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Author: Bogner, Josef

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JOSEF BOGNER

Zomicarpella maculata (Araceae) rediscovered, with notes on the tribe *Zomicarpeae*

Abstract

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Zomicarpella maculata was described from Colombia in 1881 and never found again until recently, when three new collections from Peru were made. A detailed, revised description and illustrations of this interesting species are provided, and its history, identity and relationships are discussed. Keys to the four genera of the tribe *Zomicarpeae* and the two species of the genus *Zomicarpella* are included.

Key words: aroids, *Zomicarpa, Filarum, Ulearum,* taxonomy.

Introduction

The tribe *Zomicarpeae* of the family *Araceae* contains four genera (Bogner 1979, Mayo & al. 1997, 1998). *Zomicarpa* Schott and *Zomicarpella* N. E. Br. have seeds with copious endosperm, whereas *Filarum* Nicolson and *Ulearum* Engl. have seeds without endosperm. *Zomicarpa* has, in its adult stage, compound (trisect to pedatisect) leaf blades, whereas *Zomicarpella, Filarum* and *Ulearum* always have entire leaf blades. The male flowers of *Zomicarpa* (Fig. 1A), *Zomicarpella* (Fig. 3, 5-6) and *Ulearum* (Fig. 1D) never have very long, filiform connectives as in *Filarum* (Fig. 1B-C) and by this character the genus *Filarum* can be easily recognized. Indeed, these connectives are unique in the whole family; only slightly elongate connectives (of triangular shape) are known from some species of *Biarum* Schott, *Theriophonum* Bl. and *Amorphophallus* Decne. The pollen of the *Zomicarpeae* (Fig. 2) is superficially uniform, being always spherical, inaperturate and with spinose exine. However, pollen of *Zomicarpa* and *Zomicarpella* has sporopollenin, whereas that of *Filarum* and *Ulearum* lacks sporopollenin, and therefore is not resistant to acetolysis (M. Hesse, pers. comm., unpubl. data). This is a very unusual character, because nearly all members of subfamily *Aroideae* have pollen grains without sporopollenin. It is difficult to explain why the four related genera of tribe *Zomicarpeae* differ in this fundamental character and it is tempting to assume, on this basis, that *Zomicarpa* and *Zomicarpella* are more closely related to one another than to *Filarum* and *Ulearum*. This notion is perhaps supported by chromosome counts, showing *Zomicarpa* with $2n = 20$ (based on *Z. pythonium* (Mart.) Schott),

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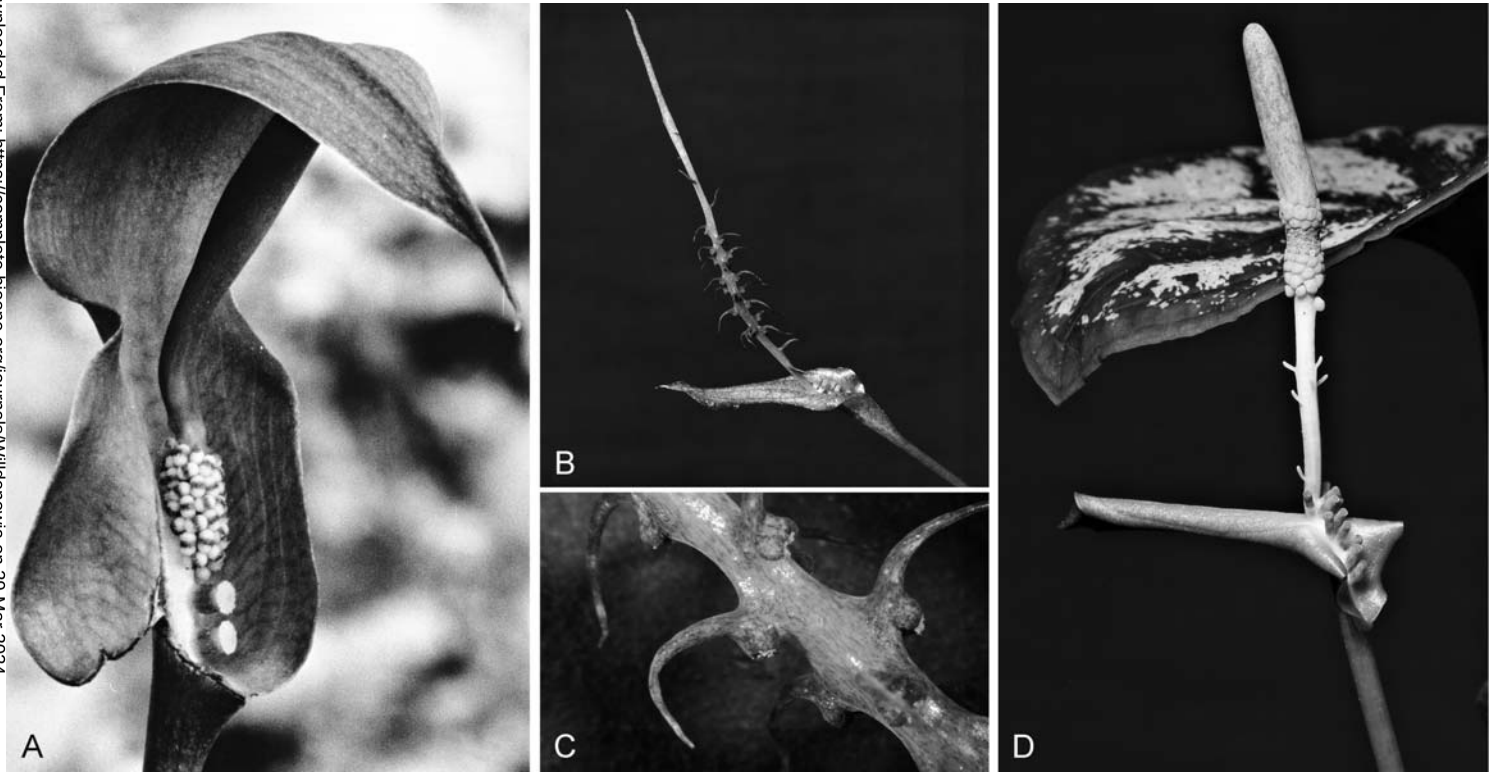


Fig. 1. A: *Zomicarpa pythonium* (Mart.) Schott (syn. *Zomicarpa riedeliana* Schott), inflorescence; spathe partly opened to show the male flowers (above) with flat connectives, which are darker coloured, and only two female flowers (below), though usually there are more (4-6); from *Bogner 1213*. – B-C: *Filarum manserichense* Nicolson, inflorescence (B, note the slender spadix, much longer than the spathe, and the elongated, thread-like connectives of the male flowers) and part of the spadix with male flowers, each consisting of only one stamen (C, note the long-elongated thread-like, curved connectives and the two sessile thecae opening with a pore); from *M. Sizemore*. – D: *Ulearum sagittatum* Engl., inflorescence; note the relatively thick upper part of the spadix and some staminodes between the female flowers in the lower half and the male flowers; the fertile male zone is very short and appears as a constriction in the upper half of the spadix, below are sterile male flowers (staminodes), above is a cylindric, ± smooth appendix with some staminodes at its base; from *Jangoux 85-05821-30*. – Photographs A: by J. Bogner, B-D: by G. Gerlach.

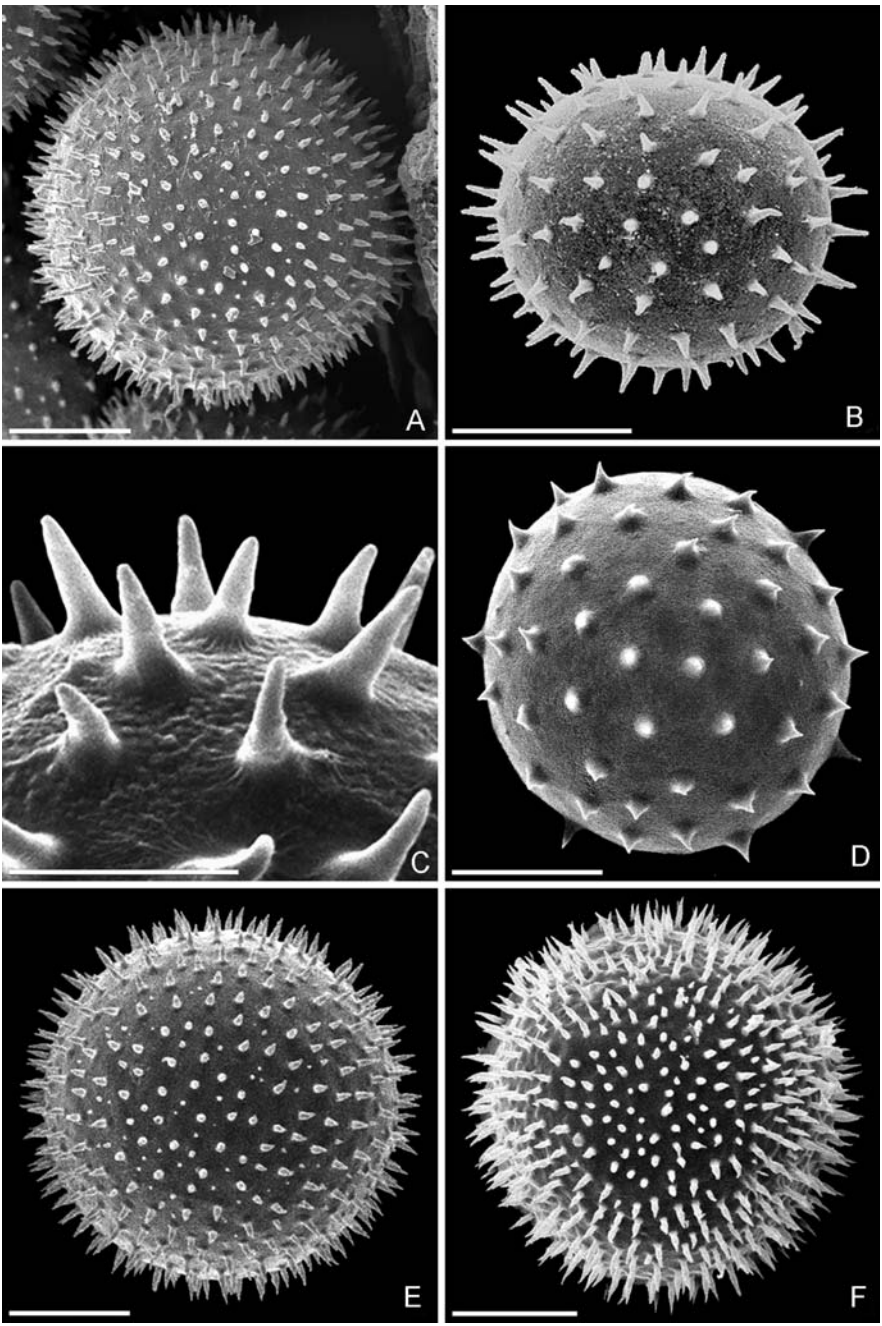


Fig. 2. A: *Zomicarpella maculata,* pollen grain; from *P. Acevedo-Rdgz. 8717*. – B-C: *Z. amazonica,* pollen grain (B) and part of the exine (C), showing the spines; from *Bogner 1985*. – D: *Zomicarpa pythonium* (syn. *Z. riedeliana*), pollen grain; from *Bogner 1213*. – E: *Filarum manserichense,* pollen grain; from *M. Sizemore*. – F: *Ulearum sagittatum,* pollen grain; from *Jangoux & al. 85-05821-30*. – Scale bars: A-B, D-F = 10 µm; C = 1 µm; SEM micrographs by H. Halbritter, Wien.

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Zomicarpella with 2*n* = 26, *Filarum* with 2*n* = 28 and *Ulearum* with 2*n* = 14 (Bogner & Petersen 2007). These data suggest that *Filarum* and *Ulearum* are more closely related and that *Filarum* is tetraploid.

The morphological distinctions among the genera of tribe *Zomicarpeae* are summarized in the following key:

1. Leaf blades compound, trisect to pedatisect with 5 leaflets (only juvenile leaf blades entire); spathe constricted; spadix shorter than spathe; male flowers with flat connectives; seeds with endosperm . . . . . *Zomicarpa*
– Leaf blades always entire, cordate, sagittate to hastate; spathe constricted or not; spadix shorter to longer than spathe; male flowers with flat or elongate and thread-like connectives; seeds with or without endosperm 2
2. Spathe constricted or not; spadix shorter to longer than spathe; male flowers with flat connectives; seeds with endosperm . . . . . *Zomicarpella*
– Spathe never constricted; spadix always much longer than spathe; male flowers with flat or elongate and thread-like connectives; seeds without endosperm 3
3. Plant with tuber; spadix slender; male zone of spadix long; male flowers with elongate, thread-like connectives . . . . . *Filarum*
– Plant with rhizome; upper part of spadix thick and cylindric; (fertile) male zone of spadix very short; male flowers with flat connectives . . . . . *Ulearum*

When I visited the Kew Herbarium (K) in January and February 2007, I saw a duplicate of a specimen from the United States National Herbarium (US) in Washington, DC., that was filed as *Filarum mansericheense* Nicolson. It was clear that this plant did not belong to *Filarum,* because of the absence of the much elongated, thread-like connectives of the male flowers. My first impression was that it represented a new species of the genus *Zomicarpella*. I requested a loan of this and other material filed as *Filarum* from US, which arrived soon at the Botanische Staatssammlung München (M). All three specimens received (see under Distribution, below) turned out to represent *Zomicarpella maculata* N. E. Br., which had been collected only once, 116 years ago, and described by N. E. Brown in 1881.

Zomicarpella N. E. Br.

Zomicarpella is regarded as comprising just two species, *Z. maculata* and *Z. amazonica* Bogner. The wild source of the type and, until now, only known specimen of *Z. maculata* was collected somewhere in Colombia, at that time called New Granada, and introduced by J. Linden into Belgium, where it was cultivated in his famous nursery. Linden sent one leaf and one inflorescence to N. E. Brown for determination. Probably Linden had only one plant, because when Brown asked for more material, the species had already disappeared from cultivation. Therefore, only this meagre herbarium material has been preserved at Kew Herbarium (Fig. 4). Brown also made drawings of the inflorescence and analyses of the flowers, but these were never published by him. Subsequently, *Z. maculata* was often described in the botanical literature (Baillon 1895, Bentham & Hooker 1883, Engler 1887-89 & 1920) or horticultural literature (Chittenden 1956, Nicholson & Mottet 1898-99), but all these accounts were based on N. E. Brown's original descriptions from 1881; not one contained any new data or illustrations. *Z. maculata* is very probably of horticultural value, but after its first introduction by J. Linden it has never again come into cultivation.

The new collections of *Zomicarpella maculata* all come from southern Peru, more than 1000 km away from the Colombian border. Therefore, it must be a widespread species, but probably quite rare or consistently overlooked, because it is a very tiny plant growing on the forest floor. I would be not surprised if more herbarium material exists, somewhere, that has not been recognized as *Z. maculata*. A similar situation happened with *Gearum brasiliense* N. E. Br. from Brazil, which was not found for about 150 years, when a Brazilian collector rediscovered it along the Río Araguaia at the border of the estados Mato Grosso and Goiás (Mayo & al. 1994, Bogner & Gonçalves 1999) and the collection was misfiled under *Xanthosoma* Schott.

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Fig. 3. *Zomicarpella amazonica,* inflorescence; note the slightly constricted spathe, the very densely arranged male flowers and the comparatively short spadix; from *Bogner 1985*. – Photograph by G. Gerlach.

Zomicarpella amazonica (Fig. 3; Bogner 1997), described from Estado Amazonas, Brazil, differs from *Z. maculata* as expressed in the following key:

1. Plant with rhizome; leaf hastate-sagittate; spathe slightly constricted; spadix shorter than spathe; male flowers very densely arranged; female flowers with depressed-globose ovary and a distinct style, stigma small (as broad as style) . . . . . *Zomicarpella amazonica*
– Plant with tuber; leaf blade cordate-sagittate; spathe not constricted; spadix much longer than spathe; male flowers somewhat densely to very laxly arranged; female flowers with an ellipsoid-oblong ovary, stigma subsessile, well distinct . . . . . *Zomicarpella maculata*

Zomicarpella amazonica must also be expected from Peru, as it has been found very near the border.

Zomicarpella maculata N. E. Br. in Gard. Chron., ser. 2, 16: 266. 1881. – Holotype: Cultivated in Belgium by J. Linden from a wild source collected in Colombia, without exact locality, *Linden* (K, see Fig. 4).

Revised description. – Plant tuberous, (8-)10-20 cm tall, with 1-2 leaves and 1-2 inflorescences (2 inflorescences only on plants with 2 leaves). *Tuber* depressed-globose to ± irregularly globose, 1-1.2 cm in diam. and 0.6-0.8(-1) cm tall. *Petiole* 9-15 cm long and 1.5-2 mm in diam., terete and

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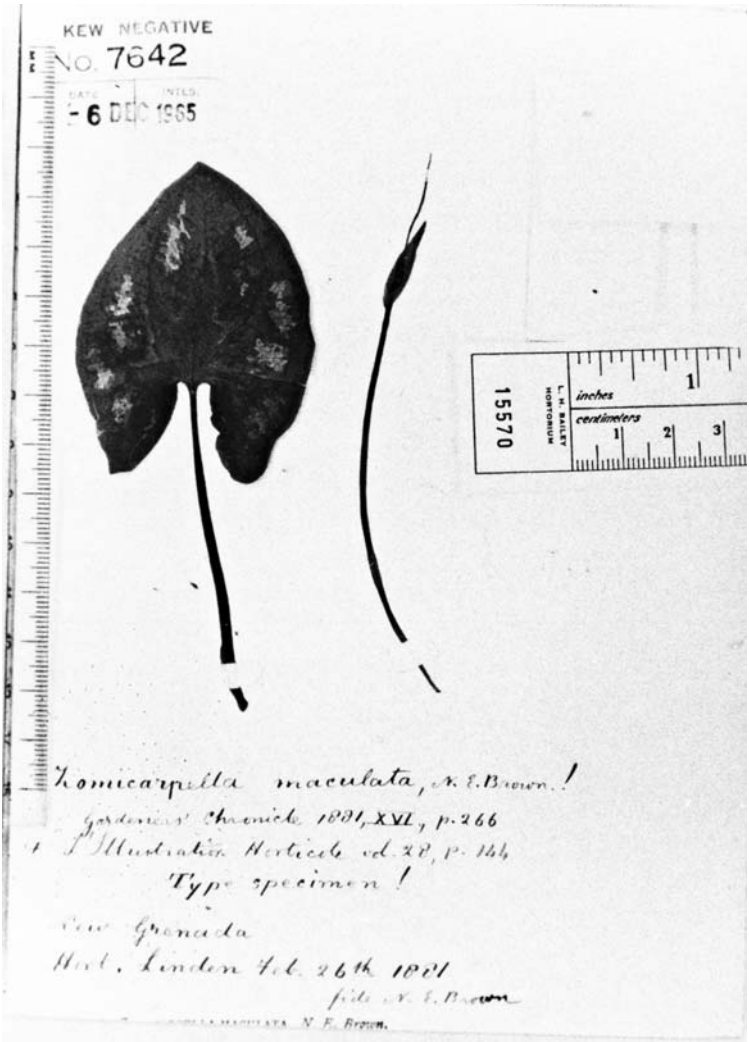


Fig. 4. *Zomicarpella maculata,* holotype (K); text in N. E. Brown's handwriting. – Courtesy of the Royal Botanic Gardens, Kew.

somewhat channelled on upper side, dull olive-green and marked with irregular transverse bars of olive-brown (according to N. E. Brown); sheath 0.5-0.8(-1) cm long. *Leaf blade* cordate to cordate-sagittate, (5-)6-10 × (4-)4.5-8 cm, light green below, plain dark green above, some with light green variegation along the midrib (from the collector's note) or variegation as lighter coloured flecks over the whole leaf blade (from the holotype and N. E. Brown's description: "prettily marked with some very irregularly shaped blotches of pale green shade and spotted with darker green"); apex acute to broadly acute; basal lobes strongly developed, with a round sinus at the petiole insertion, not overlapping or only rarely (in one specimen), ± roundish to cordate, (2-)3-4 cm long and 2.5-3.5 cm wide; venation reticulate, the midrib and three primary lateral veins on each side arising at the petiole insertion, all of the same thickness, the basal pair of primary lateral veins running into the basal lobes and after two thirds of their length becoming dichotomously divided, the second pair at first ± lateral and then slightly turning upwards, the third pair ascending

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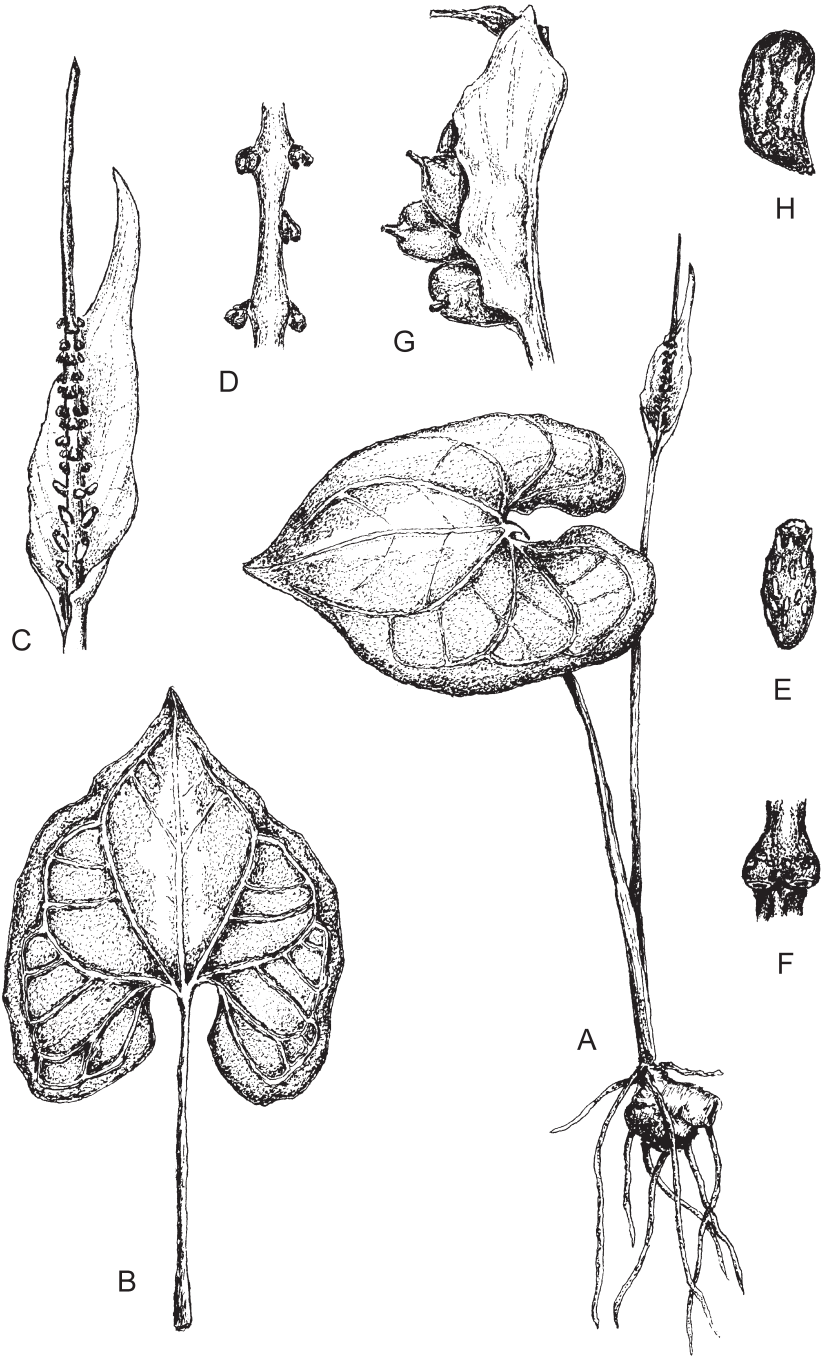


Fig. 5. *Zomicarpella maculata* – A: whole plant 0.8×; B: leaf 0.8x; C: inflorescence 2.5×; D: part of male zone of the spadix with very laxly arranged anthers, 6×; E: gynoecium (pistil), 16×; F: anther, 16×; G: infructescence, 4×; H: seed, 6×. – A-C, E from *P. Núñez & al. 24196*; D & F from *Hamilton Beltrán 3258;* G & H from *P. Acevedo-Rdgz. & al. 8717*. – Drawing by Kerstin Schuster.

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towards the apex, all primary lateral veins forming a collective vein along the margin at a distance of 4-6 mm, with a second much thinner and often inconspicuous collective vein along the margin at a distance of only 0.4-1 mm, veins of second order thinner and between the primary ones. *Cataphylls* membranaceus, (2-)2.5-3.5 cm long. *Peduncle* 9-14 cm long and c. 1 mm in diam., terete (white according to the collector's note, but probably light green; coloured like the petiole according to N. E. Brown). *Spathe* not constricted, lanceolate, 1.5-2.5 cm long and c. 0.4 cm wide in the lower part, expanded at anthesis (pink according to the collector's note; dull olive-green according to N. E. Brown), the veins well visible. *Spadix* 2.5-3(-4.5) cm long (longer than spathe), the axis dark coloured (probably ± purple); female zone c. 7 mm long, adnate to the spathe and with 5-7(-8) (or 12-15 according to N. E. Brown) flowers; sterile zone c. 3 mm long with about 3 laxly arranged rows of ± oblong, c. 0.5 mm long pistillodes on an otherwise naked axis; male zone 7-15 mm long, the flowers ± densely to very laxly arranged; appendix very slender and quite thin, filiform, 1-1.5(-2) cm long, darker coloured (purple?; black according to N. E. Brown). *Flowers* unisexual, naked. *Female flowers* bottle-shaped to ellipsoid-oblong, 0.9-1 mm long and c. 0.4 mm in diam., dull brownish olive (according to N. E. Brown); stigma subsessile (or stylar region only 0.15-0.2 mm long), discoid, c. 0.3 mm in diam.; ovary with very small spots externally, unilocular; placentation basal; ovule one, anatropous, 0.4 mm long and with a very short funicle. *Male flowers* consisting of one stamen only; thecae ± globular, subsessile, 0.4-0.45 mm in diam., very dark coloured (deep purple?; blackish according to N. E. Brown), each opening by a pore; connective inconspicuous (never elongate); pollen extruded in strands (on the holotype), orange-coloured (according to N. E. Brown), inaperturate, spherical, 30-31 µm in diam., the exine spinose, the spines 1.8-2 µm long. *Infructescence* c. 1 cm long, with 5-6 fruits, the spathe (at least the lower part) persistent. *Berries* oblong-ellipsoid, c. 3(-3.2) mm long and 2 mm in diam., one-seeded, the pericarp thin, with remnant of the style and stigma. *Seed* ellipsoid-oblong, 2.8-3 mm long and 1.5 mm in diam.; testa smooth, mottled with purple and yellow; raphe ± conspicuous, hilum small; endosperm copious, white; embryo ellipsoid, axile, undifferentiated.

Illustrations. – Fig. 2A, 4-7; Bogner (1979: 72); Mayo & al. (1997: 201, t. 59A-B).

Distribution and ecology. – The species is known from Colombia (holotype only) and Peru. *Zomicarpella maculata* grows on the forest floor in primary rainforest that is not flooded (terra firme), dominated by the bamboo *Guadua sarcocarpa* Londoño & P. M. Peterson at altitudes between 400 and 500 m. It is flowering in the wild from at least (October) November until January, mature fruits occur at least in January. The type specimen flowered on 26.2.1881 in Linden's nursery in Belgium, as is written on the holotype sheet at Kew. This fact was mentioned by Engler (1920) but never before in the literature, so that he may perhaps have seen the type specimen at K.

Additional specimens seen. – PERU: DEPT. CUZCO: Prov. Cuzco, Distr. Camisea, Campamento San Martín C, Camisea Production Unit, west of camp, 467 m, 11°47'08"S, 72°41'57"W, primary, moist, lowland non flooded forest dominated by bamboo *(Guadua),* wet season, terrestrial herb 20 cm tall, leaf light green below, dark green above, some with light green variegation along lower middle vein; peduncle white, spathe and spadix present but post reproductive, 13.1.1997, *P. Acevedo-Rdgz.,* with *D. Bell, K. Rankin & S. F. Smith 8717* (K, MO, US 3356063); Prov. La Convención, Distr. Echarati Armihuari - Río Camisea, 11°55'1.0"S, 72°46'39.9"W, upland mature forest, terrestrial, pink spathe, variegated, 11.10.1998, *P. Núñez, L. Acurio, R. de La Colina & W. Naury 24196* (US 3383601); Prov. La Convención, Distrito de Echarati, San Martín 3 Site Well, 11°46.89'S, 72°42.10'W, bosque colinoso disturbado de *Guadua sarcocarpa* (Paca [regional common name of this bamboo]), hierba terrestre de 8-10 cm altura, con tubérculo cónico lechoso inflorescencia con espádice transparente y líneas guindas dobladas, 400 m, 2.11.1998, *Hamilton Beltrán,* with *W. Naury & R. de La Colina 3258* (US 3383590).

Notes. – Brown's original description of *Zomicarpella maculata* included a number of colour characteristics and therefore I assume that he had fresh material for examination. Colours usually vary within a species; for example, leaf blades may vary strongly from plain green to maculate in

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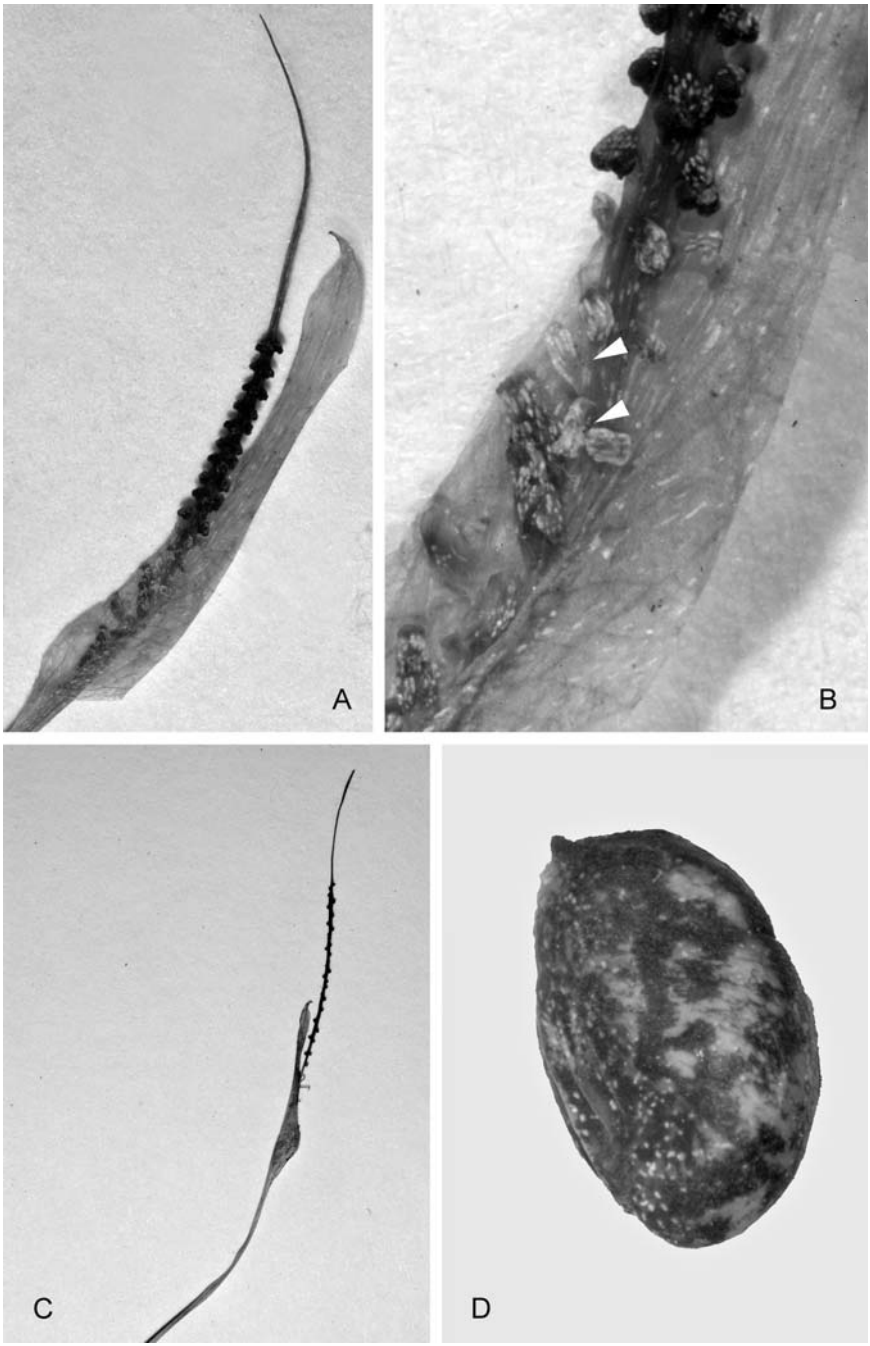


Fig. 6. *Zomicarpella maculata* – A: inflorescence; note the rather dense arrangement of the dark male flowers on the spadix compared to C; B: close-up of the same inflorescence; note the pistillodes (see arrow heads) between the female and male flowers; C: inflorescence; note the very lax arrangement of the male flowers on the spadix compared to A; D: seed, raphe on the left side. – Photographs by G. Gerlach; A-B from *P. Núñez & al. 24196*; C-D from *P. Acevedo-Rdgz. & al. 8717*.

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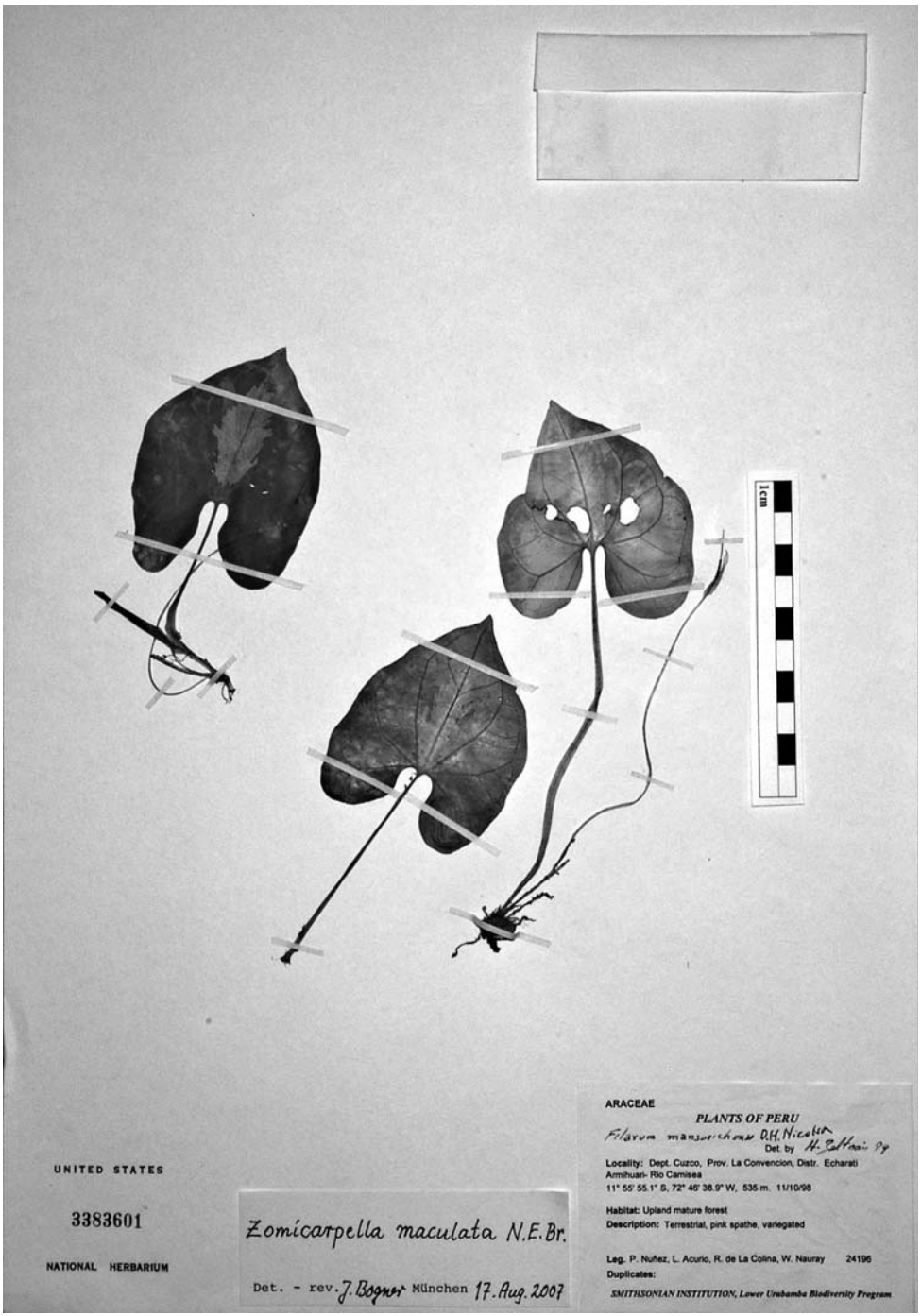


Fig. 7. *Zomicarpella maculata – Núñez & al. 24196* (US 3383601).

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natural populations and this is the case in the available herbarium specimens of *Z. maculata,* as also mentioned in a collector's note *(P. Acevedo-Rdgz. & al. 8717).* I would have liked very much to have access to living plants to better appreciate the colour variation and other characteristics. One of the recent collectors of *Z. maculata* described the peduncle as white *(P. Acevedo-Rdgz. & al. 8717),* but I can hardly believe this, however, it is at least light-coloured on the herbarium specimen and Brown (1881a) reported its colour as like that of the petiole ("dull olive-green marked with irregular transverse bars of olive-brown"). Another recent collector reported the spathe as pink *(P. Núñez & al. 24196),* and judging from the herbarium specimens the spathe is at least light-coloured; according to Brown (1881a) the spathe is "dull olive-green". It is worth noting that the recent herbarium specimens were treated with ethanol before drying and their colours thus ± altered.

With the three recently collected specimens *Zomicarpella maculata* shows a greater variation in the flower structures than is evident from the holotype only. According to Brown (1881a) the inflorescence has 12-15 female flowers, but those of the recent Peruvian collections have only up to 8; probably Brown had an inflorescence from a well-grown greenhouse specimen. It is well known from other aroids that plants growing under less favourable conditions have weaker inflorescences with fewer female flowers, e.g., in several species of *Arisaema* Mart., as well as in *Zomicarpa* Schott, *Amorphophallus* Decne., *Culcasia* P. Beauv. and *Cryptocoryne* Wydler (pers. obs.). Brown (1881a) also described the stigmas of *Z. maculata* initially as sessile, which is indeed the impression, but they would be better described as subsessile, as later Brown (1881b) and Bentham & Hooker (1883) did, because Brown clearly showed a stylar region in his longitudinal section of the ovary. This is also evident in recent fruiting specimens, which exhibit the remnant of a style and stigma. The arrangement of the male flowers on the spadix is very variable ranging from ± dense (*Linden* and *Núñez & al. 24196,* Fig. 6A) to lax or very lax *(Hamilton Beltrán 3258* and *Acevedo-Rdgz. & al. 8717,* Fig. 6C). The female flowers similarly are densely *(Linden)* to rather laxly *(P. Núñez & al. 24196)* arranged on the spadix. However, I must conclude that none of these minor differences, especially those involving colours, support the recognition of a separate species; rather, the new collections and the holotype of *Z. maculata* all fall within the expected range of variation of a single, natural species.

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References

Baillon, H. 1895: Histoire des plantes **13.** – Paris.
Bentham, G. & Hooker, J. D. 1883: Genera plantarum **3.** – London.
Bogner, J. 1979 ["1978"]: A critical list of the aroid genera. – Aroideana **1:** 63-73.
— 1997: New taxa of *Araceae.* – Sendtnera **4:** 5-12.
— & Petersen, G. 2007: The chromosome numbers of the aroid genera. – Aroideana **30:** 82-90.
— & Gonçalves, E. G. 1999: The genus *Gearum* N. E. Brown *(Araceae:* tribe *Spathicarpeae).* – Aroideana **22:** 20-29.
Brown, N. E. 1881a: *Zomicarpella maculata* N. E. Brown. – Gard. Chron., ser. 2, **16:** 266.
— 1881b: *Zomicarpella maculata* N. E. Brown. – Ill. Hort. **28:** 144.
Chittenden, F. J. 1956: Dictionary of gardening, ed. 2, **4.** – Oxford.
Engler, A. 1887-89: *Araceae*. – Pp. 102-153 in: Engler, A. & Prantl, K. (ed.), Die natürlichen Pflanzenfamilien, Abt. 2, **3.** – Leipzig.

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— 1920: *Araceae-Aroideae* und *Araceae-Pistioideae*. – In: A. Engler (ed.), Das Pflanzenreich **73.** – Leipzig.

Mayo, S. J., Bogner, J. & Boyce, P. C. 1994: *Gearum* rediscovered. – Kew Bull. **49:** 785-788. [CrossRef]

— , — & — 1997: The genera of *Araceae*. – Kew.

— , — & — 1998: *Araceae*. – Pp. 26-74 in: Kubitzki, K. (ed.), The families and genera of vascular plants **4.** – Berlin, etc.

Nicholson, G. & Mottet, S. 1898-99: Dictionnaire pratique d'horticulture et de jardinage **5.** – Paris.

Address of the author:
Josef Bogner, Augsburger Str. 43a, D–86368 Gersthofen, Germany.

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