



Names of *Tapeinochilos* (Costaceae) in Wallacea

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Key words

biogeography
Cheilocostus
Etilingera
gingers
Malesia
Ridley
typification

Abstract Four species of *Tapeinochilos* have been described from material collected in Wallacea. We designate the lectotype of the genus, *T. pungens*, which was synonymized with *T. ananassae* in 1917 and add here *T. teysmannianus* as another synonym. The type of *T. koordersianus* from Sulawesi has been rediscovered at Herbarium Bogoriense and is identified as *Etilingera heliconiifolia* (Zingiberaceae), the combination of which is published here. After establishing that *T. koordersianus* applies to a species of *Etilingera*, there is no evidence that any species of *Tapeinochilos* occurs in the island of Sulawesi; the westernmost presence of the genus being in the Sula Islands represented by *T. ananassae*, the only species thus presently occurring in Wallacea.

Published on 16 April 2010

INTRODUCTION

Tapeinochilos Miq. is a genus of about 16 species found from eastern Indonesia and New Guinea eastwards into the Pacific (Solomon Islands and Vanuatu) and southwards to Queensland, Australia (Gideon 1996). The type species, *T. pungens* (Teijsm. & Binn.) Miq. is from Seram, Indonesia, but most of the species occur in New Guinea. The western limit of the genus is in the archipelago between Borneo and New Guinea, called Wallacea (Fig. 1).

In this paper, we examine all names of *Tapeinochilos* based on material collected in Wallacea, namely *T. ananassae* (Hassk.) K.Schum., *T. koordersianus* Ridl., *T. pungens*, and *T. teysmannianus* Warb. Valeton (1917) first suggested that *T. pungens* is a synonym of *T. ananassae* and this was followed by Smith in the Flora of Australia (Smith 1987), but the other two names have not been dealt with until now. *Tapeinochilos teysmannianus* was published by Warburg (1891) but the type is assumed lost at Berlin in the Second World War. Ridley (1900) published *Tapeinochilos koordersianus*. He only mentioned the type locality as 'Celebes' but, as noted by Turner & Cheek (1998), Koorders is the obvious collector. Unfortunately, the type could not be found (Turner & Cheek 1998, Turner 2000). Originally, it was unclear who the author was but as Turner & Cheek (1998) convincingly argued, it must be Ridley who was one of the most prominent ginger experts in SE Asia at the time, based at Singapore Botanic Gardens.

MATERIAL

We have studied collections determined as *Tapeinochilos* from Wallacea at eight herbaria (BM, BO, E, G, K, L, SING and the herbarium in Bogor Botanic Garden).

In Herbarium Bogoriense (BO) we found three collections by Koorders identified as *Tapeinochilos koordersii*: Koorders

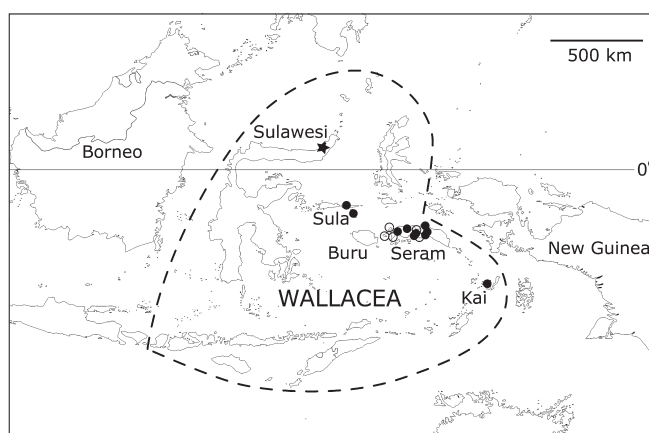


Fig. 1 The distribution of the genus *Tapeinochilos* is in Wallacea represented by the single occurring species, *T. ananassae* (●), that is also common in New Guinea and NE Australia. The type of the genus, *T. pungens*, is from somewhere in Seram. Open circles (○) are places mentioned by Rumphius (1755). The type of *T. koordersianus*, which is a synonym of *Etilingera heliconiifolia*, is from N Sulawesi (★).

19668 β (accession no. BO 084894) from Lolombulan, consists of one sheet with one leaf and half a spike with peduncle being cut just below (it is fruiting at the base and may have flowered simultaneously at the top). It has a handwritten Latin diagnosis (probably by Koorders) that matches the one published by Ridley except the latter is in English and all measurements are non-metric. Thus the height of the plant which, on the label, is given as 7.5 m, is in Ridley's published protologue 25 feet.

In the folder with Koorders 19668 β in BO were two additional unlabelled sheets: 19674 β (BO 084895) and 19675 β (BO 084896) each consisting of a folded lamina where the base is obscure. Annotations indicate that they represent the same species as 19668 β but they lack proper labels (with locality, description etc.) and a written note by Koorders indicates he could not find them. On 19674 β and 19668 β it is written '19668 = 19674, spiritus' which means that pickled material was collected and the two sheets are the same species. On 19675 β Koorders wrote that Ridley had added the species name to the left in his own handwriting but maybe because it has been remounted this is unfortunately no longer visible.

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At the herbarium in Singapore Botanic Garden (SING), *Koorders 19674β* (forest number 3822) is found with a proper label. The collection again only contains one big leaf with the base missing and is made on Soputan Mountain, also in N Sulawesi, on 5 May 1895, at 1100 m, and the plant is 5–6 m high.

Koorders-Schumacher (1914: 21) in the catalogue of her husband's collections explains that the identifications of the species of *Zingiberaceae* were all made by Ridley. The list of gingers from Sulawesi includes '*T. koordersi*' with only one collection listed, namely *19668β* (3425), collected on 12 April 1895. It is curious why *19674β* or *19675β* are not mentioned. Perhaps because the labels were missing by the time the material was returned from Ridley's inspection in Singapore.

RESULTS AND DISCUSSION

Except for the collections by Koorders, all collections are of *T. ananassae* from several islands in Wallacea (Fig. 1).

Tapeinochilos ananassae (Hassk.) K.Schum.

Tapeinochilos ananassae (Hassk.) K.Schum. (1899) 349; K.Schum. (1904) 436; Valeton (1917) 165; K.Heyne (1922) 559; (1927) 504; R.M.Sm. (1987) 36. — *Costus ananassae* Hassk. (1866) 333; Miq. (1869) 102; Valeton (1917) 165. — Type: lecto designated here, t. 22, f. 2 in Rumphius (1755); (<http://www.botanicus.org/item/31753000819463>), Indonesia, Ceram and neighbouring islands.

Tapeinochilos pungens (Teijsm. & Binn.) Miq. (1869) 101, t. 4; F.Muell. (1872–1874) 26; Benth. & F.Muell. (1873) 267; F.Muell. (1875) 13; K.Schum. (1899) 348; F.M.Bailey (1902) 1593; K.Schum. (1904) 433, f. 52; Valeton (1913) 983; (1917) 165; Loes. (1930) 640, f. 289 (copy of Schumann 1904: f. 52). — *Costus pungens* Teijsm. & Binn. (1866) 58, nom. nud. (Ceram); *Costus pungens* Teijsm. & Binn. (1867) 244. — Type: *Teijsmann s.n.* "22" (lecto BO 1290645, designated here; isolecto BO 1290646, SING), Indonesia, cultivated at Bogor Botanic Gardens (C.H.B.), originally from Moluccas, Seram (Ceram).

Tapeinochilos teysmannianus Warb. (1891) 277, syn. nov.; K.Schum. (1899) 348; (1904) 434. — *Tapeinochilos pungens* var. *teysmannianus* (Warb.) Valeton (1913) 983. — Type: *Warburg 21052* (B, assumed lost in the Second World War), Indonesia, Moluccas, Kai Islands, Lesser Kai [Key], on limestone ridge.

Tapeinochilos pungens var. *queenslandiae* F.M.Bailey (1902) 1593; R.M.Sm. (1987) 36. — *Tapeinochilos queenslandiae* (F.M.Bailey) K.Schum. (1904) 433; Loes. (1930) 640; R.M.Sm. (1987) 36. — Type: *J. Dailachy s.n.* (K, MEL), Rockingham Bay, North Queensland, Australia.

Key morphological characters and identification — Terrestrial herb in clump. Leafy shoots 1.5–3 m high with a main stem that may have several branches at apex. Leaves to 13–18 by 4–6 cm, spiralling, spike terminally on the leafy shoot or on a separate leafless shoot, cylindrical resembling a pineapple, to 30 by 11 cm, bracts red each subtending one flower. Flower yellow, hardly exceeding the bract, ovary 2-locular.

In Wallacea *T. ananassae* can only be confused with *Cheilocostus speciosus* (J.König) C.D.Specht (*Costaceae*) which may be of similar size, and has spiralling leaves, a terminal red spike but differs by its smaller spike, conspicuous flowers that exceed the bracts for most of their length, are white with yellow centre, and have a 3-locular ovary.

Distribution — Moluccas, southern New Guinea, north-eastern Australia.

Ecology — Lowland primary and secondary forests, from sea level to 680 m altitude.

Local names and uses — The local name *Auri* was recorded on Seram Island (*Chairul & Arief Hidayat AH 323*). Rumphius (1755: 52, 53) presented several names: *hamuki* and *mamoki* (Sepa District, South Seram), *mamori* and *morimori* (on Manipa and Bonoa Islands), *murimuri* (at Lubu, western Seram; also the name for *Cheilocostus speciosus*), and informed that the plant is used to treat snake bites (by applying a compress of the stem centre or drinking an infusion of the root), children with

constipation, used against cuts to heal wounds, or the leaves are eaten raw as a vegetable.

According to Rumphius (1750: 144) *Tubu Tubu* is a Malay name. Interestingly, the name *Tubu* or *Tubuh* is used by people in the highlands of Borneo where it is applied to numerous species in several genera of the *Zingiberaceae* (Christensen 2002; Poulsen 2006). Elsewhere in Borneo and Java, several local languages include a similar name with a variety of spellings (*Tobo*, *Topo*, *Topos*, *Topu*, *Topus*, *Tepus*) to refer to members of the ginger genus *Etingera* (Poulsen 2006, 2007).

Etymology — *Tubu Tubu* is apparently the generic name for all *Costaceae* as Rumphius also noted it for *Cheilocostus speciosus* (*Herba Spiralis. Tubu Tubu*) whereas he used *Globba* or other names for members of the *Zingiberaceae*. Thus the species that Rumphius (1755: 52) referred to as *Tubu Tubu Ananas* means the member of *Costaceae* with pineapple-like spike (cf. *Ananas comosum* (L.) Merr.), which was again Hasskarl's (1866) reason for choice of epithet.

Conservation status — Categorized as LC (least concern) because of its wide distribution and persistence in open or disturbed habitats (IUCN 2001).

Other material examined. *Alston 12607* (BO), Seram Island, Cult. Hort. Bog. II.B.V.91; *Bloembergen 4302* (BO, L), Sula Islands, Sula Sanana Island, Sanana-Molbufo, 25 July 1939; *Bloembergen 4644* (BO, L, SING), Sula Islands, Sula Mangoli Island, Kampong Mangoli, E above Waj Mana, 21 Sept. 1939; *Bloembergen s.n.* (BO 1679263), Sula Islands, Sula Mangoli Island; *Chairul & Arief Hidayat AH 323* (L), Seram Island, Desa Sepa, Kec. Amahai, Kab. Masohi, 20 July–8 Aug. 1997; *Eyma 1843* (BO), Seram Island, Pileana-Bivouak, Wae Pileana, 28 Oct. 1937; *Eyma 2127* (BO, L), Seram Island, Maraina-Bivouak I, Kobipototo, south slope of Seahari, 10 Nov. 1937; *Eyma 2528* (BO), Seram Island, Wae Bekai-Seakasale, 7 Jan. 1938; *Iwatsuki et al. C-80* (L), Seram Island, southern side of C Seram: en route from Hatumete (3°19'S, 129°35'E) to Sikeu Walala (3°15'S, 129°36'E), along a trail to Hoale Pass, 4 Nov. 1983; *Kato et al. 915* (L), Seram Island, C Seram, along Trans-Seram road between Amahai and Seleman, 20–37 km NE of Masohi, Wai Pia, Kecamatan (District) T.N.S., 19 Dec. 1996; *Kuswata & Soepadmo 36* (G, L), Seram Island, W Seram, Kairatu, Gempa, 2 June 1959; *Moseley s.n.* (K), Little Kei Island, Sept. 1874; *Rant 162* (BO), Seram Island, Piru, 6 June 1929; *Rutten & Kornasi 17* (Bogor Botanic Garden Herbarium), Seram Island, Wahai, Cult. Hort. Bog. XI.B.V.91, vouchered 24 Feb. 1940, field collected probably 1917 or 1918; *Teijsmann 14252* (BM), no label, sent by Teijsmann 1868, probably from Bogor; *Teijsmann s.n.* (Bogor Botanic Garden Herbarium), Seram Island, Cult. Hort. Bog. XI.B.IV.21; *Van Hulstijn* (Bogor Botanic Garden Herbarium), Sula Islands, Gunung Aponhia, Cult. Hort. Bog. X.B.V.25, vouchered 28 July 1925, field collection from 1914.

Hasskarl when describing *Costus ananassae* in 1866 was not the first to suggest that Rumphius's '*Tubu Tubu Ananas*' (1755: 52) belongs in the genus *Costus*. As Miquel (1869) noted, Henschel (1833: 202) had previously suggested that an update of Rumphius's name should include *Costus*.

Smith in *Flora of Australia* (1987: 36) referred to the type of *T. ananassae* as being 'Neue Schlüssel 191; n.v.' which is a misinterpretation most likely based on Valeton (1917) who by '(Neue Schlüssel 191) (type!)' referred to Hasskarl's protologue of *C. ananassae* (1866: 333) in his article entitled 'Neuer Schlüssel zu Rumph's Herbarium amboinense' which, in turn, refers to Rumphius (1755: 52) including the plate '22.2' with no mention of any collections. In the reprinted version of Hasskarl's 'new key' the page number of the protologue changed from the original 333 to 191 but the text remained identical. One may infer that Valeton (1917) with his 'type!' had already designated Rumphius's plate which is informative and serves as a proper type. To rule out any misunderstanding we designate this plate as lectotype here.

The type locality was presented as Amboina (Schumann 1899) or more commonly just as Seram (Schumann 1904 etc). Rumphius (1755: 53) clearly specified four localities, all of which we have been able to find a present-day position for (Fig. 1 ○): 1) Seram

Island, north coast at Hatuwe Bay (2°58'S, 129°8'E); 2) Seram Island, south coast, Sepa District (c. 3°21'S, 129°6'E), and two islands between Seram and Buru; 3) Bonoa (Boano; 3°0'S, 127°54'E); and 4) Manipa (3°18'S, 127°33'E). Rumphius did not specify that Sepa was identical to the mentioned area on the south coast of Seram but as such a place name is there, we assume this is the case. Sepa was already an important political domain in the 17th century (pers. comm. Roy Ellen). In addition to these four places, Rumphius also refers to the 'Loeboeneese', the people from Lubu. On a Dutch map from 1739, 'Loeboe' is situated on the Hoamoal Peninsula, W Seram (cf. Luhu 3°23'S, 128°0'E). It is not known whether the plate in Rumphius (1755) was based on material and observations of *T. ananassae* at all five localities or fewer.

Miquel (1869) cited Hasskarl (1866: 333) so it is strange that he did not use Hasskarl's epithet *ananassae* for the type of his new genus. Perhaps he thought that *Costus pungens* was already validly published by 1866 as it is listed in the catalogue of Bogor Botanic Garden (Teijsmann & Binnendijk 1866) but was a nomen nudum only validly published the following year. Miquel (1869: 102) in his comments to his plate of *T. pungens*, stated he had no doubt that this species was the same as Rumphius's '*Tubu Tubu Ananas*' and that if one disregarded the lateral branches below the spike, they would be in total agreement.

In both species identification keys by Schumann (1899, 1904) *T. ananassae* is listed as unplaced. He is completely aware that this species is in the same 'peculiar' genus as the one Miquel had described with *T. pungens* and knew that both names were based on material from Seram. Schumann (1899) was opposing to the synonymy of the latter (because of the branching below the spike, as mentioned above), but saying that if Miquel is correct, then *T. ananassae* should take priority because it was published earlier. Which of course it takes, but the first to actually propose this synonymy was Valeton (1917).

From the title of the paper in which *C. pungens* is published, it is obvious that Teijsmann & Binnendijk (1867) based their description on a live plant flowering in Bogor Botanic Garden. Miquel likewise based his description of *T. pungens* (1869) on a plant in this garden which is very likely to have been the very same plant originally collected by Teijsmann in Seram. Having a live flowering plant in Bogor allowed Miquel to present an elaborate description including the wonderful and informative plate even though he was not in Java himself.

It is likely that over time several vouchers were made of the plant that Teijsmann brought back to Bogor from Seram. In Herbarium Bogoriense, two duplicates have the number '22' (BO1290645: with leaves and the apex of a spike; BO1290646: leaves only) and Teijsmann is noted as the collector and the origin of the plant cultivated in Bogor Botanic Garden is Seram. Both have the annotation '*Tapeinochilos pungens* Miq!, specimen originale' and, in Dutch, '*Sent to Singapore for further identification in 1896*'. The latter is odd because why distribute for identification if it is known to be the type material? On the first set, however, Valeton wrote in 1916 that it is Teijsmann *s.n.*, cultivated in Bogor, so possibly the number was added when the duplicate was sent to Singapore to make the link clear. On Valeton's determination slip both *Costus pungens* and *Tapeinochilos pungens* are mentioned. A collection at SING, also bearing a tag with 'No. 22' in the same hand as the tag on BO1290646, originates from Bogor Botanic Garden but with no other information on collector or origin. A voucher of Teijsmann's live collection from Seram is also found in the herbarium of Bogor Botanic Garden, but the three sheets at BO and SING mentioned above are certainly of the same gathering. As Miquel seems to have seen the collection annotated '22' and Valeton had annotated their significance, it is an appropriate candidate as lectotype of

Tapeinochilos pungens and we designate the most informative sheet at BO as lectotype.

We have been unable to find any duplicates of *Warburg 21052*, the type of *T. teysmannianus* but the description matches what we know of *T. ananassae*, of which we have seen other material from Lesser Kai Island (Moseley *s.n.*, K) that anonymously had been annotated as *T. teysmannianus*. Schumann (1899, 1904) also commented that this species was very close to *T. pungens* and Valeton (1913) made it a variety of this.

Gideon (1996), in his monumental monograph of the genus *Tapeinochilos*, listed *T. koordersianus* as an excluded species because the leaves in the original description were four feet long – far too long to be a *Tapeinochilos*. Unfortunately we have not been able to find the pickled flowers that Koorders-Schumacher (1914) mentioned but the large leaves with clasping leaf bases, the huge infructescence with obpyriform, golden sericeous and spiny fruits, as well as the flower described as 'red' makes it easy to identify it as *Etilingera heliconiifolia*; a species that the first author collected as part of a currently ongoing revision of the genus *Etilingera* at the same locality as Koorders 19668 β with flowers and fruits (Poulsen et al. 2822). One of the two collections (*Warburg 15139*) mentioned by Schumann (1899) when he described *Amomum heliconiifolium* is also from Lolombulan (above Boyong).

It is perhaps surprising that Ridley could make such a big mistake. Maybe he was misled into thinking that the material represented a member of the *Costaceae* because the vegetative material in the collection mainly consists of one large lamina without a proper sheath and one cannot see if the leaf arrangement is spiral. Also, the large infructescence bears resemblance to the typical pineapple-like spike of *Tapeinochilos*. If Ridley had seen the open sheath he would undoubtedly have realized that this material could not represent a member of the *Costaceae*.

Koorders first identified his collections 19668 β , 19674 β , and 19675 β as *Amomum anthodioides* (Teijsm. & Binn.) Koord. (Koorders 1898) which is a synonym of *Etilingera hemisphaerica* (Blume) R.M.Sm. indicating that he was on the right track towards a correct identification. He hinted that there was a problem with this identification because his collection was much bigger than *Amomum anthodioides* and suggested (Koorders 1898) that the description in Miquel (1859: 602) should have been 'octometralis' and not 'octopedalis' (8 metres not 8 feet).

Obvious from annotations on Koorders 19668 β , Valeton had spotted the mistake that Ridley had made. In 1919, he made the annotation '*Geanthus nova spec. affinis G. roseus*' but we have not been able to find that Valeton actually published this as a new species or new combination. *Geanthus* is in any case presently a synonym of *Etilingera*.

Unlike all other new species names of *Amomum* from Sulawesi that Karl Schumann introduced (Schumann 1899), *A. heliconiifolium* is in the key (p. 311) only mentioned as likely being affiliated with five other species that are properly keyed out ('Hierher wahrscheinlich auch'). The notes (p. 319), however, include information on locality and habit: 'auf dem Gunung Mahawu, am äusseren Kraterabsturz grosse Dickichte von 5 m Höhe bilden' (forming thicket of more than 5 m on outer slopes of the Mahawu crater). Although Schumann did not place it accurately in the key he knew it was a new species and emphasized its large size which was a useful diagnostic character compared to the other species he knew from Sulawesi at that time. Thus one can reasonably argue that it is validly published in 1899.

Because Schumann (1904) mentioned his 1899 paper, the combination made by Poulsen (2003), who only cited Schumann

(1904), is not validly published (see Art. 33.4 & 33.7 of the ICBN, McNeill et al. 2006) and is therefore made again below.

Etilingera heliconiifolia (K.Schum.) A.D.Poulsen, *comb. nov.*

"*Etilingera heliconiifolia* (K.Schum.) A.D.Poulsen" (2003) 525, *comb. non rite publ.*; Newman et al. (2004) 77, *comb. non rite publ.* — *Amomum heliconiifolium* K.Schum., Bot. Jahrb. Syst. 27 (1899) 319; K.Schum. (1904) 227. — *Geanthus heliconiifolius* (K.Schum.) Loes. (1930) 593. — Types: K.F. & P.B. Sarasin 620 (syn B, assumed lost in the Second World War), N Sulawesi, Gunung Mahawu, flowering 25 July 1894; O. Warburg 15139 (syn B, assumed lost in the Second World War).

Tapeinochilos koordersianus Ridl. (1900) 99, *syn. nov.* — Type: *Koorders 19668β*, forest number 3425; lecto, designated here: BO, N Sulawesi Province, Lolombulan at Paku-ure [today Pakure], 950 m, flowering and fruiting 12 April 1895, to 7.5 m tall, flowers red.

Other material examined. Poulsen et al. 2625 (BO, E), N Sulawesi Province, Tomohon, Gunung Masarang, 1°19'31"N 124°52'11"E, 1100 m, flowering and fruiting 20 Feb. 2008; Poulsen et al. 2822 (BO, E), N Sulawesi Province, Boyong Atas village, base of Gunung Lolombulan, 1°4'57.7"N 124°25'14.9"E, 825 m, flowering and fruiting 25 Feb. 2009.

Tapeinochilos koordersianus was only entered in Index Kewensis after Turner & Cheek (1998) clarified that the Ridley paper (1900) was actually written by Ridley. Ridley (1900) did not mention any of Koorders collections in his description and we know he saw at least two of the three (19668β, 19674β, 19675β). In Koorders (1898) only two localities are mentioned: Lolombulan (19668β) and Sopotan (19674β) and we do not know where 19675β is from. Koorders (1898) only ever mentioned two localities for this taxon. Of the remaining two collections, we designate *Koorders 19668β* as lectotype because it is the best material and the height mentioned in the label matches that in the protologue.

As *T. koordersianus* has been shown above to be synonymous with *Etilingera heliconiifolia*, there is no evidence that the genus *Tapeinochilos* occurs in Sulawesi; at present *T. ananassae* is only documented as far west as the Sula Islands (Fig. 1). In 1904, Schumann thought the western limit of the genus was Manipa Island between Buru and Seram. We predict that *T. ananassae* also occurs on Buru Island that is situated between the islands of Sula and Seram. It may also occur in Halmahera. Future collecting, especially on the central-eastern arm of Sulawesi that stretches east toward the Sula Islands may, however, still reveal that *Tapeinochilos* also reaches as far west as Sulawesi.

Acknowledgements The first author thanks The State Ministry of Research and Technology (RISTEK) for permits to do research in Indonesia and sponsors of the fieldwork (Carlsberg Foundation, Peter Davis Expedition Fund, Augustinus, Blaxall Valentine Awards). We also thank herbarium curators Jana Leong-Škorničková (SING), John Hunnux (BM), Martin Xanthos (K), Stans Kofman (L), Yessi Santika (BO) and Wisnu Handoyo Ardi and Yayan W.C. Kusuma (herbarium at Bogor Botanic Garden) for access to collections or photographing specimens, John McNeill for valuable discussions on when a name is validly published and legitimate, Graham Hardy for help in the library at E. Antje Ahrends, Louis Ronse de Craene, Robert Mill and Philip Oswald helped translating (German, Dutch, Latin). Mark Newman (E) and an anonymous person kindly reviewed the manuscript.

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