et al. (2010) conducted an investigation of sequestrate Amanitaceae and synonymized Torrendia Bres. 1902 along with the sequestrate genus Amarrenidia Bouger & T. Lebel 2002 with Amanita, renaming Torrendia pulchella as Amanita torrendii Justo 2010 (non Amanita pulchella Imai 1933). In their analysis A. armillariiformis clustered with a second species, A. nauseosa, presumably represented by an Australian sample (GenBank AY194984) and separated from the ectomycorrhizal species. Additional sequences of grassland species of Amanita were generated by Wolfe and deposited in GenBank in 2010 by R. Tulloss, B. Wolfe and A. Pringle and used in the analyses by Wolfe et al. (2012a, b) on the trophic status and phylogeny of Amanita species and subgeneric groups. Vizzini et al. (2012) and Vizzini & Contu (2013) built upon the publications and data supplied by Wolfe et al. (2012a, b) with the addition of a second sample of A. vittadinii. They adopted a different philosophical position on the taxonomy in the family and proposed that the suspected saprophytic species in a basal clade be recognized as distinct generally from the ectomycorrhizal genus Amanita, typified by A. muscaria. They adopted the generic name Aspidella E.-J. Gilbert 1940 that appeared to be legitimate and available (Donk 1962) as typified by Aspidella vittadinii (Moretti) E.-J. Gilbert 1940 (syn. Amanita vittadinii). At that time although the name “A. pruittii” had appeared in their analyses, it was not a validly published name and therefore not available for transfer to Aspidella. Tulloss et al. (2014) considered the separation of Aspidella from Amanita as being problematic for an unexplained reason when they formally named the presumed saprophytic Amanita, A. pruittii A.H. Sm. ex Tulloss et al. 2014, which had been the invalid species name that had been used as a label in GenBank in 2010 (HQ625011) and in the published phylograms by Wolfe et al. (2012), Vizzini et al. (2012), and Hess & Pringle (2014). Notably, in the most detailed molecular investigation of the phylogeny of Amanitaceae based on four gene regions (nuclear and mitochondrial large and small units) by Wolfe et al. (2012) and re-analysis of the nuclear LSU by Hess & Pringle (2014), the non-ectomycorrhizal “Amanita” species clustered together and sister to the main Amanita clade, adding support for recognizing two genera, one ectomycorrhizal and the other non-ectomycorrhizal. Consequently Redhead & Vizzini (2015) transferred the epithet pruittii to Aspidella to supply an available combination for the genus when it is differentiated from Amanita.

Overlooked by all earlier authors, in particular mycologists, including ourselves, the name Aspidella E.-J. Gilbert 1940 is illegitimate, being a later homonym of Aspidella E. Billings 1872, typified by Aspidella terranovae E. Billings 1872, an enigmatic and famous fossil genus from the Ediacaran period (Boyce & Reynolds 2008, Burzynski & Narbonne 2015, Gehling et al. 2000, O’Brien & King 2004, Retallack 2015). Although Aspidella E. Billings may eventually universally or unequivocally be recognized as Animalia (Narbonne 2005), it has been classified as an alga, as bacterial colonies, and a basal group to the fungi, even as a type of lichen (i.e. a fungus), or even as a new kingdom, Vendobionta (Misra 2010) and it remains a puzzling fossil genus. The classification of Aspidella as either a lichenized or non-lichenized fungus (Petersen et al. 2003, Retallack 1994, 2014) or as an alga (under the now synonymous names Charnia Ford and Charniodiscus Ford (Ford 1958) places the name Aspidella E. Billings within the kingdom of names governed by the International Code of Nomenclature for algae, fungi, and plants (McNeill et al. 2012). Applying Arts 11.8 (Note 5), 45, and 54, Aspidella E.-J. Gilbert 1940 is interpreted as a later homonym under the ICN and hence illegitimate (Art. 53.1). Specifically for Art. 54.1 (a, b), even if later applied to a group covered by other codes of nomenclature; having once been classified as either an alga, fungus, or plant, a name such as Aspidella E. Billings, makes illegitimate any later homonym. Although this overlooked homonymy may appear to be unfortunate, it is in fact convenient because Aspidella E. Billings is so famous that it has occupied and saturated the scientific literature and databases. With a movement afoot to create a unified BioCode regulating the nomenclature of all organisms (Greuter et al. 2011, Hawksworth 2011), supporting a competing homonymous name for any organism is counterproductive to scientific communication. Additionally, conservation of Aspidella E-J Gilbert is unlikely
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splitting Amanita into two molecularly monophyletic genera, Amanita and Saproamanita nom. nov. (see below) along the lines of trophic status is preferred by us as a means of conveying this basic information. The two genera have been supported molecularly in studies by Moncalvo et al. (2002), Justo et al. (2010), Wolfe et al. (2012), Vizzini et al. (2012) and Hess & Pringle (2014). In the most thorough analysis of the phylogeny of Amanitaceae by Wolfe et al. (2012a) using four gene regions (nuclear and mitochondrial LSU and SSU rRNA) there is support for both a clade of ectomycorrhizal Amanita and a sister clade containing the non-ectomycorrhizal species formerly named in Amanita. Support for the former was high (100 % and 1.00 for maximum likelihood bootstrap and Bayesian posterior probability respectively) while the latter was present but at a lower level (66 % and 0.93).

Notably, support for the “clade” of non-ectomycorrhizal taxa was weaker and may indicate that the ectomycorrhizal genus Amanita arose from within the non-ectomycorrhizal clade and that the later may have more diverse range of trophic status. We note, for example, that several non-forest host plants that are primarily herbaceous may form ectomycorrhizas and could occur in open areas, e.g. Bistorta vivipara (formerly Polygonum viviparum, Polygonaceae; Sanchez et al. 2009) and Kobresia myosuroides ([sometimes classified as Carex myosuroides, Cyperaceae; Global Carex Group. 2015, Starr et al. 2015] Aamarellou et al. 2009, Davey et al. 2015, Gardes & Dahlberg 1996, Kohn, & Stavoski 1990, Massicotte et al. 1998, Moreau et al. 2006, Muthukumar et al. 2004, Peintner & Dämmlrich 2012). No known representatives of Poaceae form ectomycorrhizas (Wang & Qiu 2006). For now, we are satisfied that only two genera, Amanita and Saproamanita, should be recognized rather than three or four, and simply flag taxa in the A. inopinata clade as decomposers of unidentifiable carbon sources (Wolfe et al. 2012b).

Others may differ in opinion (see Acknowledgements) as to whether the generic name Amanita should apply to all species in the clade that we here recognize as tribe Amanitaeae R. Maire ex Killerman 1928 in Amanitaceae E.-J. Gilbert 1940, excluding the various classifications and nomenclature regarding the tribe Amanitaeae see Neville & Poumarat (2004). For a more detailed higher level classification see Dentinger et al. (2016).

In addition to monophyly, our rationale for recognizing two genera lies with the future of mycological investigations well outside the scope of traditional taxonomy. Metagenomic studies reply upon generic level associations with trophic strategies; Amanita is most often coded as ectomycorrhizal (ECM) in such studies. It would be disadvantageous to label saprotrophic Amanitaeae with the generic name Amanita and far more informative to separately label them Saproamanita to distinguish them from Amanita in future large scale environmental studies (e.g. Azul et al. 2010, Buée et al. 2009, Dance 2008, Marmeisse et al. 2013, Martin & Martin 2010, May & McMullan-Fisher 2012, Orgiazzi et al. 2012, Sato et al. 2012, Tsujino et al. 2009). Agaricologists tend to be focussed on basidiome features and infrequently compare their taxonomic systems and viewpoints to that of phylogenetic investigations and the taxonomy of other fungal groups such as yeasts, smuts, Glomeromycetes, Pleosporales, or corticioid fungi, etc., and consequently the broader picture is often obscured. Finally, we note that it was not surprising to look back in time and notice that an unusually high number of basionyms were coined in combinations with the generic names Lepiota, Armillaria, or Lepidella rather than in Amanita.

TAXONOMY

Saproamanita Redhead, Vizzini, Drehmel & Contu, nom. nov.

MycoBank MB816353

Etymology: ancient Gr. σαπρός (saprós) - decay and Amanita (f.).

Replaced name: Lepidella E.-J. Gilbert, Bull. Soc. mycol. Fr. 41: 303 (1925); nom. illegit. (Art. 53.1), non Lepidella Tiegh. 1911 (Loranthaceae).

Type species: Saproamanita vittadinii (Moretti ) Redhead et al. 2016 syn. Agaricus vittadinii Moretti 1826, Amanita vittadinii (Moretti) Vittad. 1826, Armillaria vittadinii (Moretti) Locq. 1952, Aspidella vittadinii (Moretti) E.-J. Gilbert 1940, Lepidella vittadinii (Moretti) E.-J. Gilbert 1925, Lepiota vittadinii (Moretti) Quél. 1873.

Synonyms: Aspidella E.-J. Gilbert in Bresadola, Icon. mycol. 27 (suppl. 1, fasc. 1): 63 (1940); nom. illeg. (Art. 53.1), non Aspidella E. Billings 1872 (fossil. Classified in various extant kingdoms as an alga, animal, bacterium, fungus or in an extinct Kingdom, Vendobionta).

Gilbertia Donk, in litt. “1934”; nom. inval. (Arts. 29, 36.1, 38.1, 41.5, 58.1).

Gilbertia Donk, in litt. “1934”; nom. inval. (Arts. 29, 36.1), cited by Gilbert (1940) as unpublished. See also Donk (1962) and Neville & Poumarat (2004).

Amanita subgen. Lepidella Beauseigneur, Contrib. Étude Fl. Mycol.: 38 (1926); as “Gilbert”.

Amanita subgen. Aspidella E.-J. Gilbert, Comment. Amanites, Notul. Amanites [suppl.] XXX: [3] (1941) nom. and stat. nov. based on an illegitimate basionym (Art. 58.1)

Amanita sect. Aspidella Pomerleau, Nat. can. 93: 844 (1966); replacement name at a different rank, based on an illegitimate basionym (Arts. 36.2, 38.1, 41.5, 58.1).

Amanita sect. Lepidella Corner & Bas Persoonia 2: 244 (1962); without attribution; replacement name at a different rank based on an illegitimate basionym (Arts 36.2, 38.1, 41.5, 58.1).

Amanita subsect. Vittadiniae Bas, Persoonia 5: 346 (1969).

Amanita ser. Vittadiniae (Bas) Neville & Poumarat, Fungi Europaei 9: 510 (2004).
The genus Saproamanita is here recognized as the “Free-living Amanita” clade depicted in Wolfe et al. (2012b: fig. 2) and Vizzini et al. (2012: fig. 2) in both consisting of the least inclusive clade containing S. armillaniformis and S. thiersii and characterized by the ability to decompose litter (Wolfe et al. 2012b) in the absence of a vascular plant host.

Although the generic name Saproamanita is a new name for the validly published but illegitimate generic name Lepidella, and is therefore automatically typified by S. vittadini, the taxonomic delimitation differs from previous applications of Lepidella by Gilbert (1925), Gilbert & Kühner (1928), Konrad & Maublanc (1924–27) and Beauceigneur (1925), or of Aspidella by Gilbert (1940), or at the infrageneric levels of subgenus by Beauseigneur (1926) and Vesely (1933, 1934) or of section Lepidella by Corner & Bas (1962) and Bas (1969). The concept of Saproamanita here accepted is most similar to that of Amanita subsect. Vittadinae Bas 1969 which was characterized in part by volval elements dominated by cylindrical to slender clavate inflated cells together with elongated stipes with volval elements mostly scattered mid stipe and growth in open fields and steppes, but perhaps excluding the forest inhabiting taxa with more bulbous stipes such as Amanita bubalina Bas 1969.

Application of the subgeneric name, Amanita subgen. Lepidella, for the ectomycorrhizal taxa (e.g. Drehmel et al. 1999, Wolfe et al. 2012b, Weiß et al. 1998, Zhang et al. 2004) is no longer appropriate and should be discontinued because the type of that subgeneric name is S. vittadini (syn. Amanita vittadini, Lepidella vittadini, Aspidella vittadini).

Subgeneric names combined with Amanita

Note: Some of the names listed below are no longer considered as belonging to either Amanita or Saproamanita.

Amanita subgen. Amanita [autonym]
Conserved type: Amanita muscaria (L.: Fr.) Lam. 1783 fide Wiersema et al. (2015), with corrected authority as permitted by Art. 55.3.

Amanita subgen. Amanitaria (E.-J. Gilbert) E.-J. Gilbert 1941. Basionym: Amanitaria E.-J. Gilbert 1940. Holotype: Amanita pantherina (DC.: Fr.) Kromb. 1846 fide Donk (1962)

Amanita subgen. Amanitina (E.-J. Gilbert 1940) E.-J. Gilbert 1941. Basionym: Amanitina E.-J. Gilbert 1940. Holotype: Amanita phalloides (Vaill. ex Fr.: Fr.) Link 1833 fide Donk (1962).

Amanita subgen. Amanitopsis (Roze) Barbier 1907. Basionym: Amanitopsis Roze 1876. Conserved type: Amanita vaginata (Bull.: Fr.) Lam. 1783 fide Wiersema et al. (2015).

Amanita subgen. Amidella (E.-J. Gilbert) E.-J. Gilbert 1941. Basionym: Amidella E.-J. Gilbert 1940. Holotype: Agaricus volvatus Peck 1872 (syn. Amanita volvata (Peck) Lloyd 1898, fide Donk (1962).

Amanita subgen. Amplariella (E.-J. Gilbert) E.-J. Gilbert 1941. Basionym: Amplariella E.-J. Gilbert 1940. Holotype: Amanita ampla Pers. 1801 (syn. Amanita excelsa (Fr.) Bertill. 1866 fide Donk 1962.

Amanita subgen. Euamamnita Lange 1915, and Singer (1950: 389); nom. inval. (Art. 21.2).

Amanita subgen. Limacella (Earle) E.-J. Gilbert 1918. Basionym: Limacella Earle 1909.

Amanita subgen. Metrawia (Cooke) Barbier 1907. Basionym: Agaricus subg. Metrawia Cooke 1891.

Amanita subgen. Metrawia muscaria fide Corner & Bas 1962.

Amanita subgen. Pseudoamnita Singer 1936 ex Singer 1950; validated by Singer(1950: 389).

Amanita subgen. Vaginaria (Forquignon ex Quélet) Singer 1951.

Amanita subgen. Vaginaria muscaria fide Corner & Bas 1962.

Amanita subgen. Vaginaria vaginata fide Singer (Lilloa 22: 386, 1951); see also Corner & Bas (1962: 283).

Accepted infrageneric classification of Amanita

Considering the four gene phylogeny shown by Wolfe et al. (2012b) and the type species for each of the taxon names listed above, three of the above subgeneric names are applicable to taxa within Amanita but outside of Amanita subg. Amanita; namely subg. Amanitaria, Amidella, and Amplariella. These names are available, are of equal priority when synonymized, and also are based on three generic names of equal priority. Therefore, we hereby select for the purpose of application of Article 11.5, the following synonymy that hereby establishes priority:

Amanita subgen. Amanitaria

Synonyms: Amanita subgen. Amidella
Amanita subgen. Amplariella

The family name Amanitaceae

One final note on nomenclature requires reconsideration of the family names Amanitaceae “Heim ex Pouzar 1983” as it is often cited and Torrendiaceae Jülich 1981, now that
Torrendia is considered to be synonymous with Amanita as it appeared to be necessary to conserve Amanitaceae against Torrendiaceae. When Jülich (1981) published the name Torrendiaceae independent of the Amanitaceae, he attributed the name Amanitaceae to Roze (1876a, b) but Roze spelled the family name Amanitees and therefore it was not a validly published name (Art. 18.4). Heim (1934) also used the name “Amanitaceae” but did not supply any description or reference to one, and therefore the name was still not validated (Art. 39.1). Overlooked by all later authors was the validation by Gilbert (1940: 63) where he published “FAMILLE: AMANITACEAE (vel Amanitoideae)”. The subfamily name Amanitoideae Gaúmann (1926; as “Unterfamilie. Amaniteae”) with a German description was a valid name (Arts. 18.4, 39.1) with a correctable termination. Hence, Gilbert (1940) inadvertently validated the family name Amanitaceae E.-J. Gilbert as a replacement name at a new rank as is permitted under Arts 6.10, 41.1 and 41.2, and solely attributable to Gilbert (Art. 49.2). Consequently the publication of Amanitaceae by Pouzar (1983) was unnecessary and superfluous and the name Torrendiaceae 1940 is much younger than Amanitaceae 1940.

Classification within the family
Family: Amanitaceae E.-J. Gilbert 1940
Subfamily: Amanitoideae Gaúmann 1926
Tribe: Amanitae R. Maire ex Kühlermann 1928
Amanita Pers. 1797 subgen. Amanita (type: A. muscaria) subgen. Amanitina (E.-J. Gilbert) E.-J. Gilbert 1941 (type: A. phalloides)

Saproamanita Redhead et al. 2016 (type: S. vittadinii)
Limacella Earle 1909
Catatrama Franco-Mol. 1991

Species in cluded in Saproamanita
The reclassification listed below is based on phylogenetic analyses of samples by Moncalvo et al. (2002), Justo et al. (2010), Wolfe et al. (2012), and Vizzini et al. (2012), and for selected species (marked with *) based upon anatomical, morphological and ecological similarity to molecularly placed taxa.

*Saproamanita ameghinoi* (Speg.) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816474
Basionym: Armillaria ameghinoi Spec., An. Mus. nac. Hist. nat. Córdoba 28: 276 (1899).

*Saproamanita armilliariiformis* (Trueblood & D.T. Jenkins) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816354
Basionym: Amanita armilliariiformis Trueblood & D.T. Jenkins, Mycologia 82: 120 (1990).

*Saproamanita codinae* (Maire) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816355
Basionym: Lepiella codinae Maire, Treb. Mus. Cienc. nat. Barcelona, sér. bot. 15(2): 85 (1933).

*Saproamanita flavofloccosa* (Nagas. & Hongo) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816475
Basionym: Amanita flavofloccosa Nagas. & Hongo, Trans. Mycol. Soc. Japan 25: 367 (1984).

*Saproamanita foetidissima* (D.A. Reid & Eicker) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816476
Basionym: Amanita foetidissima D.A. Reid & Eicker, Mycol. Res. 95: 83 (1991); holotype in K indicated on p. 84.

*Saproamanita grallipes* (Bas & de Meijer) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816356
Basionym: Amanita grallipes Bas & de Meijer, Persoonia 15: 345 (1993).

*Saproamanita inopinata* (D.A. Reid & Bas) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816357
Basionym: Amanita inopinata D.A. Reid & Bas, Notes R. bot. Gdn Edinb. 44: 506 (1987).

*Saproamanita lilloi* (Singer) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816477
Basionym: Amanita lilloi Singer, Lilloa 25: 245 (1952) ["1951"].

*Saproamanita manicata* (Berk. & Broome) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816358
Basionym: Agaricus manicatus Berk. & Broome, Trans. Linn. Soc. London 27: 150 (1870) ["1871"].

*Saproamanita nana* (Singer) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816478
Basionym: Amanita nana Singer, Bot. Mater. Otd. Sporov. Rast. 5(4-6): 85 (1941).

*Saproamanita nauseosa* (Wakef.) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816359
Basionym: Lepiota nauseosa Wakef., Bull. Misc. Inf., Kew 1918: 230 (1918).

*Saproamanita pieropus* (Kalchbr. & MacOwan) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816479
Basionym: Agaricus (Lepiota) pieropus Kalchbr. & MacOwan, in Kalchbrenner & Cooke, Grevillea 9: 17 (1880); as “pteropus”, a typographical error correctable under Art. 60.1, Ex. 2; corrected by Kalchbrenner (1881), Reid (1975), and Reid & Eicker (1991); and incorrectly ‘corrected’ by Saccardo (1887) as Lepiota “pteropoda”.

*Saproamanita praeclara* (A. Pearson) Redhead, Vizzini, Drehmel & Contu, comb. nov.
MycoBank MB816480
Basionym: Lepiota praecilera A. Pearson, Trans. Brit. mycol. Soc. 33: 288 (1950).

*Saproamanita praegeveolens* (Murrill) Redhead, Vizzini, Drehmel & Contu, **comb. nov.**
MycoBank MB816481
Basionym: *Lepiota praegeveolens* Murrill, Bull. Torrey bot. Club 66: 153 (1939).

*Saproamanita prairicola* (Peck) Redhead, Vizzini, Drehmel & Contu, **comb. nov.**
MycoBank MB816360
Basionym: *Amanita prairicola* Peck, Bull. Torrey bot. Club 24: 138 (1897).

*Saproamanita pruittii* (A.H. Sm. ex Tulloss *et al.*) Redhead, Vizzini, Drehmel & Contu, **comb. nov.**
MycoBank MB816361
Basionym: *Amanita pruittii* A.H. Sm. ex Tulloss *et al.*, *Amanitaceae* 1(1): 2 (2014).

*Saproamanita roseolecens* (A. Pearson & Stephens) Redhead, Vizzini, Drehmel & Contu, **comb. nov.**
MycoBank MB816482
Basionym: *Lepiota roseolecens* A. Pearson & Stephens, *Trans. Brit. mycol. Soc.* 33: 288 (1950).

*Saproamanita savannae* (Tulloss & Franco-Mol.) Redhead, Vizzini, Drehmel & Contu, **comb. nov.**
MycoBank MB816362
Basionym: *Amanita savannae* Tulloss & Franco-Mol., *Mycotaxon* 105: 318 (2008).

*Saproamanita silvifuga* (Bas) Redhead, Vizzini, Drehmel & Contu, **comb. nov.**
MycoBank MB816363
Basionym: *Amanita silvifuga* Bas, *Persoonia* 5: 356 (1969).

*Saproamanita singeri* (Bas) Redhead, Vizzini, Drehmel & Contu, **comb. nov.**
MycoBank MB816364
Basionym: *Amanita singeri* Bas, *Persoonia* 5: 364 (1969).

*Saproamanita subcaligata* (A.H. Sm. & P.M. Rea) **comb. nov.**
MycoBank MB816365
Basionym: *Armillaria subcaligata* A.H. Sm. & P.M. Rea, *Mycologia* 36: 128 (1944).

*Saproamanita thiersii* (Bas) Redhead, Vizzini, Drehmel & Contu, **comb. nov.**
MycoBank MB816366
Basionym: *Amanita thiersii* Bas, *Persoonia* 5: 382 (1969); nom. nov. for *Amanita alba* Thiers 1957 non Lam. 1783.

*Saproamanita vittadinii* (Moretti) Redhead, Vizzini, Drehmel & Contu, **comb. nov.**
MycoBank MB816367
Basionym: *Agaricus vittadinii* Moretti, *Giorn.Fis., Chim.*, Stor. nat. med. Arti 2: 66 (1826).

Notes on the name *Agaricus vittadinii*
Bass (1969: 349) selected as the lectotype for *Agaricus vittadinii*, “pl. I” published by Moretti (1826b), which is a publication that is generally separately cited from Moretti (1826a) (e.g. Neville & Poumarat 2004) even though the latter is typically cited as the publication with the protologue. Therefore, there is a question about the status of “pl. I” (=Tab. 1) being original material as used in Arts 9.2, 9.11, and 9.12 (McNeill et al. 2012) and therefore its eligibility for lectotypification as generally accepted (e.g. Vizzini *et al.* 2012).

Giuseppe Moretti (1782-1853) was a well-known botanist in his day (Bianchi *et al.* 1959) who contributed to the *Flora Italica* series. In 1826 he decided to publish discussions as supplements to *Flora Italica* under the heading “Il botanico Italiano ossia discussioni sulla Flora Italica” and he simultaneously published each of these discussions twice, each with 5-part notes entitled “I. Piante nuove”, “II. Piante non peranco indicate come indigene d’Italia”, “III. Osservazioni intorno ad alcune specie onde riflettere la sinonimia”, “IV. Memorie originali”, and “V. Piante dubbie”. He published three issues of these five-part supplements (or discussions) in near duplicate format in the journal *Giornale di fisica, chimica, storia naturale, medicini ed arti, Pavia* (Decade Secunda) and also published them as inserts distributed with the journal, each entitled “Il Botanico Italiano ossia discussioni sulla Flora Italica” (sometimes shortened in later citations as ‘Botanico Italiano’), as numbers I, II, and II. This same title was used within the journal (referred here as ‘Giornale’) for the three contributions each being the five named parts, in 1826 in vol. 9(1): 65–82; (2): 154–166; (3): 238–250. This explanatory level of detail is significant because Stafleu & Cowan (1981) in listing “6303” under G. Moretti stated that the articles are “To be cited from journal.” Stafleu & Cowan (1981) listed the ‘Botanico Italiano’ separate as having pages [1]–[44] and three plates, and the three parts do have consecutive pagination and plate numbering, but evidence suggests the three parts have three different publication dates.

As has been repeatedly noted in historical literature (Bass 1969, Gilbert 1941, Neville & Poumarat 2004), the description of *Agaricus vittadinii* occurs on pages 4–5 of the ‘Botanico Italiano’ and simultaneously on pages 66–67 of the ‘Giornale’ but that the two illustrative plates, one [foldout] on *Agaricus vittadinii* Moretti and the second on the plant *Potentilla grammopetala* Moretti were not included in the ‘Giornale’ and only occurred in the ‘Botanico Italiano’. Reference to the first plate is made on page 4 of the ‘Botanico Italiano’ as “I. *Agaricus Vittadinii* Nob. Tab. I.” whereas on page 66 of the ‘Giornale’ the same description simply states “I. *Agaricus Vittadinii* Nob.” and it lacks reference to “Tab. I.”. This anomaly was specifically noted by the bibliographers that same year (Raspail 1826b) under listings Nos 167 & 168 “Il Botanico Italiano” Moretti and No. 182 “Tentamen mycologicum, seu Amanitarum illustratorio” Vittadinii, and by Vittadinii (1826) himself who reproduced the illustration from Moretti with comments in a footnote. Evidence for the simultaneous publication of each part of ‘Botanico Italiano’ together with each of three bimestriel issues of the ‘Giornale’ comes from: (1) the separate listings by Raspail (1826a, b) for each part; (2) the mention of illustrations for part one by Raspail (1826a);
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**Fig. 1.** *Agaricus vittadinii* illustrated by Moretti (1826b: tab. 1 – selected as lectotype by Bas) and reproduced in Vittadini (1826).
(3) the quartet signature pagination counts [multiples of 4, i.e. 20, 12, and 12 pages] together with type setting of paragraphs on pages differing from the ‘Giornale’ and beginning each page one; (4) the different bimestriel distribution of the issues of the ‘Giornale’; and (5) finally the difference in appearances of the first two plates from the third plate which presumably was subject to different handling or storage conditions (cf. Biodiversity Heritage Library scanned copy from the Arnold Arboretum, Harvard University). These facts and evidence indicate that the Tab. 1 depicting *Agaricus vittadinii* published in the ‘Botanico Italiano’ is original material, just as is the case for *Potentilla grammopetala* depicted on Tab. 2 because they were simultaneously published and distributed together with the ‘Giornale’. Therefore, the lectotypification by Bas (1969) of *Agaricus vittadinii* by Tab. 1 (Moretti 1826b) that Bas designated sight unseen, can be accepted. Bas (1969) had seen Vittadini’s (1826) reproduction and accepted Gilbert’s (1941) indication that it is the same illustration published by Moretti. We can confirm that the illustrations are identical. This illustration representing the lectotype is republished here as our (Fig. 1) comparable to the species in the field (Fig. 2).

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