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**JÚLIA FIALHO SOARES**

***Pilea* Lindl. (Urticaceae) no Bioma Mata Atlântica, Brasil**

**Porto Alegre**

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“Dove non se può amare, non tardare.”

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## RESUMO

*Pilea* Lindl. é o maior gênero de Urticaceae e um dos gêneros mais ricos em Rosales, compreendendo ca. 715 espécies e distribuindo-se nos trópicos, subtropicos e regiões temperadas, com exceção da Austrália e da Nova Zelândia. É composto por ervas, arbustos, subarbustos e epífitas, frequentemente com aspecto suculento e ocorrendo em locais sombreados, em florestas úmidas ou em suas bordas, entre os 500 e os 2.000 m de elevação, próximos a cachoeiras, riachos, afloramentos e paredões rochosos e barrancos. Seus membros se distinguem de outras Urticaceae por terem folhas opostas ou decussadas, raramente alternas, combinadas com estípulas intrapeciolares, inflorescências estaminadas não reunidas em estruturas semelhantes a um receptáculo, sépalas livres nas flores pistiladas e por apresentarem ou não tricomas, estes, porém, nunca urticantes. O presente trabalho tem como objetivo preencher a lacuna de conhecimentos taxonômicos e nomenclaturais acerca do gênero *Pilea* no Bioma Mata Atlântica, Brasil. Descrevemos uma espécie nova para a Ciência e reconhecemos, ao todo, a ocorrência de 14 espécies nativas na região estudada (*P. acanthoides*, *P. astrogramma*, *P. carautae*, *P. flammula*, *P. hilariana*, *P. hirtella*, *P. hyalina*, *P. hydra*, *P. microphylla*, *P. pubescens*, *P. rhizobola*, *P. tenebrosa*, *P. ulei* e *P. sp.*), 10 das quais são endêmicas. Fornecemos uma chave de identificação dessas espécies, uma descrição para cada, acompanhada de seus sinônimos, de notas taxonômicas e nomenclaturais e de informações relacionadas à distribuição geográfica, ao habitat e ao período de floração e frutificação. Um táxon, *P. aparadensis*, permanece não resolvido, sendo apresentado depois das 14 espécies válidas. Também revisamos a tipificação de todos os nomes, designando lectótipos para vários e propondo correções em tipificações já realizadas. Esperamos que os resultados obtidos contribuam para o conhecimento científico e a conservação dos táxons estudados.

**Palavras-chave:** Rosales, taxonomia, nomenclatura botânica.

## ABSTRACT

*Pilea* Lindl. is the largest genus in Urticaceae and one of the richest in Rosales, comprising ca. 715 species and being distributed in the tropics, subtropics and temperate regions, with the exception of Australia and New Zealand. It is composed of herbs, shrubs, subshrubs and epiphytes, often with a succulent aspect and occurring in shaded places, in humid forests or on their edges, from 500 to 2,000 m of elevation, near waterfalls, streams, rocky outcrops, rocky cliffs and ravines. Its members are distinguished from other Urticaceae by having opposite or decussate, rarely alternate leaves, combined with intrapetiolar stipules, staminate inflorescences not fused in a receptacle-like structure, free sepals in the pistillate flowers, and when with trichomes, by being non-stinging. The present work aims to fill the taxonomic and nomenclatural knowledge gap about the genus in the Atlantic Forest Biome, Brazil. We describe a new species for the science and recognize the occurrence of a total of 14 native species in the studied region (*P. acanthoides*, *P. astrogramma*, *P. carautae*, *P. flammula*, *P. hilariana*, *P. hirtella*, *P. hyalina*, *P. hydra*, *P. microphylla*, *P. pubescens*, *P. rhizobola*, *P. tenebrosa*, *P. ulei*, and *P. sp.*), 10 of them endemic. We provide an identification key for these species, a description for each of them, along with their synonyms, taxonomic and nomenclatural notes, and information about the geographic distribution, habitat and flowering and fruiting period. One taxon, *P. aparadensis*, remains unresolved, appearing after the 14 valid species. We also review the typification of all the names, designating lectotypes to many of them and proposing corrections in typification already performed. We hope that the results obtained will contribute to the scientific knowledge and conservation of the taxa studied.

**Keywords:** Rosales, taxonomy, botanical nomenclature.



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## INTRODUÇÃO

*Pilea* Lindl. é o maior gênero de Urticaceae Juss. e um dos gêneros mais ricos em Rosales. Pertence à tribo Elatostemateae Gaudich. e ocorre nas regiões tropicais, subtropicais e temperadas, exceto na Austrália e na Nova Zelândia. Com 933 nomes publicados, dos quais 638 são aceitos (WCVP, 2021 [continuamente atualizado]), estima-se que o gênero compreenda cerca de 715 espécies em todo o mundo (Monro, 2004). O sudeste da Ásia corresponde ao centro de diversidade morfológica e filogenética, enquanto que as Grandes Antilhas, a América Central e os Andes correspondem aos centros de diversidade de espécies (Monro, 2006). É um gênero composto por ervas, arbustos, subarbustos e epífitas, frequentemente com aspecto suculento e ocorrendo em locais sombreados, em florestas úmidas ou em suas bordas, entre os 500 e os 2.000 m de elevação (Friis, 1993; Monro *et al.*, 2012), próximos a cachoeiras, riachos, afloramentos e paredões rochosos e barrancos.

O gênero foi descrito por Lindley (1821) através da publicação de *Pilea muscosa* Lindl., que é um sinônimo de *Pilea microphylla* (L.) Liebm. A última grande revisão global de *Pilea* foi realizada por Weddell (1869), após a publicação de três revisões preliminares (Weddell, 1852; 1854; 1856-1857). O trabalho de 1869 reconheceu 159 espécies, 24 das quais foram descritas como novas, e sugeriu a classificação das espécies do gênero em três seções – *P.* seção *Integrifoliae* Weddell, *Heterophyllae* Weddell e *Dentatae* Weddell. Em uma revisão das espécies andinas, Killip (1936, 1939) expandiu essas grupos para o que ele chamou de grupos, totalizando 12 (*Microphyllae*, *Parietariae*, *Fallaces*, *Diversifoliae*, *Imparifoliae*, *Centradenioideae*, *Flexuosae*, *Dauciodorae*, *Capitellatae*, *Multiflorae*, *Molles*, *Pubescentes*), e Chen (1982), com base em táxons chineses e de outros locais asiáticos, dividiu o gênero em sete seções – *P.* seção *Achudemia* (Blume) Chen, *P.* seção *Smithiella* Dunn ex Chen, *P.* seção *Tetrameris* Chen, *P.* seção *Pilea*, *P.* seção *Dimeris* Chen, *P.* seção *Urticella* Miquel e *P.* seção *Lecanthoides*. No entanto, essas classificações baseiam-se exclusivamente em caracteres morfológicos, de modo que apresentam incompatibilidades entre si e não refletem as relações filogenéticas entre as espécies (Monro, 2006).

De acordo com as reconstruções filogenéticas para Urticaceae e para *Pilea*, conduzidas, respectivamente por Wu *et al.* (2015) e por Monro (2006), as quais utilizaram simultaneamente caracteres morfológicos e moleculares, o gênero é monofilético. No entanto, Fu *et al.* (2020), usando uma amostragem mais completa, com um maior número de táxons, sugeriram que *Pilea*

só seria monofilético se nele fosse incluído o gênero recentemente descrito *Haroldiella* J.Florence e se não fossem incluídas as *P.* seções *Achudemia* (Blume) Chen e *Smithiella* Dunn ex Chen. Segundo esses autores, *Pilea* tem como grupos-irmãos o gênero *Lecanthus* Wedd. e o gênero *Achudemia* Blume, o qual inclui a antiga *P.* seção *Smithiella*. Monro (2006) já havia proposto que existia uma forte associação das relações filogenéticas em *Pilea* com suas características morfológicas e sua distribuição geográfica, o que resultou, na época, na delimitação de seis grupos monofiléticos denominados como unidades pelo autor. Fu *et al.* (2020) confirmaram este resultado, com a diferença de que reconheceram a existência de sete seções – *P.* seção *Trimeris* Y.G. Wei & A.K. Monro, *P.* seção *Lecanthoides*, *P.* seção *Angulata* L.F.Fu & Y.G.Wei, *P.* seção *Tetrameris*, *P.* seção *Verrucosa* L.F.Fu & Y.G.Wei, *P.* seção *Plataniflora* L.F.Fu & Y.G.Wei, *P.* seção *Leiocarpa* L.F.Fu & Y.G.Wei –, cinco das quais novas, e que o gênero se originou no Domínio Biogeográfico Indo-Malaia.

As espécies de *Pilea* se distinguem de outras Urticaceae por terem folhas opostas (cruzadas ou dísticas), raramente alternas, combinadas com estípulas intrapeciolares, inflorescências estaminadas não reunidas em estruturas semelhantes a um receptáculo, sépalas livres nas flores pistiladas e, quando com tricomas, por estes não serem urticantes (Burger, 1977; Friis, 1993; Fu *et al.*, 2020). Suas inflorescências, cimas laxas ou congestas, sésseis ou pedunculadas, são inconspícuas em comparação a outros grupos de plantas, e seu arranjo é importante na diferenciação de espécies. As flores pistiladas, polinizadas pelo vento, apresentam estigma séssil e penicilado, além de 3 sépalas (raramente 2 ou 4), sendo que a sépala dorsal é frequentemente diferente em tamanho e forma das laterais e apresenta uma protuberância dorsal (Fu *et al.*, 2020) que é denominada por alguns pesquisadores como apêndice subapical. Já as flores estaminadas, possuem 4 sépalas, raramente 2 ou 3, as quais são iguais entre si e possuem um apêndice subapical corniculado, alongado ou semelhante a uma crista, mais visível antes da antese. Os seus estames são reflexos, desdobrando-se na antese (Friis, 1993; Brack, 1989). As folhas apresentam inúmeras características que podem ser utilizadas para diagnosticar os táxons, mas também podem ser polimórficas dentro de uma mesma espécie. Muitas espécies apresentam, por exemplo, folhas desiguais no mesmo nó, isto é, com os pecíolos de comprimento diferente, e as lâminas de tamanho e forma diferentes, e a proporção desse padrão, denominado como anisofilia, pode auxiliar na diagnose dos táxons. Além disso, a margem das lâminas pode ser inteira, crenada, serrada, lobada ou apresentar variações entre esses padrões, e o formato dos dentes pode, ainda que dentro desses padrões mais amplos, diferir espécies com outras características morfológicamente semelhantes. O

tamanho e a forma das estípulas, assim como a presença, o padrão de distribuição e o tipo de tricomas e de cristólitos também variam entre os táxons. Os cristólitos são pequenas concreções de carbonato de cálcio presentes em células maiores da epiderme, que ocorrem em diferentes partes da planta, sendo de fácil visualização nas plantas secas (Rendle, 1930). Podem ser puntiformes, lineares, fusiformes, em formato de T, X, Y ou Z. Os frutos são aquênios, ovoides a suborbiculares, normalmente com superfície plana ou levemente lenticular (Brack, 1989) e comprimidos lateralmente.

Desde a revisão global de *Pilea* realizada por Weddell (1869), um elevado número de novas espécies e muitos tratamentos florísticos importantes foram publicados (Miquel, 1853; Killip, 1936; 1939; 1960; Standley; Steyermark, 1952; Sorarú; 1972; Bassett *et al.*, 1974; Burger, 1977; Chen, 1982; Friis, 1989; Nicolson, 1991; Florence, 1997; Monro, 2001; 2014; Chen; Monro, 2003; Steinmann, 2005). Entretanto, esses estudos não abrangem a riqueza e a cobertura geográfica total do gênero pois, além de o gênero possuir um elevado número de espécies, suas plantas são predominantemente de pequeno porte, apresentam flores inconspícuas e ocorrem, muitas vezes, em locais de difícil acesso, o que dificulta visualizá-las e, conseqüentemente, coletá-las e estudá-las.

O Bioma Mata Atlântica no Brasil (Brasil 2006; Fundação SOS Mata Atlântica 2021a, 2021b), onde se encontra o maior número de registros de *Pilea* para o país, é um desses locais sem um amplo tratamento florístico, taxonômico e nomenclatural para o gênero. Desde o tratado pioneiro realizado por Miquel (1853) na *Flora Brasiliensis*, que englobou tanto táxons anteriormente descritos como novos que ocorrem nesse Bioma, foram publicadas floras estaduais e locais esparsas para os estados de Pernambuco (Lima, 1985), Rio Grande do Sul (Brack, 1989) e São Paulo (Gaglioti; Romaniuc-Neto, 2012), para a Serra do Cipó, no estado de Minas Gerais (Martins; Pirani, 2010) e para o Parque Estadual das Fontes do Ipiranga, no estado de São Paulo (Romaniuc-Neto *et al.*, 2009). Além disso, novas espécies e táxons infraespecíficos foram descritos. Na Flora do Brasil 2020 (2020), são citadas 16 espécies para o Bioma.

O presente trabalho tem como objetivo preencher a lacuna de conhecimentos científicos acerca do gênero *Pilea* no Bioma Mata Atlântica do Brasil. Os capítulos 1, 2 e 3 correspondem a artigos, redigidos em inglês, com sua própria metodologia e formatados de acordo com as revistas científicas escolhidas para a submissão. Em função de estarem redigidos em inglês, apresentamos, aqui na Introdução, uma chave de identificação em português com as 14 espécies

reconhecidas até o momento na região estudada.

O Capítulo 1, “Synopsis of the genus *Pilea* (Urticaceae) in the Atlantic Forest Biome, Brazil” apresenta informações sobre a taxonomia, a tipificação, a nomenclatura, os dados geográficos, de habitat e fenológicos de cada uma das espécies, além de considerações a respeito de um táxon que indicamos como não resolvido.

O Capítulo 2, “*Pilea bradei* (Urticaceae), a New Species from the Atlantic Forest Biome in Southeastern Brazil”, consiste na publicação da espécie nova *Pilea bradei* Soares, endêmica do Bioma Mata Atlântica e com registros na Serra da Mantiqueira e na Serra da Bocaina, Sudeste do Brasil.

O Capítulo 3, “Typification of the Linnaean names *Parietaria microphylla* and *Urtica grandifolia* based on Sloane’s illustrations”, apresenta uma correção que propusemos na tipificação de dois nomes Lineanos.

Nas considerações finais, sintetizamos os principais resultados alcançados ao longo dessa parte da pesquisa, assim como as perspectivas futuras para concluí-la. Além disso, apresentamos algumas orientações para a coleta e o registro fotográfico das espécies de *Pilea*.

### **Chave de identificação para as espécies de *Pilea* que ocorrem no Bioma Mata Atlântica, Brasil.**

A seguir, fornecemos uma chave de identificação com as 14 espécies de *Pilea* atualmente reconhecidas para Bioma Mata Atlântica no Brasil. Os termos morfológicos utilizados nela estão de acordo com Ellis *et al.* (2009) e Beentje (2010).

- 1. Plantas com tricomas ..... 2
- 1'. Plantas sem tricomas ..... 4
- 2. Lâmina das folhas apenas com a face adaxial com tricomas; pecíolos com tricomas concentrados perto da junção com a lâmina; margem serrada; estípulas triangulares .....  
..... *P. hyalina* Fenzl
- 2'. Lâmina das folhas com as faces abaxial e adaxial com tricomas; pecíolos com tricomas distribuídos ao longo de sua extensão; estípulas ovais com o ápice arredondado ..... 3

3. Lâmina das folhas oval, amplamente oval, amplamente elíptica ou elíptica; com margem crenada a crenado-serrada; a maioria dos dentes com formato convexo-convexo e menos comumente reto-convexo; ápice da lâmina de formato convexo ou menos comumente reto .....  
 ..... *P. pubescens* (L.) Liebm.
- 3'. Lâmina das folhas lanceolada, estreitamente elíptica ou estreitamente oval; com margem serrada a crenado-serrada; a maioria dos dentes com formato reto-reto, reto-convexo ou convexo-reto; ápice da lâmina de formato reto ..... *P. hirtella* Miq.
4. Lâmina das folhas com margem inteira ..... 5
- 4'. Lâmina das folhas com margem crenada, crenado-serrada, serrada ou lobada ..... 6
5. Lâmina das folhas desiguais na proporção 1:2,6–4, lâmina menor 0,1–5 × 0,1–3 mm e lâmina maior 0,3–10 × 0,2–5 mm; nós com predominantemente mais de um par de folhas; inflorescências estaminadas de 0,5–10,7 mm compr., sésseis ou incluindo o pedúnculo de até 7 mm compr. .... *P. microphylla* (L.) Liebm.
- 5'. Lâmina das folhas iguais ou desiguais no mesmo nó na proporção 1:1,2–2, 3–17 × 2,2–9,7 mm; nós com predominantemente um par de folhas; inflorescências estaminadas com 5–12 mm compr., incluindo o pedúnculo de 4–10 mm compr. ....  
 ..... *P. carautae* M.DM.Vianna & R.J.V.Alves
6. Lâmina das folhas com cristólitos em forma de T, X ou Y, além dos cristólitos puntiformes, fusiformes ou lineares ..... 7
- 6'. Lâmina das folhas com apenas cristólitos puntiformes, fusiformes ou lineares ..... 9
7. Folhas opostas dísticas; lâminas no mesmo nó de comprimento sempre desigual (na proporção de 1: 2,6–17) ..... *P. rhizobola* Miq.
- 7'. Folhas opostas cruzadas; lâminas no mesmo nó de comprimento igual ou desigual (na proporção de 1:1,3–4,4) ..... 8
8. Lâminas no mesmo nó iguais ou raramente desiguais em comprimento pela proporção de 1:2; venação primária predominantemente pinada; margem com 2–3 dentes/cm, a maioria dos dentes com formato convexo-convexo, côncavo-reto ou reto-reto .....  
 ..... *P. acanthoides* Cabral & Gaglioti
- 8'. Lâminas no mesmo nó desiguais em comprimento pela proporção de 1:1,3–4,4; venação primária basal ou suprabasal acródroma; margem com 3–7 dentes/cm, a maioria dos dentes com formato convexo-retroflexo, convexo-côncavo ou convexo-reto ..... *P. astrogramma* Miq.
9. Inflorescências pistiladas laxas ..... 10
- 9'. Inflorescências pistiladas congestionadas ..... 11
10. Lâmina das folhas com o ângulo da base agudo e a forma da base cuneada ou decurrente;

- apêndice subapical nas sépalas das flores estaminadas de até 0,2 mm compr. .... *P. ulei* Killip
- 10'. Lâmina das folhas com o ângulo da base obtuso e a forma da base arredondada ou cordada; apêndice subapical nas sépalas das flores estaminadas de 0,4–0,5 mm compr. ... *P. hydra* Brack
11. Superfície abaxial das lâminas foliares com cistólitos fusiformes sobre as veias e outras partes da superfície ..... *P. bradei* Soares
- 11'. Superfície abaxial das lâminas foliares sem cistólitos fusiformes ou lineares ou com esses apenas sobre as veias ..... 12
12. Lâmina das folhas com margem lobada ou serrada, com dentes com incisão pronunciada ou próxima da veia central ..... *P. flammula* Brack
- 12'. Lâmina das folhas com margem não lobada, crenada, crenado-serrada ou serrada, com dentes com incisão não pronunciada ou próxima da veia central ..... 13
13. Lâmina das folhas lanceolada, estreitamente elíptica ou elíptica, 4–45 × 2–6 mm; venação primária basal ou suprabasal acródroma com três veias, mas parecendo pinada devido às veias basais laterais inconspícuas ..... *P. tenebrosa* Cabral & Gaglioti
- 13'. Lâmina das folhas oval, amplamente oval ou elíptica, 5–57 × 4–32 mm; venação primária basal ou suprabasal acródroma com três veias, com as veias basais laterais conspícuas .....  
..... *P. hilariana* Wedd.



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## CAPÍTULO 1

### Synopsis of *Pilea* (Urticaceae) in the Brazilian Atlantic Forest Biome<sup>1</sup>

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#### Abstract

This paper consists in a synopsis of the genus *Pilea* (Urticaceae) in the Brazilian Atlantic Forest Biome, as part of the floristic, taxonomic and nomenclatural treatment of the genus in this Biome. We present a description for the genus in the studied region and an identification key for the 14 native species recognized so far. For each species, we provide its correct name and the synonyms, as well as a description of its main diagnostic characters, taxonomic and nomenclatural notes, and information about its geographic distribution, habitat and flowering and fruiting period. We also propose the synonymization of three species names and two varieties names, typify nine names and indicate a holotype that was interpreted as a lectotype, presenting in the taxonomic and nomenclatural notes the arguments that support our decisions. One taxon remains unresolved, appearing after the 14 valid species.

**Keywords:** Rosales, taxonomy, lectotype, neotype.

#### Resumo

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<sup>1</sup> Pré-formatado de acordo com as normas da Revista PHYTOTAXA.

Esse artigo consiste em uma sinopse do gênero *Pilea* (Urticaceae) no Bioma da Mata Atlântica, Brasil, como parte do tratamento florístico, taxonômico e nomenclatural do gênero nesse Bioma. Nós apresentamos uma descrição para o gênero na região estudada e uma chave de identificação das 14 espécies nativas reconhecidas até o momento. Para cada uma das espécies, fornecemos seu nome correto e os sinônimos, bem como uma descrição de seus principais caracteres diagnósticos, notas taxonômicas e nomenclaturais, e informações sobre sua distribuição geográfica, habitat e período de floração e frutificação. Também propomos a sinonimização de três nomes de espécies e de dois nomes de variedades, tipificamos nove nomes e indicamos um holótipo que era interpretado como lectótipo, apresentando nas notas taxonômicas e nomenclaturais os argumentos que embasam nossas decisões. Um táxon permanece não resolvido, sendo apresentado depois das 14 espécies válidas.

**Palavras-chave:** Rosales, taxonomia, lectótipo, neótipo.

## Introduction

*Pilea* Lindley (1821: tab. 4) is the largest genus in Urticaceae Jussieu (1789: 400) and one of the richest genera in Rosales. It belongs to the tribe Elatostemateae Gaudichaud-Beaupré (1830: 493) and is distributed throughout tropical, subtropical, and warm temperate regions, except in Australia and New Zealand. With 933 published names, of which 638 are accepted names (WCVP 2021 [continuously updated]), it is estimated the genus comprises about 715 species worldwide (Monro 2004). Southeast Asia corresponds to its morphological and phylogenetic diversity center, and the Greater Antilles, Central America and the Andes correspond to its species diversity centers (Monro 2006). Its members are distinguished from other Urticaceae by having opposite (decussate or distichous) or rarely alternate leaves, which are combined with intrapetiolar stipules; staminate inflorescences not fused in a receptacle-like structure; pistillate flowers with free sepals; and when with trichomes, by being non-stinging (Burger 1977; Friis 1993; Fu *et al.* 2020).

The genus was first described through the publication of *Pilea muscosa* Lindley (1821: tab. 4), a synonym for *Pilea microphylla* (Linnaeus 1759: 1308) Liebmann (1851: 296). The last major global revision of *Pilea* was carried out by Weddell (1869) – after the publication of three preliminary revisions (Weddell 1852, 1854, 1856-1857) –, study that recognized 159 species, 24 of which described as new species, and that suggested the classification of the species into three sections – *Integrifoliae* Weddell (1869: 105), *Heterophyllae* Weddell (1869: 117), and

*Dentatae* Weddell (1869: 123). In a review of the Andean species, Killip (1936, 1939) expanded these sections to what he called groups, totaling 12 (*Microphyllae*, *Parietariae*, *Fallaces*, *Diversifoliae*, *Imparifoliae*, *Centradenioideae*, *Flexuosae*, *Dauciodorae*, *Capitellatae*, *Multiflorae*, *Molles*, *Pubescentes*), and Chen (1982), based on Chinese and other Asian taxa, divided the genus into seven sections – *P.* sect. *Achudemia* (Blume 1856: 57) Chen (1982: 41), *P.* sect. *Smithiella* Dunn (1920: 210) ex Chen (1982: 43), *P.* sect. *Tetrameris* Chen (1982: 44), *P.* sect. *Pilea*, *P.* sect. *Dimeris* Chen (1982: 118), *P.* sect. *Urticella* Miquel (1853: 198), and *P.* sect. *Lecanthoides* Chen (1982: 118). However, these classifications are based exclusively on morphological characters, so they present incompatibilities and do not reflect the phylogenetic relationships among the species (Monro 2006).

The phylogenetic reconstructions for Urticaceae (Wu *et al.* 2015) and for *Pilea* (Monro 2006), based on both molecular and morphological characters, had indicated the genus is monophyletic. However, Fu *et al.* (2020), using a much more complete taxa sampling, suggest *Pilea* is monophyletic only if it includes the recently described genus *Haroldiella* Florence (1997: 218), and if it does not include the *P.* sections *Achudemia* and *Smithiella*. According to the authors, the genus has as sister groups the genus *Lecanthus* Weddell (1854: 187) and the genus *Achudemia* (Blume 1856: 57), which includes the *P.* section *Smithiella*. Monro (2006) had already proposed that there is a strong association of the phylogenetic relationships in *Pilea* with its morphological characteristics and geographic distribution, which resulted in the delimitation of six monophyletic groups. Fu *et al.* (2020) confirm this result, with the difference that the authors recognize the existence of seven sections – *P.* sect. *Trimeris* Y.G. Wei & A.K. Monro in Fu *et al.* (2020), *P.* sect. *Lecanthoides*, *P.* sect. *Angulata* L.F.Fu & Y.G.Wei in Fu *et al.* (2020), *P.* sect. *Tetrameris*, *P.* sect. *Verrucosa* L.F.Fu & Y.G.Wei in Fu *et al.* (2020), *P.* sect. *Plataniflora* L.F.Fu & Y.G.Wei in Fu *et al.* (2020), *P.* sect. *Leiocarpa* L.F.Fu & Y.G.Wei in Fu *et al.* (2020) – and that the genus originated in the Indomalaya Biogeographic Domain.

Since the global revision of *Pilea* carried out by Weddell (1869), an elevated number of new species and many important floristic treatments have been published (Miquel 1853; Killip 1936, 1939, 1960; Standley & Steyermark 1952; Sorarú 1972; Bassett *et al.* 1974; Burger 1977; Chen 1982; Friis 1989; Nicolson 1991; Florence 1997; Monro 2001, 2014; Chen & Monro 2003; Steinmann 2005), but they do not comprehend the entire geographic coverage of the genus. The Brazilian Atlantic Forest Biome, where the largest number of its records for the country is found, is one of these places not covered by a wide floristic, taxonomic and nomenclatural treatment for the genus. Since the pioneering treatise by Miquel (1853) in *Flora Brasiliensis*, which consists of already described and new taxa, sparse regional floras have been

published within the Biome – for the States of Pernambuco (Lima 1985), Rio Grande do Sul (Brack 1989) and São Paulo (Gaglioti & Romaniuc-Neto 2012), for the Serra do Cipó, in the State of Minas Gerais (Martins & Pirani 2010) and for the Parque Estadual das Fontes do Ipiranga, in the State of São Paulo (Romaniuc-Neto *et al.* 2009), as well as new species and infraspecific taxa have been described. In Flora do Brasil 2020 (2020), 16 species are mentioned for the Biome.

We provide here a synopsis for the genus in this Biome, recognizing the existence of 14 native species. We present a description for the genus and an identification key for the species in the Biome and, for each species we provide its correct name and the synonyms, as well as a description of the main diagnostic characters, taxonomic and nomenclatural notes, and information about its geographic distribution, habitat and flowering and fruiting period. We also designate a lectotype for seven names, a neotype for one name, and indicated a holotype that was interpreted as a lectotype, presenting in the nomenclatural notes the arguments that support our decisions and, when pertinent, the explanation of typifications previously made by other authors. One taxon remains unresolved, appearing after the 14 valid species.

## Material and methods

The nomenclatural revision was conducted through a critical review of the protologues of all names of *Pilea* registered for the Brazilian Atlantic Forest Biome. The geographical circumscription of the Biome is in accordance with Brazil (2006) and Fundação SOS Mata Atlântica (2021a, 2021b). We examined original type specimens data, as well as taxonomic studies on the genus to verify the synonymies and if any typification had already been performed. By consulting the Taxonomic Literature II (Stafleu *et al.* 1976–2009), we identified the main herbaria in which the authors of the names and the collectors mentioned in the protologues published before the 20th century deposited their collections. The found materials have been carefully reviewed to confirm if they are in accordance with the details of the protologue to which they correspond and the authenticity of the information on their labels. For this, we analyzed the content of the labels, the handwriting of collectors and authors with the help of the Auxilium ad Botanicorum Graphics (Burdet 1979), and the available collectors' catalogues, as well as personal communications from specialists, especially from some herbaria curatorship. The typifications were performed taking this information into account and following the rules and recommendations of the current edition of the International Code of Nomenclature for algae, fungi and plants, ICN (Turland *et al.* 2018). We also followed the Rec.

50A.1 of the ICN to indicate the existence of *pro synonymos* (*pro syn.*). Complementary literature to the ICN, such as Turland (2019) and McNeill (2014), was used to clarify some nomenclatural issues. Abbreviations for authors' name, when applied, agree with The International Plant Names Index - IPNI (2021 [continuously updated]). In the header of the names, we cite the type specimens personally examined with “!”, the type specimens examined through images available on herbaria pages or other online databases with “image!”, and the type specimens examined through images received directly from the herbaria curatorship with “digital image!”, and we indicate in square brackets the current name of the type-locality. Type specimens not examined are also indicated in the header, but with no specific indication for this. All type barcodes found available are indicated.

We examined ca. 700 exsiccates deposited in CEPEC, CESJ, CRI, EFC, FLOR, FURB, HAS, HB, HBR, ICN, MBM, MPUC, PACA, R, RB, and UPCB, and we consulted online images of ca. 300 exsiccates deposited in ALCB, BM, BR, C, CTES, ESA, HBG, HCF, HUCP, HUEFS, HUFJSJ, HVASF, K, L, LP, LUSC, M, MEL, NY, OUPR, P, SP, SPF, U, UEC, UNIP, US, VIC, W, and WU (acronyms according to Thiers 2021 [continuously updated]). The online analyses was made through the databases GBIF (2021), Global Plants on JSTOR (2021), JABOT (2021), Re flora (2021), and speciesLink (CRIA 2021), or directly on the herbaria pages. We also conducted 11 field expeditions to the States of Rio de Janeiro, Rio Grande do Sul, and Santa Catarina in order to collect the species, finding eight of them. Examination and measurements of characters were based on dried herbarium material, using a caliper and stereomicroscope. Due to the provisional studies on phylogenetic relationships in the genus, we do not present to which group/section each species belongs. The descriptive terminology of the lamina of leaves (shape, base, apex, margin, and teeth) was based on Ellis *et al.* (2009), and of the other characters of the plant, on Beentje (2010), but when applicable, we comment in the taxonomic notes specific terminologies from other literature. In the list of selected specimens of each species, there are one or two representative specimen(s), chosen from all the consulted materials. For this, we preferentially select specimen(s) collected by the first author of this work and, when not collected, from those that present online images. We follow the Taxonomic Concept of Species (TSC) (Rapini 2004), which defines a species is “the taxonomic category (a class of taxa) in which each taxon is a class of organisms represented by a valid binomial following the current code of nomenclature”, and we adopted the morphological criterion for species delimitation, based on Aldhebiani (2018), which considers a species is circumscribed based on the presence of non-overlapping diagnostic morphological characters which distinguish it from the other species.



## Taxonomic and nomenclatural treatment

*Pilea* Lindley (1821: tab. 4), *nom. cons.* Genus type: *Pilea muscosa* Lindl.

= *Adicea* Rafinesque (1815: 179), *nom. nud.*

= *Adicea* Raf. ex Britton & Brown (1896: 533), *nom. illeg. superfl.*

= *Adike* Rafinesque (1836: 63). Genus type: *Adike pumila* (L.) Raf.

= *Chamaecnide* Nees & Mart. ex Miquel (1853: 203). Genus type: *Chamaecnide microphylla* Nees & Mart. ex Miq., *pro syn.*

= *Dubrueilia* Gaudichaud-Beaupré (1830: 495). Genus type: *Dubrueilia peploides* Gaudich.

= *Haroldiella* Florence (1997: 218). Genus type: *Haroldiella rapaensis* J.Florence

= *Sarcopilea* Urban (1912: 201). Genus type: *Sarcopilea domingensis* Urb.

**Herbs or less commonly subshrubs or shrubs**, perennial or less commonly annual, terri-colous or rupicolous, monoecious or dioecious, with or without trichomes, the trichomes non-stinging, with cystoliths (visible in the dried material). **Stems** erect or decumbent, branched or unbranched, with succulent aspect, with or without cystoliths. **Leaves** opposite or decussate; **stipules** intrapetiolar, persistent or less commonly non-persistent, triangular, ovate, or elliptic; **petioles** equal or unequal in length at the same node; **laminae** of the leaves equal or unequal in length and shape at the same node, symmetric or asymmetric, with punctiform, linear, fusiform, T-, X-, or Y-shaped cystoliths; margin entire, lobed, crenate, or serrate; primary venation basal or suprabasal acrodromous with 3 veins, or less commonly pinnate. **Inflorescences** dioecious or less commonly monoecious, in congested or lax cymes, pedunculate or sessile, with inconspicuous bracts and bracteoles. **Staminate flowers** pedicelate or sessile, with 4 tepals and stamens, each tepal with a subapical appendage corniculate, ridge-like, or caudate. **Pistillate flowers** pedicelate or sessile, with 2–3 tepals unequal or less commonly equal in size and shape, the dorsal tepal swollen, stigma sessile and penicillate. **Achenes** laterally compressed, ovoid, smoothy, with or without the stigma persistent.

**Nomenclatural notes:**—Lindley (1821) established the genus *Pilea* through the publication of the name *P. muscosa* Lindley (1821), which has been interpreted as an illegitimate name. However, as we detail in the nomenclatural notes of *Pilea microphylla* (Linnaeus 1759)

Liebmann (1851), Lindley considered that *Parietaria microphylla* Linnaeus (1759), the basyonym of *Pilea microphylla*, and *P. muscosa* were different taxa, so their types could not be the same, as well as their epithets. *Pilea muscosa* is therefore only a heterotypic synonym of the correct name *Pilea microphylla*.

At the Congress of Vienna in 1905, the name *Pilea* Lindl. was conserved against the names *Adike* Rafinesque (1836) and *Dubrueilia* Gaudichaud-Beaupré (1830), which were described later, and also against Rafinesque (1815), name whose *nomen nudum* status was probably unknown. We suppose that later such contradictions were clarified, and the conservation was considered superfluous, that is, unnecessary. *Pilea* remains a conserved name and therefore is presented in the Appendix III of the ICN (Turland *et al.* 2018) because, as stated in the Art. 14.13, “entries of conserved names may not be deleted”, while the names against which it was conserved are no longer listed in the same Appendix.

### Key to the species of *Pilea* that occur in the Brazilian Atlantic Forest Biome

1. Plants with trichomes ..... 2
1. Plants without trichomes ..... 4
2. Lamina of the leaves with only the adaxial surface with trichomes; petioles with trichomes concentrated near the junction with the lamina; margin serrate; stipules triangular ..... *P. hyalina* Fenzl
2. Lamina of the leaves with the abaxial and the adaxial surfaces with trichomes; petioles with trichomes distributed throughout its extension; stipules ovate with the apex shape rounded ... 3
3. Lamina of the leaves ovate, widely ovate, widely elliptic, or elliptic; with crenate to crenate-serrate margin; most teeth with convex-convex shape and less commonly straight-convex shape; lamina’s apex shape convex or less commonly straight ..... *P. pubescens* (L.) Liebm.
3. Lamina of the leaves lanceolate, narrowly elliptic, or narrowly ovate; with serrate to crenate-serrate margin; most teeth with straight-straight, straight-convex, or convex-straight shape; lamina’s apex shape straight ..... *P. hirtella* Miq.
4. Lamina of the leaves with entire margin ..... 5
4. Lamina of the leaves with margin crenate, crenate-serrate, serrate, or lobed ..... 6
5. Lamina of the leaves unequal by ratio 1:2.6–4, minor lamina 0.1–5 × 0.1–3 mm and major lamina 0.3–10 × 0.2–5 mm; nodes with predominantly more than one pair of leaves; staminate inflorescences 0.5–10.7 mm long, sessile or including the peduncle up to 7 mm long ..... *P. microphylla* (L.) Liebm.

5. Lamina of the leaves equal to unequal at the same node by ratio 1:1.2–2, 3–17 × 2.2–9.7 mm; nodes with predominantly one pair of leaves; staminate inflorescences 5–12 mm long, including the peduncle 4–10 mm long ..... *P. carautae* M.DM.Vianna & R.J.V.Alves
6. Lamina of the leaves with T-, X-, or Y-shaped cystoliths, in addition to punctiform, fusiform, or linear cystoliths ..... 7
6. Lamina of the leaves with only punctiform, fusiform, or linear cystoliths ..... 9
7. Leaves opposite; laminae in the same node always unequal in length (by ratio 1:2.6–17) .....  
..... *P. rhizobola* Miq.
7. Leaves decussate; laminae in the same node equal or unequal in length (by ratio 1:1.3–4.4)  
..... 8
8. Laminae in the same node equal to less commonly unequal in length by ratio 1:2; primary venation predominantly pinnate; margin with 2–3 teeth per cm and most teeth with convex-convex, concave-straight, or straight-straight shape ..... *P. acanthoides* Cabral & Gaglioti
8. Laminae in the same node unequal in length by ratio 1:1.3–4.4; primary venation acrodromous with 3 (supra)basal veins; margin with 3–7 teeth per cm, most teeth with convex-retroflexed, convex-concave, or convex-straight shape ..... *P. astrogramma* Miq.
9. Pistillate inflorescences lax ..... 10
9. Pistillate inflorescences congested ..... 11
10. Lamina of the leaves with the base angle acute and the base shape straight or decurrent; subapical appendage in the sepals of the staminate flowers up to 0.2 mm long ..... *P. ulei* Killip
10. Lamina of the leaves with the base angle obtuse and the base shape rounded or cordate; subapical appendage in the sepals of the staminate flowers 0.4–0.5 mm long ..... *P. hydra* Brack
11. Abaxial surface of the laminae with fusiform cystoliths over the veins and other parts of the surface ..... *P. bradei* Soares
11. Abaxial surface of the laminae without fusiform or linear cystoliths or with these only over the veins ..... 12
12. Lamina of the leaves with the margin lobed or serrate, with teeth's incision pronounced or close to the midvein ..... *P. flammula* Brack
12. Lamina of the leaves with the margin unlobed, crenate, crenate-serrate or serrate, with teeth's incision not pronounced or close to the midvein ..... 13
13. Lamina of the leaves lanceolate, narrowly elliptic, or elliptic, 4–45 × 2–6 mm; primary venation acrodromous with 3 suprabasal veins, but appearing pinnate due to the lateral basal veins inconspicuous ..... *P. tenebrosa* Cabral & Gaglioti

13. Lamina of the leaves ovate, widely ovate, or elliptic 5–70 × 4–37 mm; primary venation markedly acrodromous with 3 suprabasal veins, with the lateral basal veins conspicuous .....  
 ..... *P. hilariana* Wedd.

1. *Pilea acanthoides* Cabral & Gaglioti in Cabral *et al.* (2020: 822).

**Type:**—BRAZIL. Paraná: Antonina, estrada para o Rio Pequeno, 25°13'35.7"S, 48°40'49.8"W, 63 m elev., 15 February 2017, *F. S. Cabral et al.* 75 (Holotype: FLOR 67966 digital image!; isotypes [to be distributed]: K, NY, RB).

**Perennial herbs**, 35–50 cm tall, dioecious, glabrous. Stems erect, unbranched. **Leaves** opposite decussate, symmetric; stipules ovate to triangular; petioles equal at the same node, 10–40.5 mm long; laminae equal to less commonly unequal in length at the same node by ratio 1:2, 110–210.5 × 20.8–50.5 mm, elliptic, ovate, or lanceolate; base angle acute, base shape straight or decurrent; margin crenate or crenate-serrate, 2–3 teeth per cm and 12–30 in total in each side of the margin, most teeth with convex-convex, concave-straight, or straight-straight shape; apex angle acute, apex shape straight or acuminate, with or without drip tip; adaxial surface with fusiform, punctiform, and linear cystoliths; abaxial surface with linear, fusiform, and Y-shaped cystoliths; primary venation pinnate or less commonly suprabasal acrodromous. **Staminate inflorescences** a congested cyme, 2.8–12.2 × 3.1–11.9 mm, including the short peduncle; staminate flowers with 4 tepals, the subapical appendage ridge-like. **Pistillate inflorescences** a cyme, 0.6–1.7 × 0.3–0.9 mm, including the short peduncle; pistillate flowers with 3 tepals, unequal in size and shape. **Infrutescences** 0.6–1.7 × 0.3–0.9 mm, including the short peduncle; most achenes ca. 1 mm long.

**Selected specimens:**—BRAZIL. Paraná: Antonina, estrada para o Rio Pequeno, 25°13'35.7"S, 48°40'49.8"W, 63 m elev., 15 February 2017, *F. S. Cabral et al.* 75 (FLOR [Holotype] digital image!; K, NY, RB [Isotypes, to be distributed], NY [Isotype, to be distributed], RB [Isotype, to be distributed]).

**Distribution:**—Endemic to the Brazilian Atlantic Forest Biome, this species is currently known only from the type locality, in the State of Paraná.

**Habitat:**—*Pilea acanthoides* was collected beside a watercourse at the elevation of 63 m above sea level.

**Flowering and fruiting period:**—The species was collected in February with flowers and fruits.

**Taxonomic notes:**—The species resembles *Pilea astrogramma* and *P. rhizobola*. It differs from *P. astrogramma* by the lamina of the leaves predominantly equal in length at the same node (*vs.* unequal), by the predominantly pinnate venation (*vs.* acrodromous), and by the margin with 2–3 teeth per cm and most teeth with convex-convex, concave-straight, or straight-straight shape (*vs.* the margin with 3–7 teeth per cm and most teeth with convex-retroflexed, convex-concave, or convex-straight shape); and from *P. rhizobola* by the decussate leaves, with laminae predominantly equal in length at the same node (*vs.* opposite and unequal) and by the predominantly pinnate venation (*vs.* acrodromous). Based on morphological guides other than Ellis *et al.* (2009), its leaves can be considered trullate or rhombic.

2. *Pilea astrogramma* Miquel (1853: 201).

≡ *Adicea astrogramma* (Miq.) Kuntze (1891: 622), *nom. illeg. superfl.*

**Type:**—BRAZIL. *Provinciae Sebastianopolitanae* [Rio de Janeiro]: December [year not mentioned], *C. F. P. von Martius s.n.* (**Lectotype, designated here:** M barcode M-024124 digital image!; probable isoelectotype: U barcode U.1760094 [fragment] online image!).

**Perennial herbs**, 80–100 cm tall, monoecious or dioecious, glabrous. Stems erect, unbranched to slightly branched. **Leaves** opposite decussate, symmetric; stipules triangular; petioles equal to unequal at the same node by ratio 1:1.6–5(–7.2), 2–55 mm long; laminae unequal in length at the same node by ratio 1:1.3–4.4 to less commonly equal, 36.4–148.5 × 10–43.9 mm long, elliptic, ovate, or lanceolate; base angle acute, base shape straight or decurrent; margin serrate, crenate-serrate, or crenate-serrulate, 3–7 teeth per cm and 11–40 in total in each side of the margin, most teeth with convex-retroflexed, convex-concave, or convex-straight shape; apex angle acute, apex shape straight or acuminate; adaxial surface with fusiform, X-, and Y-shaped cystoliths; abaxial surface with fusiform, X-, and Y-shaped cystoliths; primary venation basal or suprabasal acrodromous. **Staminate** inflorescences a congested cyme, 4.9–12.3 × 5–9.8 mm, sessile or including the peduncle 1.9–5.4 mm long; staminate flowers with 4 tepals, the subapical appendage slightly corniculate to ridge-like, up to 0.1 mm long. **Pistillate inflorescences** a congested cyme, 2 × 2.2 mm, sessile or including the peduncle 1 mm long; pistillate flowers with 3 tepals, unequal in size and shape. **Infrutescences** 2.35–3.3 × 3.3–4.3 mm, sessile or including the peduncle 1 mm long; most achenes ca. 1 mm long. (Fig. 1A)

**Selected specimens:**—BRAZIL. Minas Gerais: Viçosa, Fazenda do Paraíso [Mata do Paraíso], 730 m elev., 26 November 1930, *Y. E. J. Mexia 5365* (NY image!, P image!, U image!,

US image!, VIC image!). Rio de Janeiro: Itatiaia, Parque Nacional do Itatiaia, parte baixa, trilha dos Três Picos, perto de e sobre uma pequena ponte em uma pequena cachoeira, 22°25'52.4"S 44°36'26.2"W, 1,226 m elev., 08 February 2020, *J. F. Soares et al. 153* (ICN [to be distributed]!).

**Distribution:**—Endemic to the Brazilian Atlantic Forest Biome, the species was recorded in the Serra da Mantiqueira and its surroundings, and in the Serra do Mar, in the States of Minas Gerais, Rio de Janeiro and São Paulo.

**Habitat:**—*Pilea astrogramma* is terrestrial or rupicolous, inhabiting moist places inside the forest or in its edges, shaded or with little diffused light, such as streambanks, riverbanks and waterfalls, some of which even susceptible to periodic flooding. It was collected from 700 to 1,600 m above sea level.

**Flowering and fruiting period:**—The species was collected from October to February with staminate and pistillate flowers, and from November to March with fruits.

**Taxonomic notes:**—The species resembles *P. acanthoides* and *P. rhizobola*. It differs from *P. acanthoides* by the laminae unequal in length at the same node (*vs.* predominantly equal), by the acrodromous venation (*vs.* predominantly pinnate), and by the margin of the laminae with 3–7 teeth per cm and most teeth with convex-retroflexed, convex-concave, or convex-straight shape (*vs.* 2–3 teeth per cm and most teeth with convex-convex, concave-straight, or straight-straight shape); and from *P. rhizobola* by the decussate leaves, with the laminae unequal in length at the same node by ratio 1:1.3–4.4 (*vs.* opposite and unequal by ratio 1:2.6–17), by the margin in minor and major laminae with 3–7 teeth per cm and most teeth with convex-retroflexed, convex-concave, or convex-straight shape (*vs.* 1–3 teeth per cm in the major laminae, up to 5 teeth per cm in the minor laminae, and most teeth with convex-convex, straight-convex, straight-concave shape). *Pilea astrogramma* is the species which presents the most pronounced discolor pattern between the laminae surfaces, with the abaxial surface tending to be light-gray or light-olive when dried. Based on morphological guides other than Ellis *et al.* (2009), its margins can be considered serrulate.

The gatherings by *M. F. Vieira 639* (VIC image!) and *E. D. Lozano et al. 911* (MBM!, HCF) have morphological characteristics intermediate to *P. astrogramma* and *P. rhizobola*.

**Nomenclatural notes:**—In the protologue of *P. astrogramma*, Miquel (1853) mentioned the type “*Crescit in depressis silvaticis prov. Sebastianapolitanae passim, m. Dec: M.*”, where “M” corresponds to Martius, the collector. We found, in M, a sample collected by Martius (M-024124), mounted on one sheet, which is in agreement with the collection information and the description given in the protologue. On its label, original from the Herbarium of Martius, there

are, in addition to the printed information “*D: Martius*” and “*Íter Brasil*”, the annotations “*Pilea astrogramma* Miq” and “*Miquel ipse.*”, with Miquel's handwriting, and the information of collection “Habitat in depressis sylvaticis”, “Provinciae Sebastianopolitanae, passim” and “Dec.”, with Martius' handwriting. The collector and collection information were also confirmed by the M curatorship (Hans-Joaquim Esser pers. comm.). In addition, we found a leaf fragment preserved in U whose morphological characteristics and information on the labels indicate it may have been removed from the sample in M. It was not possible to find out whether the fragment was removed before or after the description of *P. astrogramma*, but, together with the U curatorship (Marnel Scherrenberg, pers. comm.), we supposed it was removed before 1932 from the sample in M, as the photograph of this sample (F negative 18846), taken in that year, is identical to the current exsiccate, or that it was removed from other original material, not localized so far. According to the U curatorship, the fragment was probably first mounted on the dark sheet, next to the label with the annotations “*Pilea astrogramma*” (hidden below the latest label) and “*L. Depr. Sylv. Sebastianap.*”, and was cataloged only on 10 September 1960, when it received the stamp with that date, plus two new mounting strips, and the latest label with the annotations “*Pilea astrogramma* Miq.” and “Brasília”. Although the sample deposited in M is the only one found so far with all information in the specimens and on the label according to the protologue, it cannot be considered the holotype, as a particular herbarium in which the original material was deposited was not mentioned in the protologue (McNeill 2014). Therefore, following the Art. 9.11 and 9.12 of the ICN (Turland *et al.* 2018), we designated it as the lectotype and considered the fragment in U as a probable isolectotype.

### 3. *Pilea bradei* Soares in Soares & Miotto (in prep.).

**TYPE:**—BRAZIL. Rio de Janeiro: Itatiaia, Parque Nacional do Itatiaia, parte baixa, nas pedras ao redor do poço da Cachoeira Vêu de Noiva, 22°25'35.9"S 44°37'05.0"W, 1,198 m elev., 08 February 2020 (staminate fl., pistillate fl., fr.), *J. F. Soares, W. S. Piovesani & I. P. V. Chaves 149* (Holotype: ICN 203106!, isotypes [in process of distribution]: K!, MBM!, NY!, RB!).

**Perennial herbs**, 10–35 cm tall, monoecious or dioecious, glabrous. Stems erect, unbranched or sparsely branched. **Leaves** opposite decussate, symmetric; stipules triangular; petioles unequal at the same node by ratio 1:1.15–7.2(–8.5) to less commonly equal, 3.7–50 mm long; laminae unequal in length at the same node by ratio 1:1.2–1.9 to less commonly equal, 15.3–107.3(–115.3) × 6.6–50.6 mm, elliptic, ovate, or less commonly oblong, narrowly

elliptic or narrowly ovate; base angle acute or obtuse, base shape convex, cuneate, or less commonly rounded or concave; margin crenate to crenate-slightly serrate, 2–4 teeth per cm and 10–22 in total in each side, most teeth with convex-convex, straight-convex, or convex-straight shape, mucronate or not; apex angle acute, apex shape straight or acuminate; adaxial surface with fusiform cystoliths; abaxial surface with punctiform cystoliths except over the veins, and fusiform cystoliths over the veins and other parts of the surface; primary venation basal acrodromous. **Staminate inflorescences** a congested, glomeruliform cyme, (3,8–)7–54,6(–68,8) × 2,7–10,5 mm, including the peduncle 5–47,7(–63,1) mm long; staminate flowers with 4 tepals, the subapical appendage slightly corniculate. **Pistillate inflorescences** a congested cyme, 1,5–14(–34) × 1,5–11,5 mm, including the peduncle 1–14(–26) mm long; pistillate flowers with 3 tepals, unequal in size and shape. **Infrutescences** (3,6–)7–38,2(–54) × 3–20,8 mm, including the peduncle 3–40 mm long; most achenes ca. 1 mm long. (Fig. 1B)

**Selected specimens:**—BRAZIL. Rio de Janeiro: Itatiaia, 3 Picos (I cascata), September 1933, A. C. Brade 12699 (IPA, RB [on two sheets!]); Itatiaia, Maromba, picada nova, 1,200 m elev., 23 March 1942, A. C. Brade 17299 (RB!).

**Distribution:**—Endemic to the Brazilian Atlantic Forest Biome, the species was recorded in the Serra da Mantiqueira and its surroundings, and in the Serra da Bocaina (closer to the Serra da Mantiqueira than to the ocean), in the States of Minas Gerais, Rio de Janeiro and São Paulo (Southeastern Brazil).

**Habitat:**—*Pilea bradei* is terrestrial or rupicolous, inhabiting moist places inside the forest or in its edges, shaded or with little diffused or direct light, such as streambanks, riverbanks, rock walls, rocky outcrops, and closer to waterfalls, some of which even susceptible to periodic flooding. It was collected from 1,000 to 1,600 m above sea level.

**Flowering and fruiting period:**—The species was collected with staminate and pistillate flowers, and fruits in the same plant from September to March. It has also been collected only with staminate flowers in December, only with staminate flowers and fruits in February, only with pistillate flowers and fruits from March to May, and only with fruits in March.

**Taxonomic notes:**—The species resembles specimens of intermediate size of *Pilea hydra* and specimens of major size of *P. hilariana*, differing from both mainly by the abaxial surface of the leaves with fusiform cystoliths over the veins and other parts (*vs.* fusiform to linear absent or only over the veins); specifically from *P. hydra* by the congested pistillate inflorescences (*vs.* lax), and by the slightly corniculate subapical appendage 0.1–0.2 mm long on staminate flowers sepals (*vs.* strongly corniculate 0.4–0.5 mm long); and specifically from *P. hilariana*, by the 10–20 major secondary veins on each side of the midvein (*vs.* 3–8), and by the minor secondary



and tertiary veins markedly visible to the naked eye when dried (*vs.* barely visible). The presence of fusiform cystoliths over the veins and other parts of the abaxial surface of the leaves (*vs.* absent or only over the veins) differs *P. bradei* of all the other species in the Brazilian Atlantic Forest Biome without trichomes and which present only punctiform, linear or fusiform cystoliths (and not T-, X-, or Y-shaped cystoliths).

The gathering by *J. P. Souza et al. 946* (ESA image!, RB!) has morphological characteristics intermediate to *P. bradei* and *P. hilariana*, because it seems to belong to *P. hilariana* except by being the only one among all *P. hilariana* analyzed specimens that presents fusiform cystoliths over the veins and other parts of the abaxial surface of the leaves.

4. *Pilea carautae* M.D.M.Vianna & R.J.V.Alves (2010: 469).

**Type:**—BRAZIL. Rio de Janeiro: Arraial do Cabo, Ilha do Cabo Frio, Ponta do Maramutá, 23°01'S, 42°03'W, 21 December 2006, *M. D. M. Vianna Filho 1450 & R. J. V. Alves 6330* (Holotype: R 211144 barcode R00211144!; Isotypes: R 213411 barcode R000213411!, RB [not distributed], RB [ex GUA] [not distributed]).

= *Pilea muscosa* Lindl. var. *portulacoides* Weddell (1856-1857: 175) **syn. nov.** ≡ *Pilea microphylla* (L.) Liebm. var. *portulacoides* (Wedd.) Weddell (1869: 106). **Type:**—*Brasilia meridional* [BRAZIL]. Prov. de Rio de Janeiro [Rio de Janeiro]: Cap. Frio [Cabo Frio], 1818, *A. de Saint-Hilaire 98, Cat. B<sup>2</sup> Sect 2* (**Lectotype, designated here:** P barcode P00601950 online image!; isolectotypes: P barcode P00601951 online image!, P barcode P00601952 online image!, P barcode P00605715 online image!).

**Perennial herbs**, up to 40 cm tall, monoecious or dioecious, glabrous. Stems erect or procumbent, branched. **Leaves** opposite decussate, symmetric or asymmetric, in one pair or less commonly more per node; stipules not seen; petioles unequal at the same node by ratio 1:1.4–2 to less commonly equal, 0.7–6 mm long; laminae equal to unequal in length at the same node by ratio 1:1.2–2, 3–17 × 2.2–9.7 mm, obovate, widely obovate, suborbicular, or less commonly orbicular or elliptic; base angle acute or obtuse, base shape straight, decurrent, or less commonly rounded; margin entire, apex shape rounded; adaxial surface with linear to fusiform cystoliths perpendicular to the midvein; abaxial surface without cystoliths; primary venation pinnate. **Staminate inflorescences** a congested cyme, 5–12 × 1.5–4 mm, including the peduncle 4–10 mm long; staminate flowers with 4 tepals, the subapical appendage curniculate, up to 0,1 mm. **Pistillate inflorescences and infrutescences** a congested cyme, 1–

5 × 1–3 mm, sessile or including the peduncle up to 4 mm long; pistillate flowers with 3 tepals, unequal in size and shape; most achenes ca. 0.8 mm long.

**Selected specimens:**—BRAZIL. Rio de Janeiro: Arraial do Cabo, Praia do Forno, 5 m elev., 04 April 1982, *M. B. Casari 712* (ICN!); Cabo Frio [Arraial do Cabo]: Praia Grande, 15 January 1967, *D. Sucre 1330* (RB! [paratype], US image!).

**Distribution:**—Endemic to the Brazilian Atlantic Forest Biome, the species was recorded in the state of Rio de Janeiro only in municipalities of the Cabo Frio Region.

**Habitat:**—*Pilea carautae* is terrestrial or rupicolous, inhabiting shaded or with diffused light places, such as nepheline syenite outcrops, fissures of stone bridges and other structures, and slopes and hilltops with xeric vegetation. It was collected up to 150 m above sea level.

**Flowering and fruiting period:**—The species was collected with staminate and pistillate flowers and fruits in October and from December to April, with pistillate flowers and fruits in May, and with staminate flowers in June.

**Taxonomic notes:**—The species resembles *Pilea microphylla*, from which it differs by the nodes with predominantly one pair of leaves (*vs.* predominantly more than one), by the lamina of the leaves equal to unequal at the same node by ratio 1:1.2–2, 3–17 × 2.2–9.7 mm (*vs.* unequal by ratio 1:2.6–4, minor lamina 0.1–5 × 0.1–3 mm and major laminae 0.3–11 × 0.2–5 mm), and by the staminate inflorescences 5–12 mm long, including the peduncle 4–10 mm long (*vs.* 0.5–10.7 mm long, sessile or including the peduncle up to 7 mm long).

**Nomenclatural notes:**—According to R and RB curatorship, the isotypes of *P. carautae* that should be in RB (which had incorporated GUA) have not been distributed and are currently being located by the R curatorship. We also found an isotype in R, which we cited in the header above but that was not mentioned in the protologue.

By publishing *P. muscosa* var. *portulacoides*, Weddell (1856-1857) did not indicate a type in the protologue. In the P online database, we found four separated sheets labelled as being part of a gathering made by A. de Saint-Hilaire, all of them with the collector number “98” followed by the symbol “δ”, and identified with “*Pilea muscosa* δ var. *portulacoides* Wedd.” in Weddell’s handwriting. Later, in 1869, Weddell corrected the name by publishing *P. microphylla* var. *portulacoides* and cited the gathering by A. De Saint-Hilaire through “*Ⓞ ? In Brasilia meridionali (Aug. St-Hilaire) et passim cum typo?*”, indicating, at the end of the description, it was in the P Herbarium (“*v. s. in hb. Mus. Par.*”). Although this gathering is not indicated in the protologue, the indirect information present in the exsiccates and in Weddell (1869) allow us to conclude that it is a not cited original material eligible for the lectotypification, in accordance with the Art. 9.12 of the ICN (Turland *et al.* 2018). In P online

database, it is stated the collector number for this collection is “86 s” and that it was carried out in the Minas Gerais state. Nonetheless, consulting A. de Saint-Hilaire’s catalogues and Dwyer (1955), we clarified the collection was made at “Prov. de Rio de Janeiro”, specifically in Cabo Frio (“Cap. Frio”). We were already considered the types of *P. microphylla* var. *portulacoides* were very similar to those of *P. carautae*, and the correction in location confirmed the hypothesis that they correspond to the same taxon, which, according to our analysis, is in fact a distinct species of *P. microphylla*. According to the Art. 11.2 of the ICN (Turland *et al.* 2018), the name *P. carautae* has priority. We also checked the names placed in the synonymy of the protologue of the variety, which are presented along with a question mark by Weddell, and they are synonymous of *P. microphylla*. The thesis by Groult (1999) cited the type and the isotypes of *P. microphylla* var. *portulacoides* were in P, but it cannot be considered as an inadvertent lectotypification because, according to the Art. 30.9 of the ICN (Turland *et al.* 2018), it is not in an effective publication. We chose as lectotype the sample P00601950, which has a label with the indication of holotype by Groult (1999: 291) and which is the best preserved material.

5. *Pilea flammula* Brack (1987: 1).

**Type:**—BRAZIL. Rio Grande do Sul: Cambará do Sul, Faxinalzinho, 1,000 m elev., March 1986, M. Sobral 5060 (Holotype: ICN 094666 barcode 00000588 [on two sheets]!).

**Perennial herbs**, 10–30 cm tall, monoecious or dioecious, glabrous. Stems erect, branched. **Leaves** opposite decussate, symmetric; stipules triangular to lanceolate; petioles equal or unequal in length at the same node by ratio 1:2.4–3, 3–20 mm long; laminae equal at the same node, 5–22.6 × 4–17 mm, ovate, narrowly ovate or elliptic; base angle acute or obtuse, base shape rounded, convex, truncate, or straight; margin lobed or serrate with teeth’s incision pronounced, close to the midvein, 2–3 teeth/lobes per cm and 3–6 in total in each side, most teeth/lobes with convex-concave, straight-concave, or straight-retroflexed shape; apex angle acute, apex shape straight or acuminate; adaxial surface with fusiform cystoliths; abaxial surface without or less commonly with punctiform cystoliths except over the veins; primary venation basal or suprabasal acrodromous. **Staminate inflorescences** a congested cyme, 12–25 × 2–3 mm, including the peduncle 11–25 mm long; staminate flowers with 4 tepals, the subapical appendage slightly corniculate or inconspicuous, up to 0.05 mm long. **Pistillate inflorescences** a congested or subcongested cyme, 1–3 × 1–2 mm, including the peduncle 0.7–2 mm; pistillate flowers with 3 tepals, unequal in size and equal in shape. **Infrutescences** 2–10 × 2–4.5 mm, including the peduncle 2–10 mm long; most achenes ca. 1 mm long.

**Selected specimens:**—BRAZIL. Rio Grande do Sul: Cambará do Sul, Faxinal, 900 m elev., January 1984, *M. E. G. Sobral & K. Esposito 3666* (ICN! [paratype], PACA! [paratype]). Santa Catarina: Santo Amaro da Imperatriz [Anitápolis], Eastern edge of Campo dos Padres, Dis. Anitapolis, 1,600 m elev., 18-19 November 1956, *L. B. Smith & R.M. Klein 7750* (HBR! [paratype], R! [paratype], RB! [paratype], U image!, US image!).

**Distribution:**—Endemic to the Brazilian Atlantic Forest Biome, this species was recorded in the Serra Geral, in the States of Santa Catarina and Rio Grande do Sul.

**Habitat:**—*Pilea flammula* is terrestrial, inhabiting shaded and moist places inside the forest, such as streambanks, riverbanks, rocky outcrops and ravines. It was collected from 900 to 1,600 m above sea level, mainly in cloud forests.

**Flowering and fruiting period:**—The species was collected with flowers from November to January, March and April, and with fruits in March and April.

**Taxonomic notes:**—*Pilea flammula*, which resembles *P. tenebrosa* and specimens of minor size of *P. hilariana*, is the only one among the species in the Brazilian Atlantic Forest Biome whose margin of the leaves is lobed, which, based on morphological guides other than Ellis *et al.* (2009), can also be interpreted as having incised teeth (with sinus close to the midvein) or as being laciniated. The species differs specifically from *P. hilariana* by the teeth/lobes with convex-concave, straight-concave, or straight-retroflexed shape (*vs.* teeth with concave-convex, straight-convex, or concave-straight shape); and from *P. tenebrosa* by the ovate or elliptic shape of the lamina of the leaves (*vs.* lanceolate, narrowly elliptic, or elliptic) and by the teeth/lobes with convex-concave, straight-concave, or straight-retroflexed shape (*vs.* teeth with concave-convex, straight-convex, or straight-retroflexed). The gathering *L. B. Smith & R. M. Klein 7888* (R, P), whose exsiccate deposited in R is a paratype of *P. flammula*, seems to us, due to the shape of the lamina of the leaves and of the teeth, to be composed of small specimens of *P. tenebrosa*.

6. *Pilea hilariana* Weddell (1856–1857: 210).

**Type:**—BRAZIL. Prov. de S. Paul [Paraná]: Serra de Paranagua, May 1820, *A. Saint-Hilaire 1645 Cat. C<sup>2</sup> Sect 1* (Holotype: P barcode P00684657 online image!).

= *Pilea loefgrenii* Toledo (1946: 25). **Type:**—BRAZIL. São Paulo: Córrego Alegre, 03 January 1897, *A. Loefgren s.n. (3520)* (Holotype: SP 12785 barcode SP001680 online image!).

= *Pilea loefgrenii* var. *bradeana* Toledo (1946: 26). **Type:**—BRAZIL. São Paulo: Serra da Cantareira, July 1913, *A. C. Brade 6945* (Holotype: SP 6435 barcode SP001682 online image!).

**Perennial herbs**, 10–35 cm tall, monoecious or dioecious, glabrous. Stems erect or decumbent, branched or unbranched. **Leaves** opposite decussate, symmetric; stipules ovate to triangular; petioles equal to unequal at the same node by ratio 1:1.2–2.7, 3–35 mm long; laminae equal or unequal in length at the same node by ratio 1:1.1–1.8, 5–57 × 4–32 mm, ovate, widely ovate, or elliptic; base angle obtuse, base shape convex, subcordate, or straight; margin serrate or crenate-serrate, 1–4 teeth per cm and 3–9(–14) in total in each side, most teeth with concave-convex, straight-convex, or concave-straight shape, mucronate or not; apex angle acute, apex shape straight or acuminate; adaxial surface with fusiform cystoliths; abaxial surface without or with fusiform to linear cystoliths only over the veins; primary venation basal or suprabasal acrodromous. **Staminate inflorescences** a congested cyme, 14–46 × 2.7–7.2 mm, including the peduncle 12–40.5 mm long; staminate flowers with 4 tepals, the subapical appendage slightly corniculate. **Pistillate inflorescences** a congested, subglomerate cyme, 2–14 × 2–4 mm, including the peduncle 1–12 mm long; pistillate flowers with 3 tepals, equal or unequal in size and unequal in shape. **Infrutescences** 5.7–35 × 3.6–11.5, peduncle up to 34 mm long; most achenes ca. 1 mm long. (Fig. 1C)

**Selected specimens:**—BRAZIL. Paraná: Morretes, Serra Marumbi, picada ao Olimpo, 19 January 1995, *O. S. Ribas & E. Barbosa 740* (MBM!, NY image!, US image!). Santa Catarina: Urubici, Estrada para o Cânion Espiraiado, paredão oeste da Pedra da Águia (próximo ao Rio Canoas), 28°01'34.1"S, 49°22'26.9"W, 1,015 m elev., 19 December 2019, *J. F. Soares et al. 120* (ICN [to be distributed]!).

**Distribution:**—Endemic to the Brazilian Atlantic Forest Biome, this species was recorded in the Serra Geral and Serra do Mar, in the States of São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul. There is an undigitized record from the state of Espírito Santo (*Araújo 235 – VIES*, according to Araújo *et al.* 2021) that has not yet been consulted and, therefore, needs to have its identification confirmed.

**Habitat:**—*Pilea hilariana* is terrestrial or less commonly rupicolous, inhabiting moisty and shaded places inside the forest, such as streambanks, riverbanks, and muddy soils. It was collected from 300 to 1,400 m above sea level, and it is abundant in cloud forests, especially close to specimens of *Dicksonia sellowiana* Hooker (1844: 67).

**Flowering and fruiting period:**—The species was collected with staminate and pistillate flowers, and fruits from October to May, only with staminate flowers from October to January, and only with pistillate flowers and fruits from February to June.

**Taxonomic notes:**—Specimens of intermediate or major size of *Pilea hilariana* resembles *P. bradei* and *P. ulei*, and of minor size, *P. flammula*. It differs from *P. bradei* by the linear or fusiform cystoliths only over the veins of the abaxial surface or absent (*vs.* over the veins and other parts of the abaxial surface), by the 3–8 major secondary veins on each side of the midvein (*vs.* 10–20), and by the minor secondary and tertiary veins barely visible to the naked eye when dried (*vs.* markedly visible); from *P. ulei* by the congested pistillate inflorescences (*vs.* lax), by the apex of the laminae without drip tip (*vs.* with drip tip), and by the symmetric laminae (*vs.* predominantly asymmetric); and from *P. flammula* by the unlobed margin (*vs.* lobed or with incised teeth), and by the teeth with concave-convex, straight-convex, or concave-straight shape (*vs.* convex-concave, straight-concave, or straight-retroflexed).

The gathering by *J. F. Soares 117* (ICN [to be distributed]!) has morphological characteristics intermediate to *P. hilariana* and *P. ulei*, and the gathering by *D. B Falkenberg & F. A. Silva Filho 5939* (FLOR!, ICN [to be distributed]!), has morphological characteristics intermediate to *P. hilariana* and *P. tenebrosa*, as the shape of the lamina of the leaves. The gathering by *J. P. Souza et al. 946* (ESA image!, RB!) seems to belong to *P. hilariana* except by being the only one among all *P. hilariana* analyzed specimens that presents fusiform cystoliths over the veins and other parts of the abaxial surface of the leaves, morphological characteristic which occurs only in *P. bradei*.

*Pilea loefgrenii* and *P. loefgrenii* var. *bradeana* has already been considered synonyms of *P. hilariana* by Brack (1989) and Gaglioti & Romaniuc-Neto (2012). The only difference in relation to the type of *P. hilariana* is that the types of these names comprise monoecious specimens, and specifically the type of the variety is major and has larger leaves. However, *P. hilariana* has both monoecious and dioecious specimens, in addition to having polymorphic leaves with a wide range of sizes.

**Nomenclatural notes:**—In the protologue of *P. hilariana*, Weddell (1856-1857) does not mention the type locality. By consulting A. de Saint-Hilaire's catalogues and Dwyer (1955), we found the type was collected in May 1820, in the Serra de Paranaguá, a place that belonged to the Province of São Paulo and which currently belongs to the State of Paraná. We consider this sample as the holotype because it was the only one found in P, the herbarium cited by Weddell in the protologue.

7. *Pilea hirtella* Miquel (1853: 202).

Basionym: *Boehmeria repens* Nees & Martius in Wied-Neuwied (1823: 36). ≡ *Adicea hirtella* (Miq.) Kuntze (1891: 622), *nom. illeg. superfl.*

**Type:**—BRAZIL. Bahia: *Ilheos* [Ilhéus], *Ad viam Felisbertiam*, s.d., *A. P. Prinz zu Wied s.n.* (Klaenze 90) (**Lectotype, designated here:** BR 658772 barcode BR0000006587727 online image!; isoelectotypes: K barcode K000973365 online image!, MEL 2331212A online image!).

**Perennial herbs**, 20–40 cm tall, monoecious, with trichomes. Stems erect, branched or unbranched. **Leaves** opposite decussate, symmetric; stipules ovate with the apex shape rounded; petioles equal to unequal at the same node by ratio 1:1.5–1.6, 3.3–21.2 mm long, with trichomes; laminae equal at the same node, 12.5–100.9 × 4.2–26.8 mm, lanceolate, narrowly elliptic, or narrowly ovate; base angle acute or obtuse, base shape convex or straight; margin serrate or crenate-serrate, with trichomes, 3–5 teeth per cm and 5–15 in total in each side, most teeth with straight-straight, convex-straight, or straight-convex shape; apex angle acute, apex shape straight; adaxial surface with trichomes and with fusiform cystoliths; abaxial surface with trichomes and fusiform cystoliths; primary venation acrodromous with 3 basal veins. **Inflorescences** with pistillate and staminate flowers; a lax cyme, 6–57.3 × 4.4–31.3mm, including the peduncle 3.5–46.2 mm long; staminate flowers, concentrated in the inflorescence's basal portion, with 4 tepals, the subapical appendage strongly elongated, 0.6–1 mm long; pistillate flowers with 3 tepals. **Infrutescences** 6–57.3 × 4.4–31.3mm, including the peduncle 3.5–46.2 mm long; most aquenes almost 1 mm long.

**Selected specimens:**—BRAZIL. Bahia: Almadina, Rod. Almadina/Ibitupã, entrada a 7 km, Serra do Sete Paus, ca. 12 km da entrada, Faz. Cruzeiro do Sul, 26 February 1997, *J. G. Jardim et al.* 977 (CEPEC!, RB!, NY image!).

**Distribution:**—Endemic to the Brazilian Atlantic Forest Biome, this species was recorded in the South of the State of Bahia.

**Habitat:**—*Pilea hirtella* is rupicolous or less commonly terrestrial, inhabiting rocky slopes near streambanks inside the forest or in its edges.

**Flowering and fruiting period:**—The species was collected with flowers and fruits from January to April.

**Taxonomic notes:**—The species resembles *Pilea pubescens* especially due to the presence of thichomes, from which it differs by the lanceolate, narrowly ovate, narrowly elliptic or elliptic shape of the lamina of the leaves (*vs.* elliptic, widely elliptic, ovate or widely ovate) and by most teeth with straight-straight, convex-straight, or straight-convex shape (*vs.* convex-convex shape, and less commonly straight-convex shape). It also can be distinguished from *P. hyalina*, which is the other species with trichomes, by the petiole with trichomes throughout its

extension (*vs.* concentrated only near the junction with the lamina) and by the lamina of the leaves with trichomes in both surfaces (*vs.* only on the adaxial surface). *P. hirtella* was described based on a gathering in which the specimens have small leaves similar to those of some specimens of *P. pubescens*, but narrower. The later collections of this species compose a gradient with even narrower leaves. However, *R. S. Pinheiro s.n. [1834]* (ICN 066246!, IPA) has morphological characteristics intermediate to *P. hirtella* and *P. pubescens*.

**Nomenclatural notes:**—*Pilea hirtella* was published as a *nomen novum* (Art. 6.11 of the ICN, Turland *et al.* 2018) based on *Boehmeria repens* Nees & Martius because the specific epithet *repens* was unavailable in *Pilea*. Moraes *et al.* (2013, 2016) indicated the sample deposited in BR as the holotype of the basynonym *B. repens*, possibly because it was the only material found in this herbarium, which houses the Wied-Neuwied collection that belonged to Martius (Stafleu *et al.* 1976–2009). However, it cannot be considered the holotype, because a particular herbarium in which the original material was deposited was not mentioned in the protologue (McNeill 2014), and because there are duplicates in other herbaria. In Wied-Neuwied (1823), Nees & Martius mentioned only the collector and the type locality in the protologue. Thus, following the Art. 9.11 and 9.12 of the ICN (Turland *et al.* 2018), we designated the sample in BR as the lectotype, considering it has the most complete labels and that it best represents the current application of the name *P. hirtella*.

According to Martius (1837: 34), Wied-Neuwied shared part of his collection with other naturalists, including Hofkammerrath Wilhelm Klenze (also written as “Klaenze”). For this reason, it is common to find many of his collections labeled with numbers given by Klaenze, as is the case of the lectotype and one of the isolectotypes of *P. hirtella*. In contrary, Wied-Neuwied did not number his collections (Moraes *et al.* 2013).

8. *Pilea hyalina* Fenzl (1849: 256).

≡ *Urtica arvensis* Poepp. ex Fenzl (1849: 256), *pro syn.* ≡ *Adicea hyalina* (Fenzl) Kuntze (1891: 622), *nom. illeg. superfl.*

**Type:**—Brésil [BRAZIL]. Rio de Janeiro, 1831-1833, *C. Gaudichaud-Beaupré 1075* (**Neotype, designated here:** P barcode P06874596 image!; isoneotypes: P barcode P06874591 image!, P barcode P06874592 image!, P barcode P06874602 image!).  
**Syntypes** (not localized):—Brasilia [BRAZIL]. In the protologue: prope Rio de Janeiro, s.d., *Schüch s.n.* Peruvia [PERU]. In the protologue: in Peruvia subandina prope Cuchero ad fossas cultorum, December 1829, *Poeppig [Urtica arvensis Poeppig Coll. n. 1539; Diar. n. 1608]*.



= *Pilea lundii* Liebm. (1851: 299) ≡ *Adicea lundii* (Fenzl) Kuntze (1891: 623), *nom. illeg. superfl.* Type:—Brasilia [BRAZIL]: s.l. [Rio de Janeiro], s.d., *P. W. Lund s.n.* (Lectotype, designated by Monro (2001): C [Schumacher's Herbarium] barcode C10019755 [specimen 2] digital image!; probable isoelectotypes: C [Hornemann's Herbarium] barcode C10024092 digital image!, C [Warming's Herbarium] barcode C10024091 digital image!). Remaining syntypes:—MEXICO: Potrero de Consoquitla, November 1841, *F. M. Liebm. s.n.* (C 14243 barcode C10019756 [specimen 1] digital image!); 1841-43, *F. M. Liebm. s.n.* (C 14245 barcode C10019758 [specimen 3] digital image!). REPUBLIC OF COSTA RICA: Prope Cartago, 1845-48, *A. S. Ørsted s.n.* (C 14244 barcode C10019757 [specimen 2] digital image!).

= *Pilea hyalina* var. *longipes* Miquel (1853: 201), **syn. nov.** ≡ *Urtica longipes* Mart. ex Miquel (1853: 201), *pro syn.* Types:—BRAZIL. [Rio de Janeiro]: Serra d'Estrella, *B. Luschnath s.n.* (**Lectotype, designated here:** BR barcode BR0000013012953 online image!). Remaining syntypes:—BRAZIL. [Rio de Janeiro]: Serra d'Estrella, *Martius s.n.* (not localized). Peruvia [PERU]. In the protologue: in Peruvia ad Cuchero, *Poeppig 1539* (not localized).

**Annual herbs**, 10–50 cm tall, monoecious, with trichomes. Stems erect, branched or unbranched. **Leaves** opposite decussate, symmetric; stipules triangular; petioles equal or unequal at the same node by ratio 1:1.2–1.5, 2.9–77 mm long, with trichomes concentrated near the junction with the lamina; laminae equal at the same node, 7.4–64.4 × 5–38.9 mm, elliptic, base angle acute or obtuse, base shape straight; margin serrate, (1.5–)2–4 teeth per cm and 5–9 in total in each side, most teeth with straight-straight, straight-concave, or straight-convex shape; apex angle acute, apex shape straight; adaxial surface with linear and fusiform cystoliths and trichomes; abaxial surface with linear and fusiform cystoliths; primary venation basal or suprabasal acrodromous. **Inflorescences** with staminate and pistillate flowers, a lax cyme, 2.5–20 × 1.5–14 mm, including the peduncle 1.5–12.1 mm long; staminate flowers with 2–3 tepals, the subapical appendage slightly corniculate or inconspicuous, up to 0.05 mm; pistillate flowers with 3 tepals, unequal in size and shape. **Infrutescences** 2.5–20 × 1.5–14 mm, including the peduncle 1.5–12.1 mm long; most achenes ca. 0.5 mm long. (Fig. 2A)

**Selected specimen:**—BRAZIL. Rio de Janeiro: Recreio dos Bandeirantes, Prainha, Parque Ecológico Municipal da Prainha, trilha para o Mirante, 100 m elev., 06 August 2004, *J. M. A. Braga & L. J. T. Cardoso 7442* (NY image!, RB!).

**Distribution:**—Native and widely distributed throughout Mexico, Central America, South America (Venezuela, Colombia, Ecuador, Peru, Bolivia, Paraguay, Chile, Argentina, Uruguay, Brazil) and Mexico (Killip 1939; Sorarú 1972; Monro 2014). In Brazil, this species was recorded in Cerrado, Caatinga and Atlantic Forest Biomes. In the Atlantic Forest Biome, it was recorded in the States of Pernambuco, Alagoas, Sergipe, Bahia, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, and Santa Catarina.

**Habitat:**—*Pilea hyalina* is rupicolous or less commonly terrestrial, inhabiting places inside the forest or in its edges, shaded or with diffused or direct light, with different intensities of humidity. It is common in coastal forests, with high salinity and light incidence, and was collected from sea level to almost 800 m of elevation.

**Flowering and fruiting period:**—The species was collected with flowers and from March to October.

**Taxonomic notes:**—This species resembles *Pilea pumila* Linnaeus (1753) Gray (1848), which occurs in North America to East Asia (Chen & Monro, 2003). In the Brazilian Atlantic Forest Biome, *P. hyalina* differs from *P. pubescens* and *P. hirtella*, the other species with trichomes, by the petiole with trichomes concentrated only near the junction with the lamina (*vs.* throughout the petiole extension) and by the laminae of the leaves with trichomes only on the adaxial surface (*vs.* in both surfaces). Based on morphological guides other than Ellis *et al.* (2009), its leaves can be considered rhombic. *P. hyalina* is the species in the Brazilian Atlantic Forest Biome that, when dried, has the most flattened and yellowish branches, and it is also the only species in this Biome with dark brown dots in the surface of the fruits (*vs.* without dots).

**Nomenclatural notes:**—In the protologue of *P. hyalina*, two syntypes are mentioned. One is a collection by Poeppig in December 1829 in Peru, and the other is a collection by Schüch in Brazil. Also, Fenzl (1849) mentioned the *pro synonymo* “*Urtica arvensis* Poeppig Coll. n. 1539 B.; Diar n. 1608!”, which we assume may be the collection by Poeppig in Peru, that is, one of the syntypes, originally deposited in B. Monro (2001) designates a lectotype in C for this name, but according to the curatorship of the herbarium, it is not there. This lectotype appears as visualized in person by Monro (2001, 2014), but Jeomol & Sunojkumar (2020) presented a question mark in the mention this type in their work, possibly because they did not find it either. We looked for duplicates in B and other herbaria that house Poeppig’s collections, but no duplicates have been found so far. According to the curatorship of B, if it was there, it was probably destroyed (Robert Vogt pers. comm.). Likewise, we have not located Schüch's collection in any herbarium that houses his collections. As no original material has been found so far, we designated P06874596 as a neotype, following the Art. 9.8, 9.11, and 9.13 of the ICN

(Turland *et al.* 2018). It is a collection by *C. Gaudichaud-Beaupré* in Rio de Janeiro, the same province of the collection by Schüch, which is a syntype of *P. hyalina*. The year appearing on the publication of *P. hyalina* is 1850, but according to Stafleu *et al.* (1976–2009) and Monro (2014), the year of publication was 1849.

In the protologue of *Pilea lundii*, Liebmann (1851) mentioned that the type is in the Schumacher's herbarium under the name "*Urtica nitida* Schum", and that it was sent from Brazil by Lund, from whom Liebmann named the species ("I Schumachers Herbarium ligger den under Navn af *Urtica nitida* Schum. sendt fra Brasilien af Dr. Lund, efter hvem jeg har benævnt Arten"). However, he also cited in the protologue gatherings from three localities in Mexico, all deposited in Schumacher's herbarium in C, which can be interpreted, together with the gathering by Lund, as syntypes. Furthermore, it is not written "*Urtica nitida* Schum" in the label of the sample by Lund, but only "*Urtica nitida*". Thus, we agree with the designation of this sample as the lectotype by Monro (2001). In the header, we specified of the syntypes of this name with the specimen number and its correspondent barcode, because they are all at the same sheet. We also indicated the probable isolecotypes of *P. lundii* that were found by C curatorship as a result of our solicitation, which are in Hornemann's herbarium and Warming's herbarium. It is mentioned in the labels of these isolecotypes that the collection is from Rio de Janeiro, but this information was not available in the sample consulted by Liebmann in Schumacher's herbarium.

In the protologue of *P. hyalina* var. *longipes*, it is mentioned that this is the beta variety of *P. hyaline*, which has three syntypes: a collection by Martius and a collection by Luschnath, both in Serra D'Estrella, and a collection by Poeppig in Peru. This collection by Poeppig seems to be one of the syntypes of the name *Pilea hyalina*, which was not found so far, as well as the collection by Martius. The only original material associated with this variety name that was found corresponds to a Luschnath's collection in Serra D'Estrella deposited in BR (BR0000013012953), which we designate as a lectotype, in agreement with the Art. 9.11 and 9.12 of the ICN (Turland *et al.* 2018). The label of its exsiccate contains the annotation "*Pilea umbrosa*  $\beta$  *longipes*" and also the annotation "*Urtica longipes* Mart.", which is mentioned in the protologue of the variety as a *pro synonymo*. Furthermore, the illustration of the variety, which is mentioned in its protologue, seems to reproduce the specimen on the left of the sheet of BR0000013012953.

## 9. *Pilea hydra* Brack (1987: 3).

**Type:**—BRAZIL. Rio Grande do Sul: Aratinga – Osório [Itati], Estrada Tainhas – Itati, beira de estrada, 700 m elev., 02 February 1984, *M. Sobral 3755* (Holotype: ICN 063889 barcode 00000584 [on three sheets]!).

**Perennial herbs**, 15–50 cm tall, monoecious or dioecious, glabrous. Stems decumbent or erect, unbranched or less commonly branched. **Leaves** opposite decussate, symmetric or slightly asymmetric; stipules triangular; petioles equal to unequal at the same node by ratio 1:1.15–2, 10–150 mm long; laminae equal in length at the same node, 35.2–200 × 21.8–91.2, ovate or elliptic; base angle obtuse, base shape rounded or cordate; margin serrate or crenate-serrate, 1–3 teeth per cm and 8–22 in total in each side, most teeth with concave-convex, straight-convex, or concave-straight shape; apex angle acute or obtuse, apex shape straight or acuminate, with or without drip tip; adaxial surface with fusiform cystoliths; abaxial surface with sparsely punctiform cystoliths except over the veins, and with or without fusiform to linear cystoliths over the veins; primary venation basal acrodromous. **Staminate inflorescences** a congested, glomeruliform cyme, 11.6–35.2 × 2.3–9.8 mm, including the peduncle 7.8–30.5 mm long; staminate flowers with 4 tepals, the subapical appendage strongly corniculate to ridge-like, 0.4–0.5 mm long. **Pistillate inflorescences and infrutescences** a lax cyme, 8.3–53 × 4.6–98 mm, including the peduncle 3.9–35.5 mm long; pistillate flowers with 3 tepals, unequal in size and shape; most aquenes almost 1 mm long. (Fig. 2B)

**Selected specimens:**—BRAZIL. Rio Grande do Sul, Itati, Estrada embaixo da Rodovia RS-453 (Rota do Sol), cujo acesso é pelo Mirante da Rota do Sol, 29°21'19.7"S 50°10'31.3"W, 795 m elev., 17 January 2020, *J. F. Soares et al. 143* (ICN [to be distributed]!); Três Cachoeiras, Perdida, 300 m elev, 29 January 1993, *D. B. Falkenberg & J. A. Jarenkow 6060* (FLOR!, ICN [to be distributed]!).

**Distribution:**—Endemic to the Brazilian Atlantic Forest Biome, this species was recorded in the Serra Geral, in the State of Rio Grande do Sul.

**Habitat:**—*Pilea hydra* is terrestrial or less commonly rupicolous, inhabiting moist places inside the forest or in its edges, shaded or with little diffused or direct light, such as streambanks, riverbanks, rock walls, and ravines. It was collected from 300 to 1,100 m above sea level, mainly in cloud forests.

**Flowering and fruiting period:**—The species was collected with staminate and pistillate flowers and fruits from January to February, and with only pistillate flowers and fruits from March to April.

**Taxonomic notes:**—The species resembles *Pilea bradei* and *P. ulei*, differing from both by the corniculate subapical appendage 0.4–0.5 mm long on staminate flowers sepals (*vs.* 0.1–0.2 mm long); specifically from *P. bradei* by the fusiform to linear cystoliths in the abaxial surface of the leaves only over the veins or absent (*vs.* over the veins and other parts of the abaxial surface), and by the lax pistillate inflorescences (*vs.* congested); and specifically from *P. ulei* by the lamina of the leaves with the base angle obtuse (*vs.* acute) and the base shape rounded or cordate (*vs.* straight or decurrent).

10. *Pilea microphylla* (L.) Liebmann (1851: 296).

Basionym: *Parietaria microphylla* Linnaeus (1759: 1308).  $\equiv$  *Urtica microphylla* (L.) Swartz (1787: 66).

**Type:**—H. Sloane, Voy. Jamaica 1: tab. 93, fig. 2. 1707 (Lectotype, designated by Soares *et al.*, in prep.—JAMAICA. *H. Sloane s.n.* (Epitype, designated by Soares *et al.* (in prep.): BM barcode BM000588988 image!).

= *Pilea muscosa* Lindley (1821: tab 4). Type:—Plate in Lindley (1821: tab. 4) (**Lectotype, designated here**).

= *Pilea peplidifolia* Schlechtendal (1856: 496), **syn. nov.** Types:—BRAZIL. Bahia: Ilheos [Ilhéus], s.d., [*Luschnath s.n.*] Martius Herb. Fl. Bras. 952 (Syntypes: BR 557009 barcode BR0000005570096 [pro parte] online image!; BR 557044 barcode BR0000005570447 online image!; BR 557042 barcode BR0000005570423 online image!; HAL 098189 barcode HAL0098189 online image!; M barcode M-0274910 online image!; M barcode M-0274911 online image!).—MEXICO. Prope Jalapam, s.d., F. Deppe & C. J. W. Shiede s.n. (Syntypes: HAL 098188 barcode HAL0098188 online image!; HAL 110254 barcode HAL0110254 online image!).

**Perennial herbs**, up to 40 cm tall, monoecious or dioecious, glabrous. Stems procumbent or erect, branched. **Leaves** opposite decussate, symmetric or asymmetric, in one or predominantly more pairs per node; stipules ovate; petioles unequal at the same node by ratio 1:1.5–2 to less commonly equal, up to 4 mm long; laminae unequal in length at the same node by ratio 1:2.6–4, minor laminae 0.2–5 × 0.2–3 mm, major laminae 0.3–11 × 0.2–5 mm, both obovate, ovate, suborbicular, or less commonly elliptic; base angle acute or obtuse, base shape straight, decurrent, or less commonly rounded; margin entire, apex shape straight or rounded; adaxial surface with linear or fusiform cystoliths perpendicular to the midvein; abaxial surface without cystoliths or less commonly with few linear cystoliths parallel to the midvein; primary

venation pinnate. **Staminate inflorescences** a congested cyme, 0.5–10.7 × 0.5–4 mm, sessile or including the peduncle up to 7 mm long; staminate flowers with 4 tepals, the subapical appendage slightly corniculate or inconspicuous, up to 0.05 mm long. **Pistillate inflorescences and infrutescences** a congested cyme, 0.5–3 × 0.5–2 mm, sessile or including the peduncle up to 2 mm long; pistillate flowers with 3 tepals, unequal in size and shape; most achenes ca. 0.5 mm long.

**Selected specimens:**—BRAZIL. Bahia: Camacan, Serra Bonita (Serra da Torre), 10 km N of Camacan on road to Jacareci, then 6.2 km. W on road to transmission towers, 15°23'53.4"S 39°34'07.2"W, 920 – 950 m elev., 02 August 2020, *W. W. Thomas et al. 13008* (CEPEC, NY image!, RB!). Espírito Santo, Itaguassú [Itaguaçu], Jatiboca, 13 May 1946, *Brade et al. 18199* (RB!).

**Distribution:**—Native and widely distributed throughout Central America, South America, Mexico and United States (Monro 2014). In Brazil, this species was recorded in all Biomes. In the Atlantic Forest Biome, it was recorded in the states of Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul, but most of the records are from cultivated specimens.

**Habitat:**—*Pilea microphylla* is rupicolous or terrestrial, and tolerates different intensities of humidity and light. It inhabits inside the forest or in its edges, such as in rock walls and (limostane) rocky outcrops, as well as in places with anthropogenic interferences, such as in fissures of sidewalks and walls. It was collected up to 1,400 m above sea level.

**Flowering and fruiting period:**—The species was collected with flowers and fruits throughout the year.

**Taxonomic notes:**—The species resembles *P. carautae*, from which it differs by the nodes with predominantly more than one pair of leaves (*vs.* predominantly one), by the lamina of the leaves unequal by ratio 1:2.6–4, minor lamina 0.1–5 × 0.1–3 mm and major laminae 0.3–11 × 0.2–5 mm (*vs.* equal to unequal at the same node by ratio 1:1.2–2, 3–17 × 2.2–9.7 mm), and by the staminate inflorescences 0.5–10.7 mm long, sessile or including the peduncle up to 7 mm long (*vs.* 5–12 mm long, including the peduncle 4–10 mm long).

**Nomenclatural notes:**—As detailed in Soares *et al.* (in prep.), De Rooij (1975) indicated as “type” of *P. microphylla* a material (LINN 1220.8 - LINN) for which there is no evidence that was used by Linnaeus for the description of the basionym, being, therefore, incorrect. In Soares *et al.* (in prep.), we indicated as the lectotype for the basionym *Parietaria microphylla* the only material for which we find evidence of being used by Linnaeus (1759), that is, the illustration in Sloane (1707: tab. 93, fig 2), associated by him with the genus *Herniaria* and the

phrase name *lucida aquatica*, and which is mentioned by Linnaeus (*l.c.*) in protologue of *Parietaria microphylla*. We also indicate the specimen that gave rise to this illustration (BM000588988) as an epitype.

In the publication of the genus *Pilea*, Lindley (1821) presents a diagnosis for the genus and for the new species *P. muscosa*, followed by the names *Parietaria microphylla* and *Urtica microphylla* and their respective publications, the description of the new species, and a text about the decision for describing this new genus. In this text, the author explains that he saw the plant he is describing for the first time in the Comte de Vandes' greenhouse in Bayswater, and that Swartz found it in the West Indies, identifying it first as belonging to *Parietaria microphylla* and then to *Urtica microphylla*, identification which remained in the *Flora Indiae Occidentalis* (Swartz 1797). Afterwards, Lindley (1821) explains why the plant he saw in the greenhouse does not belong to any of this genera and then proposes it as a type of the new genus, to which *U. herniarioides*, *U. trianthemoides*, and another species brought from the East Indies by Van Rohr should also belong. *P. muscosa* had been considered a superfluous illegitimate name (Groult 1999; Monro 2001, 2014), because its type and its epithet were not adopted from the supposed basionym *Parietaria microphylla* that Lindley (1821) cited in its synonymy. However, by choosing the plant he saw in the greenhouse as the type of the genus *Pilea*, describing it as *P. muscosa*, Lindley makes it clear that the species he is describing is different from *Parietaria microphylla*. In fact, he also writes that “The *Herniaria lucida aquatica* of Sloane, which is usually cited to this plant, seems to us decidedly to belong to *Pilea trianthemoides*”, and the genus *Herniaria* and the phrase name *lucida aquatica* are associated with the illustration on which Linnaeus (1759) consulted to publish *Parietaria microphylla*. Lindley (1821) seems to mention *Parietaria microphylla* in this publication just to show that it should be included in the new genus, and not as a synonym of his new species *P. muscosa*. Based on this information, we concluded that *P. muscosa* is a legitimate name whose typification and, consequently, legitimacy, had not been understood. It is a heterotypic synonym of *Pilea microphylla*, and *Pilea microphylla* is the correct name for this species because its basionym, *Parietaria microphylla*, is the earliest legitimate name. Due to this context and because we have not found an exsiccate clearly associated with the specimen observed by Lindley in the greenhouse, following the Art. 9.11 and 9.12 of the ICN (Turland *et al.* 2018) we designated as the lectotype for *P. muscosa*, the only original material found that we interpreted as directly related to this name, that is, the illustration present in its protologue.

For the name *Pilea peplidifolia*, we did not designate a lectotype, because it is necessary to clarify the origin of the syntypes and the relationship among them. It was not possible to

confirm that the syntypes from Brazil correspond to the same gathering, since, in addition to Luschnath being mentioned as the collector only in the exsiccate BR0000005570447, the specimen from Brazil mounted on the right side of the sheet of the exsiccate BR0000005570096 (which have two more specimens, both from outside Brazil and not related to this name) presents morphological variations in relation to the other syntypes. Thus, we do not have enough evidence to refuse the possibility that different collections are mixed under the number 952 assigned by Martius in the exsiccates. According to the protologue of *P. peplidifolia*, the peduncle of the staminate inflorescences is long, but we found this characteristic only in the syntypes HAL0098188, from Mexico, and BR0000005570096, from Brazil. Even though *P. microphylla* is described in most of the taxonomic treatments as presenting sessile or subsessile staminate inflorescences, we consider the presence of larger peduncles in these few exsiccates of *P. peplidifolia* insufficient to determine it as a distinct species. All the other morphological features described in the protologue and present in the syntypes of this name allow us to consider it within *P. microphylla*. It is necessary to collect more specimens with this characteristic in order to understand its geographic distribution and to cover this variation in the descriptions. It is also important to report that the name *P. peplidifolia* was already associated with *Pilea serpyllacea* (Kunth 1817: 37) Liebmann (1851: 296) and *Pilea serpyllifolia* (Poiret 1804: 16) Weddell (1869:107). Some specialists consider *P. serpyllacea* as a synonym of *P. microphylla* and, others, as a distinct species because, in addition to being restricted to elevations above 1,500 m, it presents pistillate inflorescences with longer peduncles. *P. serpyllifolia*, a consistently distinct species, is also restricted to higher elevations and presents a pattern of distribution of cystoliths on the adaxial surface of the leaves completely different from that of *P. microphylla*.

11. *Pilea pubescens* Liebmann (1851: 302).

**Type:**—BRAZIL. *s. l., s.d., P. W. Lund s.n.* (Holotype: C [Schumacher's Herbarium] barcode C10019780 [specimen 2] digital image!; probable isotype C [Hornemann's Herbarium] barcode C10024088 [specimen 2] digital image!).

= *Pilea gaudichaudiana* Weddell (1852: 226). **Type:** — BRAZIL. [Rio de Janeiro]: Corcovado, *M. Guillemain 1339 Cat. n. 741 (Lectotype, designated here: P barcode P06874403 online image!)* Remaining syntypes:—BRAZIL. Rio de Janeiro: 1831-1833, *C. Gaudichaud-Beaupré 1077 (P barcode P00753674 online image!, P barcode P06874413 online image!);* Rio de Janeiro, 1832, *C. Gaudichaud-Beaupré 93 (P barcode P00753673 online image!, P barcode P06874407 online image!)*.



= *Pilea grossecrenata* Miquel (1853: 199). ≡ *Urtica radicans* Pohl ex Miquel (1853: 199), *pro syn.* ≡ *Urtica grossecrenata* Martius ex Miquel (1853: 199), *pro syn.* Type:—BRAZIL. S. Joao Marques”, *J. B. E. Pohl s.n.* (**Lectotype, designated here:** W barcode 0073530 online image!; isolectotype: BR barcode BR0000005623686 online image!). Remaining syntype:—BRAZIL. Prov. Rio de Janeiro: Tocaya, February, *J. C. Mikan s.n.* (W barcode 0073528 online image!).

= *Pilea maximilianii* Miquel (1853: 200), **syn. nov.** Type:—BRAZIL. Bahia: Ilheos [Ilhéus], ad viam Felisbertiam, January 1817, *M. A. P., Prinz zu Wied s.n.* (**Lectotype, designated here:** BR 658871 barcode BR0000006588717 online image!; isolectotypes: BR 658838 barcode BR0000006588380 online image!, U barcode 0006977 online image!).

**Perennial herbs**, 10–40 cm tall, monoecious, with trichomes. Stems erect and unbranched. **Leaves** opposite decussate, symmetric; stipules ovate with the apex shape rounded; petioles equal to unequal at the same node by ratio 1:1.5–1.6, 3.4–60 mm long, with trichomes; laminae equal at the same node, 10.5–114.5 × 9.1–78.15 mm, elliptic, widely elliptic, ovate, or widely ovate; base angle obtuse, base shape rounded, convex, or straight; margin crenate or crenate-serrate, with trichomes, 1–3 teeth per cm and 5–15 in total in each side, most teeth with convex-convex shape or less commonly straight-convex shape; apex angle obtuse or less commonly acute, apex shape convex or less commonly straight; adaxial surface with fusiform cystoliths and with trichomes; abaxial surface with fusiform cystoliths and with trichomes; primary venation basal acrodromous. **Inflorescences** with pistillate and staminate flowers, a lax cyme, 11.6–102 × 4.7–71 mm, including the peduncle 9–63 mm long; staminate flowers concentrated in the inflorescence’s basal portion, with 3–4 tepals, the subapical appendage strongly elongated, 0.5–1 mm long; pistillate flowers with 4 tepals, unequal in size and shape. **Infrutescences** 11.6–102 × 4.7–71 mm, including the peduncle 9–63 mm long; most achenes almost 1 mm long. (Fig. 2C)

**Selected specimens:**—BRAZIL. Rio de Janeiro: Itatiaia, Parque Nacional do Itatiaia, parte baixa, trilha dos 3 picos, 22°25′55.0″S 44°36′25.6″W, 1,214 m elev., 09 February 2020, *J. F. Soares et al. 151* (ICN [to be distributed]!). Santa Catarina: Blumenau, Morro do Cachorro, do meio para o topo, 26°46′36.0″S 49°01′55.0″W, 700 m [763 m] elev., 31 January 2014, *A. L. Gasper et al. 3465* (FUEL, FURB!).

**Distribution:**—Native and widely distributed throughout Mexico, Central America, and South America (Monro 2014). In Brazil, this species was recorded in the Atlantic Forest and Amazonian Biomes. In the Atlantic Forest Biome, it was recorded in the States of Bahia, Minas

Gerais, Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul.

**Habitat:**—*Pilea pubescens* is predominantly terrestrial, inhabiting moist and shaded places inside the forest, such as streambanks, riverbanks and ravines. It was collected from 30 to 1,400 m above sea level.

**Flowering and fruiting period:**—The species was collected with staminate and pistillate flowers and fruits from December to April, and with only pistillate flowers and fruits from April to June.

**Taxonomic notes:**—The species resembles *Pilea hirtella* especially due to the presence of trichomes, from which it differs by the elliptic, widely elliptic, ovate, or widely ovate shape of the lamina of the leaves (*vs.* lanceolate, narrowly ovate, or narrowly elliptic) and by most teeth with convex-convex shape, and less commonly straight-convex or convex-straight shape (*vs.* straight-straight, convex straight, or straight-convex). It also can be distinguished from *P. hyalina*, which is the other species with trichomes, by the petiole with trichomes throughout its extension (*vs.* concentrated only near the junction with the lamina) and by the lamina of the leaves with trichomes in both surfaces (*vs.* only on the adaxial surface).

*R. S. Pinheiro s.n. [1834]* (ICN 066246!, IPA) has morphological characteristics intermediate to *P. pubescens* and *P. hirtella*. FURB 43557 is the only specimen without trichomes found so far, so we consider it corresponds to a variation.

The types of *P. maximilianii* differ from those of *P. pubescens* by the leaves with a straight apex (*vs.* rounded), and because they are dioecious, with only pistillate flowers and fruits, and, specifically the lectotype, by the margin predominantly serrate to crenate-serrate (*vs.* crenate to crenate-serrate). Among all specimens similar to *P. pubescens* analyzed, the lectotype of *P. maximilianii* is the only one with this serrate margin, while the acuminate apex and the absence of staminate flowers in all its types (which may be a consequence of having been collected when these flowers had already fallen) appeared in other samples. Thus, we consider the types of *P. maximilianii* have features with local variation, which are not sufficient to recognize it as a distinct species.

**Nomenclatural notes:**—In the protologue of *Pilea pubescens*, Liebmann (1851) mentioned the type as “*Urtica pubescens* hb. Schumacheri”. As only the specimen 2 in C10019780, which is preserved specifically in Schumacher’s herbarium, has this information, we consider it to be the holotype. Thus, in accordance with the Art. 9.19(a) of the ICN (Turland *et al.*, 2018), the choice of the lectotype for this name made by Monro (2001) is superseded. We also found another sample of *P. pubescens* collected by Lund in Brazil, preserved in C,

specifically in Hornemann's herbarium, which is similar enough to belong to the same gathering, so we considered it as a probable isotype. In the header of *P. pubescens*, we specified the holotype and the isotype with the specimen number and its correspondent barcode, because they are mounted in sheets with other specimens, from different collectors. De Rooij (1975) had already indicated the existence of a "type" of this name in C, so if a lectotypification was needed, his indication would have priority, as it would have been an inadvertent lectotypification, and would be corrected here with a second-step lectotypification in order to specify Schumacher's herbarium, and the choice of the lectotype by Monro (2001) would be superseded too.

The lectotypes for the synonyms of *P. pubescens* were designated following the Art. 9.11 and 9.12 of the ICN (Turland *et al.* 2018). For *P. gaudichaudiana* we designated P06874403 as the lectotype because it is the best preserved among the five syntypes found, in addition to being in accordance with the description.

For *P. grossecrenata* we designated W 0073530 as the lectotype because it is the well preserved and most complete, and because its label contains the geographic information presented in the protologue and the annotation "*Urtica radicans* Pohl", which is a *pro synonymo* mentioned in the protologue in the side of the Latin expression *non aliorum*. As this expression possibly means "no other", we interpret that it may indicate that the sample in whose label this name appears was the main collection used for the description. However, as there is no evidence to prove this, the lectotypification is recommended. In the protologue of *P. grossecrenata*, another *pro synonymo*, "*Urtica grossecrenata* Mart. Herb.", was mentioned. This name appears only on the label of the sample corresponding to the isolectotype, which was faithfully reproduced in the illustration associated with *P. grossecrenata* in its protologue.

In the protologue of *P. maximilianii*, Miquel (1853) mentioned "*Urtica iners* Nees et Mart. in Nov. Act. L.C. Nat. Cur. XI. 33., excl. syn. Sloam. Jam. I. 124. t. 83. f. 2, mihi saltem dubio". This clarification was necessary because Miquel (*l.c.*) used, to describe *P. maximilianii*, a gathering by Wied-Neuwied in Ilhéus that had been cited under *Urtica iners* in the work *Beitrag zur Flora Brasiliens* (Wied-Neuwied 1823). Possibly "mihi saltem dubio" means "my last doubt", so Miquel clarifies he had no doubts that *U. iners* corresponds to another species, which we confirmed. Moraes *et al.* (2013) indicated that the sample U 0006977 as the holotype of *P. maximilianii*, but there is no holotype, since a particular herbarium in which the original material was deposited was not mentioned in the protologue (McNeill 2014), and because there are duplicates in other herbaria (BR). Thus, we designated BR0000006588717 as the lectotype for *P. maximilianii* because it is the well preserved and most complete, and because its label is

more complete than in the other duplicates. In the exsiccate of the isoelectotype BR0000006588380, the name *Urtica caravellana* Schrank is mentioned, which was possibly the first identification attributed to this collection, incorrectly. It is also important to clarify that it is possible to find the specific epithet written as *maximiliani*, *maximilianii* and *maximiliana* in databases, while in the type materials it is written as *maximiliani* and *maximiliana*, and in publications, as *maximiliani*. According to the Art. 60.8(b) of the ICN (Turland *et al.* 2018), the correct orthography for this substantial epithet is *maximilianii*.

12. *Pilea rhizobola* Miquel (1853: 202).

Basionym: *Boehmeria radicans* Nees & Mart in Wied-Neuwied (1823: 35)  $\equiv$  *Adicea rhizobola* (Miq.) Kuntze (1891: 623), *nom. illeg. superfl.*

**Type:**—BRAZIL. [Bahia]: Ilheos [Ilhéus], Ad viam Felisberti, December 1816, *M. A. P. zu Wied-Neuwied s.n.* (Klaenze 81) (Lectotype, designated by Moraes *et al.* (2014): BR barcode BR0000006588700 online image!; isoelectotypes: BM barcode 000593502 online image!, BR barcode BR0000006589035 online image!, K barcode 000442055 online image!).

**Perennial herbs, subshrubs, or arbusts**, 50–150 cm tall, monoecious or dioecious, glabrous. Stems erect or decumbent, branched or unbranched. **Leaves** opposite distichous, symmetric or asymmetric; stipules triangular or ovate; petioles unequal at the same node by ratio 1:5–40, minor petioles sessile or up to 1 mm, major petioles 5–40.5 mm long; laminae unequal in length at the same node by ratio 1:2.6–17, minor laminae 4–49.5  $\times$  3–15.8 mm, elliptic, ovate, or widely elliptic, major laminae 39–180  $\times$  13.6–53 mm, elliptic, ovate, or lanceolate, base angle acute, base shape straight, concave, or decurrent; margin serrate or crenate-serrate, 1–3 teeth per cm and 15–25 in total in each side of the major laminae, and up to 5 teeth per cm and 5–16 in total in each side of the minor laminae, most teeth with convex-convex, straight-convex, straight-concave shape; apex angle acute, apex shape straight or acuminate, with or without drip tip; adaxial surface with punctiform, fusiform, T-, X-, and Y-shaped cystoliths; abaxial surface with punctiform, linear, fusiform, T-, X-, and Y-shaped cystoliths; primary venation basal or suprabasal acrodromous. **Staminate inflorescences** a congested or subcongested cyme, 3.85–20  $\times$  2–15.6 mm, including the peduncle 1–2.7 mm long or sessil; staminate flowers with 4 tepals, the subapical appendage ridge-like, up to 0.2 mm. **Pistillate inflorescences** a congested or subcongested cyme, 5–6  $\times$  2–5 mm, including the peduncle 0.5–2 mm long or sessil; pistillate flowers with 3 tepals, unequal in size and shape.

**Infrutescences** 5–6 × 2–8 mm, including the peduncle 0.5–2 mm long; most aquenes almost 1 mm long. (Fig. 3A)

**Selected specimens:**—BRAZIL. Bahia: Jussari, Fazenda Serra do Teimoso, Reserva Serra do Teimoso. Near top of mountain, in area near source of the Riberao da Bica, 15°05'44"S, 39°32'33"W, 750–850 m elev., *W. W. Thomas et al. 13355* (CEPEC!, NY image!); Santa Catarina: Blumenau, Área Virgem do Parque Nacional da Serra do Itajaí, -27.097017 - 49.139353, 660 m [648 m] elev., 23 November 2009, *T. J. Cadorin et al. 752* (FURB!, SP, UEC image!).

**Distribution:**—Currently known for the Brazilian Atlantic Forest Biome, occurring in the States of Bahia, Minas Gerais, Espírito Santo, , Rio de Janeiro (photographic record by Rodrigo Freitas), São Paulo, Santa Catarina, and Rio Grande do Sul, but a collection from the State of Acre, in the Amazonian Biome (*Acevedo-Rdgz. et al. 14954*), with few pistillate flowers and fruits, seems to belong to this species.

**Habitat:**—*Pilea rhizobola* is terrestrial or rupicolous, inhabiting moist and shaded places inside the forest or in its edges, such as streambanks, riverbanks, rocky outcrops, and ravines. It was collected from 200 to 1,400 m above sea level.

**Flowering and fruiting period:**—The species was collected with staminate and pistillate flowers and fruits from December to March and in June, only with staminate flowers from August to March, only with pistillate flowers and fruits from December to March, in June and August, and only with fruits in May.

**Taxonomic notes:**—The species resembles *Pilea acanthoides* and *P. astrogramma*, differing from both by the opposite distichous leaves (*vs.* opposite decussate). It differs specifically from *P. acanthoides* by the laminae unequal in length at the same node (*vs.* predominantly equal), and by the acrodromous venation (*vs.* predominantly pinnate); and from *P. astrogramma* by the laminae unequal in length at the same node by ratio 1:2.6–17 (*vs.* unequal by ratio 1:1.3–4.4), and by presenting 1–3 teeth per cm in the major laminae, up to 5 teeth per cm in the minor laminae, and most teeth with convex-convex, straight-convex, straight-concave shape (*vs.* the margin in minor and major laminae with 3–7 teeth per cm and most teeth with convex-retroflexed, convex-concave, or convex-straight shape).

Among the anisophyllous specimens with T–, X–, or Y–cystoliths, we consider as *P. rhizobola* only specimens that have opposite distichous and not opposite decussate leaves, as this feature is markedly visible in the types. However, specimens that present opposite decussate leaves, as well as other markedly differences from the types of *P. rhizobola*, such as unpronounced anisophilly, differences in the venation pattern, and larger stipules, have been

considered as belonging to this species. It was not possible to specifically study these different morphotypes, but it is recommendable in order to verify the hypothesis that some of them correspond to new species. Specimens collected in Bahia have, among other differences from specimens from other localities in the Brazilian Atlantic Forest Domain, the lamina of the leaves thicker and more wrinkled, in addition to a more accentuated difference in size between the leaves of the same node and smaller stipules.

The gatherings by *M. F. Vieira 639* (VIC image!) and *E. D. Lozano et al. 911* (MBM!, HCF) have morphological characteristics intermediate to *P. rhizobola* and *P. astrogramma*.

**Nomenclatural notes:**—*Pilea rhizobola* was published as a *nomen novum* (Art. 6.11 of the ICN) based on *Boehmeria radicans* Nees & Martius because the specific epithet *radicans* was unavailable in *Pilea*. The lectotype designated by Moraes *et al.* (2014) is what best represents the current application of the name, has the most complete labels, and was faithfully reproduced in the illustration of the name in *Flora Brasiliensis*. Based on the indication of the holotype for *P. hirtella* by Moraes *et al.* (2013, 2016), we suppose that Moraes *et al.* (2014) lectotypified *B. radicans* probably because there are two duplicates in BR, the herbarium which houses the Wied-Neuwied collection that belonged to Martius (Stafleu *et al.* 1976–2009). However, even if there were only one sample in that herbaria, the lectotypification would be necessary, since there is no holotype because a particular herbarium in which the original material was deposited was not mentioned in the protologue (McNeill 2014), and because there are duplicates in other herbaria. In Wied-Neuwied (1823), Nees & Martius mentioned only the collector and the type locality in the protologue. Moraes *et al.* (2014) considered the sample M0244461 deposited in M (also registered in the F negative 18849) was a syntype, but this information was omitted in Moraes *et al.* (2016). We do not consider it as a syntype, because it was collected by Martius, information confirmed by the M curatorship (Hans-Joaquim Esser pers. comm.) and by the content of its label, and there is no evidence in the protologue of *B. radicans* of the existence of syntypes collected by him.

13. *Pilea tenebrosa* Cabral & Gaglioti in Cabral *et al.* (2020: 823).

**Type:**—BRAZIL. Santa Catarina: Treviso, close to the Guanabara Community, “Comunidade Guanabara”, 28°27'58.3”S, 49°30'38.5”W, 337 m elev., 12 April 2017, *F. S. Cabral et al.* 82 (holotype FLOR 67967 digital image!; isotypes [to be distributed] K, NY, RB).

**Perennial herbs**, 12–28 cm tall, monoecious or dioecious, glabrous. Stems erect, branched or unbranched. **Leaves** opposite decussate, symmetric; stipules triangular; petioles equal to less

commonly unequal at the same node by ratio 1:1.8–2, 0.5–15 mm long; laminae equal to unequal by ratio 1:1.2–1.4 in length at the same node, 4–45 × 2–6 mm, lanceolate, narrowly elliptic, or elliptic; base angle acute, base shape straight or decurrent; margin crenate to crenate-serrate, 2–3 teeth per cm and 2–7 in total in each side, most tooth with concave-convex, straight-convex, or straight-retroflexed shape; apex angle acute, apex shape straight; adaxial surface with fusiform cystoliths; abaxial surface with punctiform cystoliths except over the veins; primary venation basal or suprabasal acrodromous, appearing pinnate in function of the lateral basal veins almost inconspicuous. **Pistillate inflorescences** a congested or subcongested cyme, 1–3 × 1.5–3 mm, sessile or including the peduncle 1 mm long; pistillate flowers with 3 tepals, unequal in size and shape. **Infrutescences** 1–3 × 1.7–3 mm, sessile or including the peduncle 1.5–2 mm long; most achenes almost 1 mm long. (Fig. 3B)

**Selected specimens:**—BRAZIL. Santa Catarina: Alfredo Wagner, interior do fragmento florestal, -27.811667, -49.322222, 112 m [1139 m] elev., 06 April 2018, *A. Kassner Filho et al.* 2548 (FURB!, MBM [pro parte – the specimen on the top of the sheet] image!, RB!); Treviso, Mato próximo à Comunidade Guanabara, acesso pela trilha que dá na parte de baixo da cachoeira maior (aprox. 5m altura), em paredão argiloso à esquerda dessa cachoeira, 28°27'58.3"S 49°30'38.5"W, 347 m elev, 05 January 2020, *J. F. Soares & D. C. Antoni 164* (ICN! [to be distributed]).

**Distribution:**—Endemic to the Brazilian Atlantic Forest Biome, this species was recorded in the Serra Geral, in the State of Santa Catarina.

**Habitat:**—*Pilea tenebrosa* is terrestrial, inhabiting shaded and moist places inside the forest or in its edges, such as streambanks, riverbanks, rocky outcrops and ravines. It was collected from almost 300 to 1,150 m above sea level.

**Flowering and fruiting period:**—The species was collected with pistillate flowers and fruits in January and April.

**Taxonomic and nomenclatural notes:**—*Pilea tenebrosa* differs from *P. flammula* by the lanceolate, narrowly elliptic, or elliptic shape of the lamina of the leaves (vs. ovate or elliptic), by the teeth with concave-convex, straight-convex, or straight-retroflexed shape (vs. convex-concave, straight-concave, or straight-retroflexed), and by the margin unlobed (vs. lobed or with incised teeth). Based on morphological guides other than Ellis *et al.* (2009), its leaves can be considered narrowly trullate or narrowly rhombic.

The specimen on the top of the sheet of the duplicate of *Kassner-Filho et al.* 2548 deposited in MBM is clearly *P. tenebrosa*. However, it was not possible to confirm if the specimens from the lower part, which are monoecious and smaller, with smaller leaves, and with margin

between lobed and with convex-retroflexed teeth, belong to this species, or to *P. flammula*, because they have morphological characteristics intermediate to these species. The duplicate of *L. B. Smith & R. M. Klein 7888* deposited in R, which is a paratype of *P. flammula*, seems to us, due to the shape of the lamina of the leaves and of the teeth, to be composed of small specimens of *P. tenebrosa*. The duplicate of this gathering deposited in P, as well as the specimen of *P. tenebrosa* on the duplicate of *Kassner-Filho et al. 2548* deposited in MBM have staminate inflorescences, but as they were not analyzed in person, the description of this structure is not presented here. The gathering by *D. B Falkenberg & F. A. Silva Filho 5939* (FLOR!, ICN [to be distributed]!) has morphological characteristics intermediate to *P. tenebrosa* and *P. hilariana*, as the shape of the lamina of the leaves.

14. *Pilea ulei* Killip (1934: 42).

**Type:**—BRAZIL. Santa Catarina: Lauro Müller, nos rochedos humidios do pendor da Serra do Oratório, April 1889, *E. H. G. Ule 1194* (Holotype: P barcode P06812876 online image!; isotypes: HBG barcode HBG513319 online image!, HBG barcode HBG513320 online image!, US 1540128 barcode 00090814 online image!).

**Perennial herbs**, 15–60 cm tall, monoecious or dioecious, glabrous. Stems erect, branched or unbranched. **Leaves** opposite decussate, predominantly asymmetric; stipules triangular; petioles equal to unequal at the same node by ratio 1:1.7–4, 3.3–72 mm long; laminae unequal in length at the same node by ratio 1:1.2–1.4 to less commonly equal, 17.5–118 × 5.7–48.2 mm, elliptic, narrowly ovate, lanceolate, or ovate; base angle acute, base shape straight or decurrent; margin serrate, 2–4 teeth per cm and 7–12 in total in each side, most teeth with concave-retroflexed, concave-straight, or straight-convex shape, mucronate or not; apex angle acute, apex shape straight or acuminate with drip tip or less commonly without; adaxial surface with fusiform to linear cystoliths; abaxial surface with punctiform cystoliths except over the veins; primary venation basal or suprabasal acrodromous. **Staminate inflorescences** a congested, glomeruliform cyme, 10–90 × 2.3–13.3 mm, including the peduncle 8–85 mm long; staminate flowers with 4 tepals, the subapical appendage corniculate, up to 0.2 mm long. **Pistillate inflorescences** a lax cyme, 7.6–22.3 × 4.5–36 mm, including the peduncle 5.4–10 mm long; pistillate flowers with 3 tepals, unequal in size and shape. **Infrutescences** 8.2–22.3 × 4.5–13.9 mm, including the peduncle 4.2–11.8 mm long, most aquenes 1 mm long. (Fig. 3C)

**Selected specimens:**—BRAZIL. Santa Catarina: Bom Jardim da Serra: Serra do Oratório (complexo da Serra do Rio do Rastro), Trilha do Cabo Aéreo, -28.3724 -49.55733, 1313 m



elev., 15 January 2020, *J. F. Soares et al. 134* (ICN!); Urubici, Serra do Corvo Branco, Rodovia SC-370 (antiga SC-439), bem perto da placa turística, na curva após o paredão (descendo a Serra), -28.055917 -49.366861, 1118 m elev., 19 December 2019, *J. F. Soares et al. 115* (ICN!).

**Distribution:**—Endemic to the Brazilian Atlantic Forest Biome, this species was recorded in the Serra Geral, in the States of Santa Catarina and Rio Grande do Sul.

**Habitat:**—*Pilea ulei* is rupicolous or terrestrial, inhabiting shaded and moist places inside the forest or in its edges, shaded or with little diffused or direct light, such as streambanks, riverbanks, rocky outcrops, and rock walls. It was collected from almost 300 to 1,650 m above sea level, mainly in cloud forests.

**Flowering and fruiting period:**—The species was collected with staminate and pistillate flowers and fruits from December to April, with only pistillate flowers and fruits in December, March, and April, and with only fruits in March.

**Taxonomic notes:**—The species resembles *P. hydra* and specimens of intermediate or major size of *P. hilariana*. It differs from *P. hydra* by the slightly corniculate subapical appendage 0.1–0.2 mm long on staminate flowers sepals (vs. strongly corniculate 0.4–0.5 mm long), and by the lamina of the leaves with the base angle acute (vs. obtuse) and the base shape straight or decurrent (vs. rounded or cordate); and from *P. hilariana* by the lax pistillate inflorescences (vs. congested), by the predominantly asymmetric laminae (vs. symmetric), and by the apex of the laminae with drip tip (vs. without). Based on morphological guides other than Ellis *et al.* (2009), its leaves can be considered rhombic. When *P. ulei* is fresh, it is possible to see on the adaxial surface of its leaves only the impression of the primary veins and small circular protuberances, which gives to it a smooth and flat or concave appearance. This features help to distinguish *P. ulei* from the species it resembles. The species was described based on a gathering from April that has only pistillate flowers, but most specimens sampled, including in the type locality, are monoecious.

*J. F. Soares 117* (ICN [to be distributed]!) has morphological characteristics intermediate to *P. ulei* and *P. hilariana*.

**Nomenclatural notes:**—In the protologue, Killip mentions that the “type” is in P, so we consider that the only material found in this herbarium is the holotype.

## Unresolved taxon

1. *Pilea aparadensis* Brack (1993: 1).

**Type:**—BRAZIL. Santa Catarina: Praia Grande, Faxinalzinho, no interior da porção superior do “Cânion” Faxinalzinho, 17 April 1988, *P. Brack & R. Schmidt 50* (Holotype: ICN 114968 barcode 00000589!).

**Taxonomic notes:**—*Pilea aparadensis* was described as a new species similar to *P. hydra*. The vegetative differences between these species pointed out by Brack (1993) refers to the stem thickness, the size of the leaves, the number of teeth on each side of the margin of the leaves, and the length of the petioles, presenting some overlaps. The reproductive differences pointed out by the author refers to the size of the pistillate inflorescence, the size of the staminate flowers and the presence and shape of the subapical appendage in the staminate flowers.

However, we observed in our analysis that the holotype does not present staminate flowers and present scarce pistillate flowers, and that the paratypes are infertile. Additionally, in the protologue of *P. aparadensis*, it is mentioned that the species have flowers and fruits from March to June, but the types correspond to collections carried out in April and June, and there are no other collections prior to the description identified as belonging to the species. Thus, it was not possible to confirm the flowering and fruiting period and in which material the description and the illustration of the staminate flowers were made. We also could not conclude if other material, not mentioned in the protologue, was used, or if all the staminate flowers in the holotype were lost or destroyed.

All specimens collected after the description identified as *P. aparadensis* actually correspond to *P. hilariana*. The description of the staminate inflorescences and flowers of *P. aparadensis* is compatible with what is known for these structures in *P. hilariana*, and the illustration of the staminate flower of *P. aparadensis* seems to correspond to a flower in process of anthesis (and not to a floral bud, as it is referred in the illustration’s legend, or to an open flower), stage observed with the same morphology in specimens of different sizes of *P. hilariana*. Furthermore, through the expansion of the sampling of *P. hydra*, we confirmed that the types of *P. aparadensis* present vegetative morphological characteristics very similar to those of *P. hydra* and, sometimes, overlapping them. We also did not find specimens in nature that could fit into *P. aparadensis*.

All these information make us hypothesize that *P. aparadensis* has been described based on a holotype with morphological characteristics intermediate to *P. hilariana* and *P. hydra*, possibly infrequent in nature, and on paratypes that, being infertile, can be either intermediate to *P. hilariana* and *P. hydra* or belong to *P. hydra*. The scarcity of fertile materials with the

diagnostic characteristics of the species, added to the incomplete material available, indicate the need for further analysis, which is why this name remains unresolved.

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## Figures



FIGURE 1. A. *Pilea astrogramma* Miq. (in detail, pistillate inflorescences on the left of the branch and staminate, on the right). B. *Pilea bradei* Soares (in detail, pistillate inflorescences below the staminate inflorescences). C. *Pilea hilariana* Wedd. (in detail, a infructescence). (A: general aspect photographed by Josimar Kulkamp, and detail by Isis Paglia; B: general aspect photographed by Isis Paglia, and detail by Caio Baez; C: general aspect and detail photographed by Júlia Fialho Soares).



FIGURE 2. A. *Pilea hyalina* Fenzl. (in detail, a infructescence). B. *Pilea hydra* Brack (in the upper detail, a staminate inflorescence, and in the lower detail, a pistillate inflorescence). C. *Pilea pubescens* Liebm., with a inflorescence with pistillate and staminate flowers. (A: general aspect and detail photographed by Victor Frajalla; B: general aspect photographed by Júlia Fialho Soares, and details by Priscila Porto Alegre Ferreira; C: photographed by Júlia Fialho Soares).



FIGURE 3. A. *Pilea rhizobola* Miq. (infertile specimen). B. *Pilea tenebrosa* Cabral & Gaglioti (with an inconspicuous pistillate inflorescence). C. *Pilea ulei* Killip (in the upper detail, a pistillate inflorescence, and in the lower detail, a staminate inflorescence). (A: photographed by Rodrigo Freitas; B: photographed by Júlia Fialho Soares; C: general aspect and lower detail photographed by Júlia Fialho Soares, and upper detail photographed by Willian Souza Piovesani).

## CAPÍTULO 2

### *Pilea bradei* (Urticaceae), a New Species from the Atlantic Forest Biome in Southeastern Brazil <sup>2</sup>

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#### Abstract

*Pilea bradei* is described as a new species, endemic to the Brazilian Atlantic Forest Biome, with records in Serra da Mantiqueira and Serra da Bocaina, Southeastern Brazil. Among the species of the Brazilian Atlantic Forest Biome that do not have trichomes and that present punctiform, linear, or fusiform cystoliths (and not cystoliths of other shapes), *P. bradei* is the only one that has fusiform cystoliths over the veins and other parts of the abaxial surface (vs. linear or fusiform cystoliths absent or only over the veins). The description is accompanied by an illustration, field photographs, comparisons with similar species, information about its geographical distribution, habitat, flowering and fruiting period, and history of the collections, as well as a preliminary conservation status assessment using IUCN Red List categories and criteria, with suggestions of protection efforts. We also provide an updated checklist and a key for *Pilea* species from the Atlantic Forest Biome circumscribed to Southeastern Brazil.

**Keywords:** Rosales, Taxonomy, Serra da Mantiqueira, Serra da Bocaina, Serra do Brigadeiro, Serra do Caparaó, *Pilea hilariana*, *Pilea hydra*.

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<sup>2</sup> Pré-formatado de acordo com as normas da Revista PHYTOTAXA (já submetido).

## Resumo

*Pilea bradei* é descrita como uma espécie nova, endêmica do Bioma Mata Atlântica, com registros na Serra da Mantiqueira e na Serra da Bocaina, Sudeste do Brasil. Dentre as espécies no Bioma Mata Atlântica no Brasil que não apresentam tricomas e que apresentam apenas cristólitos puntiformes, lineares ou fusiformes (e não de outros formatos), *P. bradei* é a única que apresenta cristólitos fusiformes sobre as nervuras e outras partes da superfície abaxial das folhas (vs. cristólitos lineares ou fusiformes ausentes ou apenas sobre as nervuras). A descrição é acompanhada por uma ilustração, fotografias de campo, comparações com espécies semelhantes, informações sobre sua distribuição geográfica, habitat, período de floração e frutificação e história das coletas, bem como uma avaliação preliminar do estado de conservação usando as categorias e os critérios da Lista Vermelha da IUCN, com sugestões de medidas para protegê-la. Também fornecemos um *checklist* atualizado e uma chave de identificação para as espécies de *Pilea* do Bioma Mata Atlântica circunscrito ao Sudeste do Brasil.

**Palavras-chave:** Rosales, Taxonomia, Serra da Mantiqueira, Serra da Bocaina, Serra do Brigadeiro, Serra do Caparaó, *Pilea hilariana*, *Pilea hydra*.

## Introduction

*Pilea* Lindley (1821: tab. 4) is the largest genus in Urticaceae Jussieu (1789: 400), belonging to the tribe Elatostemateae Gaudichaud-Beaupré (1830: 493). Encompassing about 715 species (Monro 2004), the genus is distributed throughout tropical, subtropical, and warm temperate regions, except in Australia and New Zealand. This morphologically diverse genus comprises herbs, shrubs and epiphytes with succulent aspect, which occur in shaded places close to waterfalls, streams, rocky outcrops, rock walls, ravines, or other moist places, mainly inside humid forests or in their edges, from 500 to 2,000 m of elevation (Friis 1993; Monro *et al.* 2012). Its members have opposite, decussate, or rarely alternate leaves, intrapetiolar stipules, staminate inflorescences not fused in a receptacle-like structure, free sepals in the pistillate flowers, and when with trichomes, by being non-stinging (Burger 1977; Friis 1993; Fu *et al.* 2020).

*Pilea* has not been monographed since the global revision carried out by Weddell (1869) after the publication of three preliminary revision (Weddell 1852, 1854, 1856-1857), hence

floristic treatments from different regions of the world (Miquel 1853; Killip 1936, 1939, 1960; Standley & Steyermark 1952; Sorarú 1972; Bassett *et al.* 1974; Burger 1977; Chen 1982; Friis 1989; Nicolson 1991; Florence 1997; Monro 2001, 2014; Chen & Monro 2003; Steinmann 2005) and the elevated number of descriptions of new species represent important taxonomic contributions, although they do not comprise the entire geographic coverage of the genus. Despite having the largest number of records for the genus in Brazil, the Atlantic Forest Biome had not been fully considered in a taxonomic study for *Pilea* until the ongoing taxonomic and nomenclatural treatment (Soares & Miotto, in prep.). Since the pioneering treatise of already described and new taxa by Miquel (1853) in *Flora Brasiliensis*, new species and infraspecific taxa (Weddell 1856–1857, 1869; Killip 1934; Schlechtendal 1856; Toledo 1946; Brack, 1987, 1993; Vianna-Filho & Alves 2010; Cabral *et al.* 2020) have been published within the Biome, as well as sparse regional floras – for the States of Pernambuco (Lima 1985), Rio Grande do Sul (Brack 1989) and São Paulo (Gaglioti & Romaniuc-Neto 2012), for the Serra do Cipó, in the State of Minas Gerais (Martins & Pirani 2010) and for the Parque Estadual das Fontes do Ipiranga, in the State of São Paulo (Romaniuc-Neto *et al.* 2009).

Here we describe *Pilea bradei* as a new species, endemic to the Brazilian Atlantic Forest Biome, whose first record is from the first half of the 20th century and which has been collected in Southeastern Brazil, mainly in the Serra da Mantiqueira, but also in the Serra da Bocaina. The description is accompanied by an illustration, field photographs, information on its geographical distribution, habitat, flowering and fruiting period, and history of the collections and identifications, as well as a preliminary conservation status assessment using IUCN Red List categories and criteria, with suggestions of protection efforts. We also provide an updated checklist and a key for *Pilea* species from the Atlantic Forest Biome circumscribed in Southeastern Brazil.

## Material and Methods

The new species was found during the ongoing floristic, taxonomic, and nomenclatural revision of *Pilea* in the Brazilian Atlantic Forest Biome (Soares & Miotto, in prep.). We examined ca. 700 exsiccates deposited in CEPEC, CESJ, CRI, EFC, FLOR, FURB, HAS, HB, HBR, ICN, MBM, MPUC, PACA, R, RB, and UPCB, and we consulted online images of ca. 300 exsiccates deposited in ALCB, BM, BR, C, CTES, ESA, HBG, HCF, HUCP, HUEFS, HUFSJ, HVASF, K, L, LP, LUSC, M, MEL, NY, OUPR, P, SP, SPF, U, UEC, UNIP, US, VIC, W, and WU (acronyms according to Thiers 2021 [continuously updated]) through the online databases



GBIF (2021), JABOT (2021), Re flora (2021), and speciesLink (CRIA 2021), or directly on the herbaria page. In order to verify similar species in the Neotropical Region, we examined images of types through the online databases already cited and through Global Plants on JSTOR (2021), as well as available taxonomic literature. Additionally, we conducted a field expedition in order to collect the new species, in February 2019, to the Parque Nacional do Itatiaia, in the State of Rio de Janeiro. The preliminary conservation status assessment was made according IUCN (2019), the Abbreviations for authors' name, when applied, agree with The International Plant Names Index - IPNI (2021 [continuously updated]), and nomenclatural implications are in accordance with the International Code of Nomenclature for algae, fungi and plants (Turland *et al.* 2018). To propose the new species, we followed the Taxonomic Concept of Species (TSC) proposed by (Rapini 2004) and adopted the morphological criterion for species delimitation, based on Aldhebiani (2018). Examination and measurements of characters were based on dried herbarium material, using a caliper, graph paper, and stereomicroscope. The description pattern and characters were chosen based on recent international publications for the genus. The descriptive terminology of the lamina of leaves (shape, base, apex, margin, teeth and selected venation characters) was based on Ellis *et al.* (2009), and of the other characters of the plant, on Beentje (2010).

### **Taxonomic treatment**

*Pilea bradei* Soares, sp. nov. TYPE:—BRAZIL. Rio de Janeiro: Itatiaia, Parque Nacional do Itatiaia, parte baixa, nas pedras ao redor do poço da Cachoeira Véu de Noiva, 22°25'35.9"S 44°37'05.0"W, 1198 m elev., 08 February 2020 (staminate fl., pistillate fl., fr.), *J. F. Soares, W. S. Piovesani & I. P. V. Chaves 149* (Holotype: ICN 203106!, isotypes [in process of distribution]: K!, MBM!, NY!, RB!).

**Diagnose:**—*Pilea bradei* has morphological similarities with *Pilea hydra* Brack and with specimens of major size of *Pilea hilariana* Wedd., differing from both mainly by the linear or fusiform cystoliths over the veins and other parts of the abaxial surface of the leaves (vs. absent or only over the veins). It differs specifically from *P. hydra* by the congested pistillate inflorescences (vs. lax), and by the subapical appendage 0.1–0.2 mm on staminate flowers sepals (vs. 0.4–0.5 mm); and from *P. hilariana* by the punctiform cystoliths over the abaxial surface, except over the veins (vs. absent), by the 10–20 major secondary veins on each side of the midvein (vs. 3–8), and by the minor secondary and tertiary veins markedly visible to the

naked eye when dried (vs. barely visible).

**Description:**—**Perennial herbs**, 11–35 cm high, terricolous or rupicolous, stoloniferous, monoecious or less commonly dioecious, glabrous. **Stems** erect, unbranched or less commonly sparsely branched, with succulent aspect, yellow-green or vinaceous when fresh, light brown, dark brown, or blackish when dried, with fusiform cystoliths 0.05–0.1(–0.2) mm, longitudinally distributed; internodes  $2\text{--}42\text{(–}57\text{)} \times (0.7\text{–})1\text{--}3.5\text{(–}4\text{)}$  mm, cylindrical when fresh and canaliculate when dried. **Leaves** decussate, petiolate. **Stipules**  $(0.9\text{–})1.5\text{--}2.5\text{(–}3\text{)} \times (0.7\text{–})1\text{--}3.5\text{(–}4\text{)}$  mm, intrapeiolar, persistent, triangular, base shape truncate to less commonly auriculate, apex shape obtuse, yellow-green when fresh, light brown when dried, with fusiform cystoliths. **Petioles** at the same node unequal by ratio 1:1.15–7.2(–8.5) to less commonly equal, smaller petioles 3.7–29 mm long and larger petioles 8–50 mm long, canaliculate when dried, with fusiform cystoliths longitudinally distributed. **Laminae** in the same node unequal in length by ratio 1:1.2–1.9 to less commonly equal, smaller leaves  $15.3\text{--}77.6 \times 6.6\text{--}36.5$  mm and larger leaves  $23.3\text{--}107.3\text{(–}115.3\text{)} \times 9.2\text{--}50.6$  mm, elliptic, ovate, or less commonly oblong, narrowly elliptic or narrowly ovate, symmetric, papyraceous or membranaceous; base angle acute or obtuse, base shape convex, cuneate, or less commonly rounded or concave; margin unlobed, crenate to crenate-serrate, the basal  $(1/7\text{–})1/5\text{--}1/3$  entire; teeth 2–3(–4) per cm and total of 5–22 in each side of the margin, tooth shape convex-convex, straight-convex, or convex-straight, mucronate or not; apex angle acute, apex shape straight or acuminate; adaxial surface with slight convexities between the slight impression of the secondary veins when fresh, dark yellow-green or yellow-green when fresh, dark olive or dark brown when dried, with fusiform cystoliths 0.05–0.2(–0.3) mm randomly and densely distributed over the entire surface or less commonly in parts of it, never in the veins; abaxial surface dull yellow-green or vinaceous when fresh, light olive or light brown when dried, with punctiform cystoliths sparsely and randomly distributed except over the veins (predominantly inconspicuous), fusiform cystoliths 0.05–0.1(–0.2) mm randomly distributed, densely and over the entire surface or less commonly sparsely and close to the veins and fusiform cystoliths 0.05–0.2(–0.3) mm over primary veins, and; primary venation acrodromous with 3 basal veins, lateral primary veins visible  $4/5$  of the lamina, 10–20 major secondary veins on each side of the midvein, at an angle of  $50^\circ\text{--}70^\circ$  with the midvein, paired or unpaired, minor secondary and tertiary veins markedly visible to the unaided eye when dried. **Inflorescences** (2–)4–13 per stem, 1–2 per axil, pedunculate. **Staminate inflorescences** 1–5 per stem, 1(–2) per axil,  $(3.8\text{–})7\text{--}54.6\text{(–}68.8\text{)} \times 2.7\text{--}10.5$  mm, bearing (3–)8–50 flowers in a congested and glomeruliform cyme, including the peduncle  $5\text{--}47.7\text{(–}63.1\text{)}$  mm long; bracts  $0.8\text{--}1.5 \times 0.5\text{--}0.7$ , triangular, with linear or fusiform cystoliths;

bracteoles  $0.3\text{--}0.5 \times 0.2\text{--}0.3$ , triangular, with linear cystoliths. **Staminate flowers** yellow-green to white when fresh, basal portion cream and apical portion brown when dried,  $(1.1\text{--})1.5\text{--}2.2 \times (1\text{--})1.3\text{--}1.5(-2)$  mm immediately prior to anthesis and  $1.9\text{--}2.5(-2.8) \times (1.4\text{--})1.8\text{--}3(-3.6)$  mm after anthesis, pedicels  $0.4\text{--}1.5$  mm to less commonly sessil; sepals  $(1.6\text{--})1.9\text{--}2.3 \times 0.7\text{--}1.2$  mm, ovate, with linear cystoliths at apical portion and with the subapical appendage  $0.1\text{--}0.2$  mm long, corniculate; stamens 4. **Pistillate inflorescences** 2–9 per stem, 1–2 per axil,  $1.5\text{--}14(-34) \times 1.5\text{--}11.5$  mm, bearing 8–60 flowers in a congested cyme, including the peduncle  $1\text{--}14(-26)$  mm; bracts  $0.6\text{--}1.7 \times 0.6\text{--}0.9$ , triangular, with linear or fusiform cystoliths; bracteoles  $0.4\text{--}1 \times 0.3\text{--}0.5$ , triangular, with linear cystoliths. **Pistillate flowers** yellow-green when fresh, dark brown when dried,  $0.5\text{--}1 \times 0.3\text{--}0.5\text{--}0.9$  mm; pedicels  $0.2\text{--}0.3$  mm to sessile; sepals 3, unequal, with linear cystoliths; dorsal sepal  $0.5\text{--}1 \times 0.2\text{--}0.4$  mm, elliptic and distally swollen, the subapical appendage  $0.05\text{--}0.1$  mm; lateral sepals  $0.5\text{--}0.9 \times 0.2\text{--}0.3$  mm, ovate to triangular; stigma sessile, penicilate. **Infrutescences**  $(3.6\text{--})7\text{--}38.2(-54) \times 3\text{--}20.8$  mm, congested or slightly lax; peduncle  $3\text{--}40$  mm. **Achenes** 9–60 per infrutescence,  $0.6\text{--}1.4 \times 0.5\text{--}0.9$  mm, assymmetric, ovoid, compressed, with smoothy surface, dull light brown to dark brown when fresh and dried, sepals persistent. Figure 1.

**Paratypes:**—BRAZIL. Minas Gerais: Bom Jardim de Minas [Santa Rita de Jacutinga], BR - 494; estrada secundária junto à primeira ponte sobre o ribeirão Jacutinga, [-22.042778, -44.156000], 1190 m elev. [1093 m elev.], 02 October 2011 [stam. & pist. fl, fr.], *M. E. G. Sobral 14256* (HUFSJ digital image!, OUPR digital image!, RB!); Espera Feliz, Parque Nacional do Caparaó, Portal de Macieira, January 1998 [stam. & pist. fl, fr.], *L. S. Leoni 3852* (ICN!, RB 731142!, RB 747604!); Serra da Araponga, PESB. Trilha da Mina - próxima ao abrigo de campo, 1300 m elev., 13 March 1994 [stam. & pist. fl, fr.], *L. S. Leoni 2481* (HB!, RB [on two sheets]!). Rio de Janeiro: Itatiaia, 3 Picos (I cascata), September 1933 [stam. & pist. fl, fr.], *A. C. Brade 12699* (IPA, RB [on two sheets]!); Itatiaia, Maromba, picada nova, 1200 m elev., 23 March 1942 [fr.], *A. C. Brade 17299* (RB!); Itatiaia, Parque Nacional do Itatiaia. Rio na trilha para os Três Picos, [-22.423056, -44.591389], 1581 m elev. [1593 m elev.] 16 December 2019 [stam. & pist. fl, fr.], *C. Baez & P. Hungria 1872* (ICN!, RB!, SPF!); Itatiaia, Maromba, 1000 m elev., 22-28 November 1938 [stam. & pist. fl, fr.], *F. Markgraf & A. C. Brade 3736* (IPA, RB!); Itatiaia, Parque Nac. do Itatiaia, on rock by path to fall Veú da Noiva, 15 April 1967 [stam. fl, fr.], *J. C. Lindeman & J. H. Haas 5130* (MBM, NY image!, RB!, U image!); Itatiaia, Parque Nacional do Itatiaia, parte baixa, trilha dos Três Picos, perto de e sobre uma pequena ponte em uma pequena cachoeira, [-22.431217, -44.607267], 1225 m elev., 09 February 2020 [stam. & pist. fl, fr.], *J. F. Soares, W. S. Piovesani & I. P. V. Chaves 152* (ICN!); Itatiaia, Parque

Nacional do Itatiaia, parte baixa, trilha dos Três Picos, [-22.424117, -44.591983], 1553 m elev., 09 February 2020 [stam. & pist. fl, fr.], *J. F. Soares, W. S. Piovesani & I. P. V. Chaves 154* (ICN!); Itatiaia, Parque Nacional do Itatiaia, 21 April 1972 [pist. fl, fr.], *U. C. Câmara 11689* (CESJ!). São Paulo: Bananal, Sertão do Rio Vermelho, Bocaina, 20 May 1936 [pist. fl, fr.], *A. C. Brade 15314* (RB!); Piquete, Trilha para o Pico dos Marins, [-22.50907418, -45.14717858], 1581 m elev., 09 December 2019 [stam. fl.], *G. P. Coelho, J. Külkamp, F. Gonzatti & B. Botura 356* (ICN!).

**Distribution and habitat:**—Endemic to the Brazilian Atlantic Forest Biome, *P. bradei* is currently known from the States of Minas Gerais, Rio de Janeiro, and São Paulo, in Southeastern Brazil (Figure 2). It was recorded mainly in the Serra da Mantiqueira, but also in the Serra da Bocaina (closer to the Serra da Mantiqueira than to the ocean), between 1,100 and 1,600 m above sea level. The species is terrestrial or rupicolous, inhabiting moist places inside the forest, shaded or with little diffused or direct light, such as streambanks, riverbanks, rock walls, rocky outcrops, ravines, and close to waterfalls, some of which even susceptible to periodic flooding.

**Flowering and fruiting period:**—The species has been collected with staminate and pistillate flowers, and fruits in the same plant from September to March. It has also been collected only with staminate flowers in December, only with staminate flowers and fruits in February, only with pistillate flowers and fruits from March to May, and only with fruits in March.

**Etymology:**—The specific epithet honors Alexander Curt Brade (1881-1971), an important botanist who contributed to the knowledge of many phanerogams groups and carried out the first collection of this new species, in September 1933, in the Parque Nacional do Itatiaia, State of Rio de Janeiro.

**Preliminary analysis of the Threat Category and suggestion of protection efforts:**—We recommend the new species to be Endangered (EN) according to IUCN (2019) categories and criteria B2biii,iv+ciii. Its Area of Occupation (AOO) is 36 km<sup>2</sup> and the Extent of Occurrence (EEO) is ca. 18,492 km<sup>2</sup>. Most records of *P. bradei* are within Conservation Units (Parque Nacional do Itatiaia, Parque Estadual da Serra do Brigadeiro, and Parque Nacional do Caparaó), which is favorable and recommended to safeguard the species. Nonetheless, even inside these protect areas, the species occurs in places under anthropogenic pressure due to practices of tourism. One of the largest subpopulations sampled by the first author in 2020 (figure 3.B) on the Três Picos trail, within the Parque Nacional do Itatiaia, was recently suppressed (figure 3.D) in order to open the trail and make it cleaner. The subpopulation

inhabited rocks around a small waterfall and the stone bridge used to cross it, but it was not obstructing the passage of people. Given this scenario and based on the studies about conservation of threatened plant species by Martins *et al.* (2014), De Lírío *et al.* (2018), and especially by Paglia *et al.* (in press), we recommend the development of a conservation plan for *P. bradei* that includes: the training of Conservation Units management and maintenance teams about places where vegetation cannot be removed due to the existence of this and other threatened species; the restriction of the access of Conservation Units visitors to where the species inhabits; the instruction of visitors, through signs on the trails and other educational approaches (lectures, posts on social networks, etc.) regarding the existence of this and other threatened species in Conservation Units and the importance of minimizing impacts during the trails; and the conduction of field expeditions in search of new records.

**Taxonomic remarks:**—*P. bradei* remained undescribed for almost 90 years, probably due to the scarcity of taxonomic studies on *Pilea* covering its geographic distribution and to the characteristic difficulty in diagnosing the species of the genus. The species had been identified in most exsiccates till the rank of family or genus, but also with names corresponding to other species that occur in the Brazilian Atlantic Forest Biome – *Pilea grossecrenata* Miquel (1853: 199), a synonym of *Pilea pubescens* Liebmann (1851: 302), *Pilea rhizobola* Miquel (1853: 2002), and *Pilea ulei* Killip (1934: 42) –, or that are endemic to other South American countries – *Pilea apiculata* Killip (1936: 390) and *Pilea minutiflora* Krauze (1906: 529) –, all of them very different among themselves and from *P. bradei*. Despite having been historically determined to belong to these species, *P. bradei* is vegetatively more similar to specimens of intermediate size of *Pilea hydra* Brack (1987: 3), because, when fresh, the abaxial surface of the leaves has slight convexities between the slight impression of the secondary veins; and to specimens of major size of *Pilea hilariana* Weddell (1856–1857: 210), because of the general aspect of the plant and the shape of the leaves. Concerning the reproductive structures, *P. bradei* has compact inflorescences similar to those of *P. hilariana*. The morphological differences in relation to these two species are detailed in Table 1. However, we emphasize that, among the species in the Brazilian Atlantic Forest Biome without trichomes and which present only punctiform, linear, or fusiform cystoliths (and not T-, X-, or Y-shaped cystoliths), *P. bradei* is the only one that has fusiform cystoliths over the veins and other parts of the abaxial surface of the leaves (vs. fusiform or linear cystoliths absent or only over the veins), characteristic that can be examined only when the specimen is dried.

**Notes on the history of collections and identifications:**—The first collection of *P. bradei* known to date (*A. C. Brade 12699*) was made in 1933 by the German botanist (naturalized

Brazilian) Alexander Curt Brade. The information on the label indicates it was carried out in the first waterfall of the trail to Três Picos, municipality of Itatiaia, State of Rio de Janeiro, in September 1933. This location is within the Parque Nacional do Itatiaia, the first Brazilian national park, founded in June 1937, in which all collections of the species for the State of Rio de Janeiro were carried out, most of them by Brade, but also by other botanists. The last collections of *P. bradei* carried out in this Park before 2019 date from the 1970's. However, the species was found, in 1994, in the Parque Estadual da Serra do Brigadeiro, municipality of Araponga, in 1998, in the Parque Nacional do Caparaó, in 2011, in the municipality of Santa Rita de Jacutinga (in the label, Bom Jardim de Minas), all in the State of Minas Gerais, and in 2019, in the municipality of Piquete, State of São Paulo, locations that, as well as the Parque Nacional do Itatiaia, are within the Serra da Mantiqueira. In 1936, three years after the first collection of the species, Brade registered it in Serra da Bocaina, State of São Paulo, and in 1959, new collections were made in the same Serra by other botanists. The only taxonomic treatment of Urticaceae within Southeastern Brazil was carried out by Gaglioti & Romaniuc-Neto (2012) for the State of São Paulo, in which the few specimens collected in that State were not included in any taxon. As the first collection of *P. bradei* has few inflorescences and infrutescences, with most of the flowers immature, the holotype and isotypes were chosen from the collection carried out by the first author in the Parque Nacional do Itatiaia, but at another location, the Vêu de Noiva waterfall.

### **Checklist of *Pilea* in the Atlantic Forest Biome circumscribed in Southeastern Brazil**

Among the 14 native species of *Pilea* currently recognized for the Brazilian Atlantic Forest Biome (Soares & Mioto, in prep.), eight occur in the Southeastern Region (Table 2). They are rupicolous or terrestrial, inhabiting moist places, shaded or with predominance of indirect light, usually inside the forest, such as near waterfalls and streams. *P. microphylla* (Linnaeus 1759: 1308) Liebmann (1851: 296), *P. pubescens*, and *Pilea hyalina* Fenzl (1849: 256) are widely distributed in the Neotropical Region, occurring up to approximately 2,000 m of elevation. In the Brazilian Atlantic Forest Biome, *P. hyalina* is more common in coastal forests, and *P. microphylla* even occurs in environments with anthropogenic interferences, such as in sidewalks and walls. *Pilea rhizobola* is currently known for the Atlantic Forest Biome, occurring from the State of Bahia (BA) to the State of Santa Catarina (SC), but the collection by *P. Acevedo-Rdgz 14954*, from the State of Acre (AC), in the Amazonian Biome (RB!), which has few pistillate flowers and fruits, seems to belong to this species. In the Southeastern Region,

this species has been recorded up to approximately 1,300 m above the sea level. *Pilea astrogramma* Miquel (1853: 201) and *P. bradei* occur only in the Southeastern region. The first one has been recorded from 700 m to 1,600 m above sea level, and the second, from 1,100 to 1,600 m, both in Serra da Mantiqueira and its surroundings and in localities of the Serra da Bocaina closer to the Serra da Mantiqueira than to the ocean. *Pilea carautae* M.D.M.Vianna & R.J.V.Alves (2010: 469) is also restricted to the Southeastern Region, occurring in places with open vegetation and soils with high salinity, close to sea level, in municipalities from the Cabo Frio Region. *Pilea hilariana*, otherwise, is more common in the States of Southern Brazil, with the few records in the Southeastern Region all in the Serra do Mar and its surroundings, 900 m above sea level or more.

### **Key to the species of *Pilea* in the Atlantic Forest Biome circumscribed in Southeastern Brazil**

1. Plants with trichomes ..... 2
1. Plants without trichomes ..... 3
2. Lamina of the leaves with serrate margin, only the adaxial surface with trichomes; petioles with trichomes concentrated near the junction with the lamina ..... *P. hyalina* Fenzl
2. Lamina of the leaves with crenate margin, the abaxial and the adaxial surface with trichomes; petioles with trichomes distributed throughout its extension .....  
..... *P. pubescens* (L.) Liebm.
3. Lamina of the leaves with entire margin ..... 4
3. Lamina of the leaves with crenate, crenate-serrate, or serrate margin ..... 5
4. Lamina of the leaves unequal by ratio 1:2.6–4, minor lamina 0.1–5 × 0.1–3 mm and major laminae 0.3–10 × 0.2–5 mm; nodes with predominantly more than one pair of leaves; staminate inflorescences sessile or with the peduncle up to 6 mm long .....  
..... *P. microphylla* (L.) Liebm.
4. Lamina of the leaves equal to unequal at the same node by ratio 1:1.2–2, 3–17 × 2.2–9.7 mm; nodes with predominantly one pair of leaves; staminate inflorescences with the peduncle 4–10 mm long ..... *P. carautae* M.D.M.Vianna & R.J.V.Alves
5. Lamina of the leaves with T-, X-, or Y-shaped cystoliths ..... 6
5. Lamina of the leaves Lamina of the leaves without T-, X-, Y-, or Z-shaped cystoliths (or with only punctiform, fusiform, or linear cystoliths) ..... 7

6. Leaves decussate; laminae in the same node unequal in length by ratio 1:1.3–4.4; margin with 3–7 teeth per cm, most teeth with convex-retroflexed, convex-concave, or convex-straight shape ..... *P. astrogramma* Miq.
6. Leaves opposite; laminae in the same node unequal in length by ratio 1:5–12; margin with 1–3 teeth per cm, most teeth with convex-convex, straight-convex, straight-concave shape .....  
..... *P. rhizobola* Miq.
7. Abaxial surface of the laminae without linear to fusiform cystoliths or with only over the primary veins, and with minor secondary and tertiary veins barely visible to the naked eye when dried; 3–8 major secondary veins in each side of the midvein ..... *P. hilariana* Wedd.
7. Abaxial surface of the laminae with fusiform cystoliths over the veins and other parts of the surface, and with minor secondary and tertiary veins markedly visible to the naked eye when dried; 10–20 major secondary veins in each side of the midvein ..... *P. bradei* Soares

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## Figure and tables

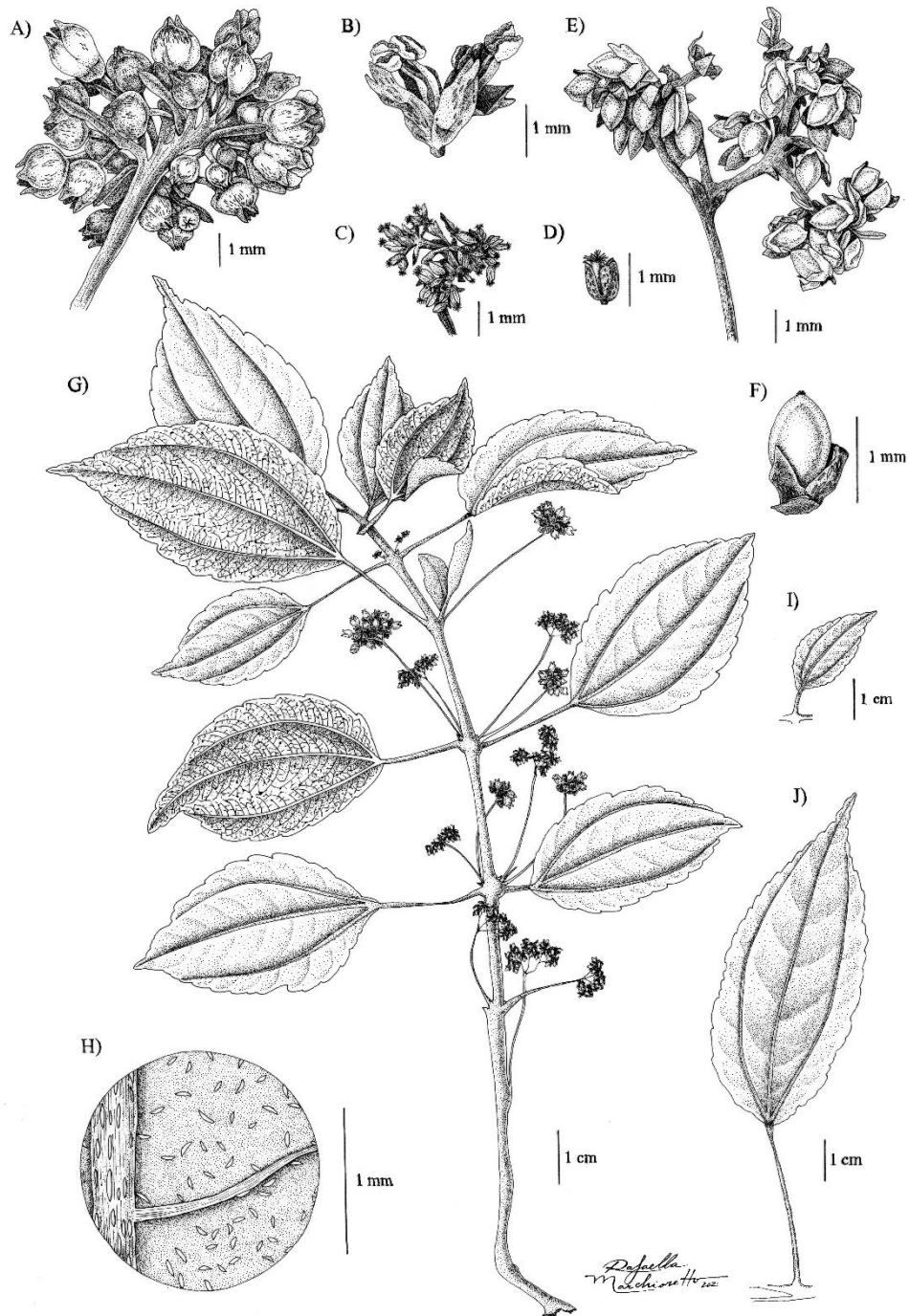


FIGURE 1. Line drawings of *Pilea bradei* Soares. A. Staminate inflorescence with flowers prior to and on anthesis. B. Staminate flower after anthesis. C. Pistillate inflorescence. D. Pistillate flower. E. Infructescence. F. Fruit included in the perigonium. G. Habit and detail of the venation pattern in the abaxial surface of the leaves. H. Detail of the fusiform cystoliths in the abaxial surface of the leaves. I–J. Leaves with extreme size. Drawn by Rafaella Migliavacca Marchioretto: A–B, E–H from the holotype (J. F. Soares *et al.* 149, ICN), C–D, J from *M. Sobral* 14256 (RB), and I from *A. C. Brade* 17299 (RB).

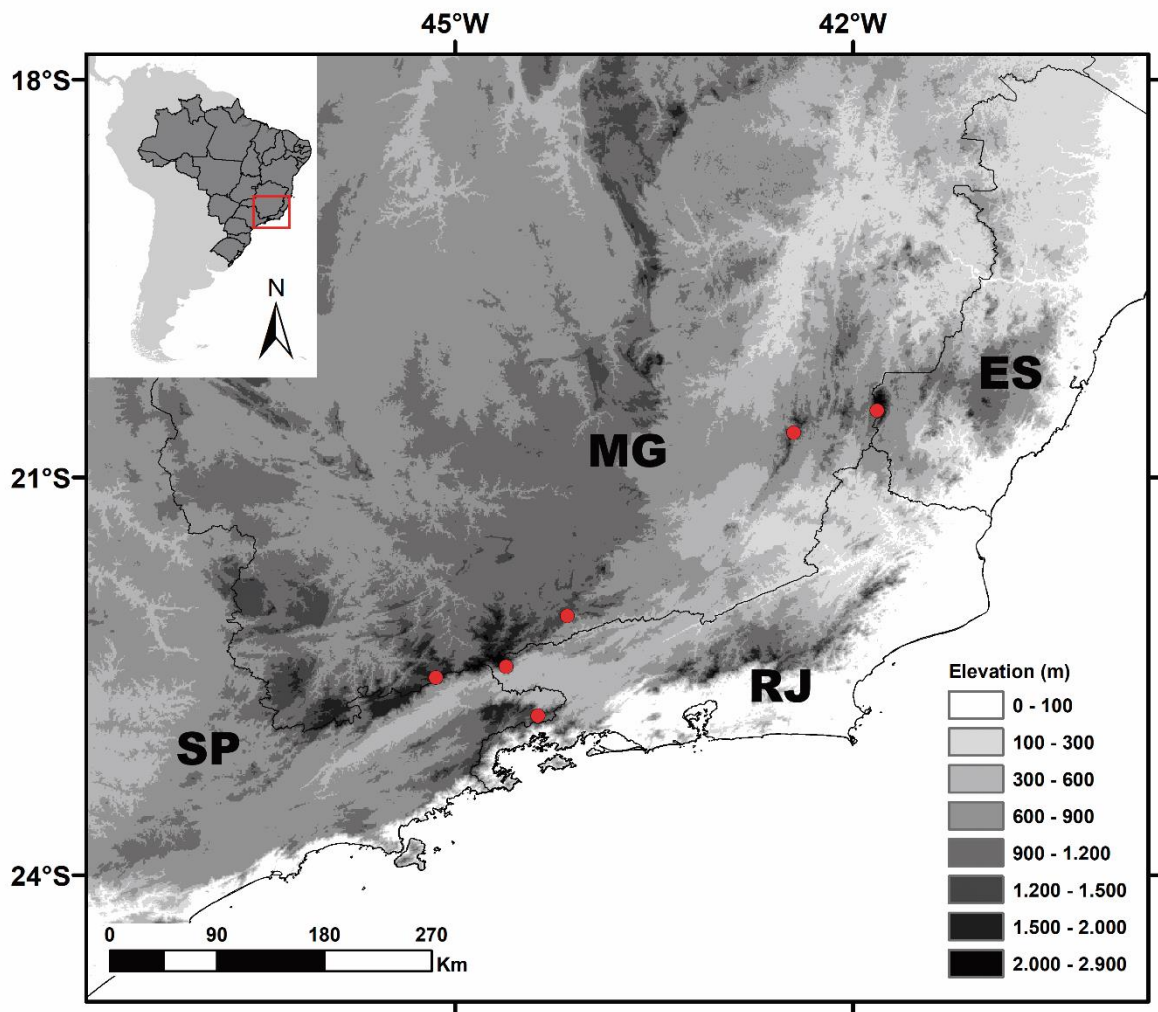


FIGURE 2. Distribution map of *Pilea bradei*, showing the known localities (red points) where the species occurs in Southeastern Brazil. Abbreviations for Brazilian States: ES = Espírito Santo; MG = Minas Gerais; RJ = Rio de Janeiro; SP = São Paulo.



FIGURE 3. *Pilea bradei* in the nature. A. Laminae of some leaves representing part of the morphological variety in shape and color of this structure and showing the venation pattern on its abaxial surface. B. Subpopulation of the species over a stone bridge in the Três Picos Trail, in the Parque Nacional do Itatiaia, State of Rio de Janeiro, in February 2019. C. Specimen with vinaceous leaves and stems, probably because it is occurring on a rock wall with incidence of direct light during part of the day. D. Stone bridge in which the subpopulation registered in the image B inhabited (arrow points the exact location), after the suppression carried out in 2020. (A: photographed by Guilherme Peres Coelho and Isis Paglia; B, C and D: photographed by Isis Paglia).



TABLE 1. Comparative diagnostic characteristics of *Pilea bradei*, *P. hilariana*, and *P. hydra*. Abbreviations for Brazilian States: MG = Minas Gerais; PR = Paraná; RJ = Rio de Janeiro; RS = Rio Grande do Sul; SC = Santa Catarina; SP = São Paulo.

	<i>P. bradei</i>	<i>P. hilariana</i>	<i>P. hydra</i>
Stems	Erect or decumbent, unbranched to less commonly sparsely branched.	Decumbent or erect, branched.	Decumbent or erect, unbranched to less commonly sparsely branched.
Lamina shape and size	Elliptic, ovate, oblong, narrowly ovate, or narrowly elliptic, 15.3–115.3 × 6.6–50.6 mm.	Ovate, widely ovate, elliptic, 6–40 × 5.5–25 mm.	Ovate, elliptic, 35.2–200 × 21.8–91.2 mm.
Cystoliths in the lamina's abaxial surface	Punctiform cystoliths sparsely and randomly distributed except over the veins; fusiform cystoliths 0.05–0.3 mm over primary veins; and fusiform cystoliths 0.05–0.2 mm densely and over the entire surface or less commonly sparsely and close to the veins.	Absent or less commonly fusiform to linear cystoliths 0.1–0.3 mm only over primary veins.	Punctiform cystoliths sparsely and randomly distributed except over the veins; and less commonly fusiform to linear cystoliths 0.1–0.2 mm only over primary veins.
Major secondary veins	10–20 on each side of the midvein.	3–8 on each side of the midvein.	7–10 on each side of the midvein.
Minor secondary and tertiary veins visibility	Markedly visible when dried.	Barely visible when dried.	Markedly visible when dried.
Teeth per cm	2–4.	1–3.	1–3.
Teeth in each side of the margin	5–22.	3–13.	8–22.
Main tooth shape	Convex-convex, straight-convex, or convex-straight.	Concave-convex, straight-convex, or concave-straight.	Concave-convex, straight-convex, or concave-straight.
Pistillate inflorescence arrangement	Congested cyme.	Congested cyme.	Lax cyme.
Pistillate inflorescence size	1.5–14(–34) × 1.5–11.5 mm.	2–14 × 2–4 mm.	8.3–53 × 4.6–98 mm.

(including the peduncle)			
Subapical appendage on staminate flowers	Slightly corniculate, 0.1–0.2 mm long.	Slightly corniculate, 0.1–0.2 mm long	Strongly corniculate, 0.4–0.5 mm long.
sepals			
Geographic distribution	MG, RJ, and SP.	PR, RS, SC, and SP.	RS and SC.
Vouchers	Holotype, isotypes, and paratypes.	<i>A. A. B. Rubens</i> 28 (RB!); <i>A. C. Brade</i> 6945 (Holotype synonym <i>P. loefgrenii</i> var. <i>bradeana</i> - SP image!)	<i>D. B. Falkenberg</i> 9751 (FLOR!, ICN!); <i>J. F. Soares et al.</i> 143 (ICN!).

TABLE 2. Updated checklist of *Pilea* in the Atlantic Forest Biome circumscribed to Southeastern Brazil. <sup>1</sup> = Endemic to the Brazilian Atlantic Forest Biome; <sup>2</sup> = Endemic to Southeastern Brazil. Abbreviations for Brazilian States: ES = Espírito Santo; MG = Minas Gerais; RJ = Rio de Janeiro; SP = São Paulo.

Species	Geographic Distribution	Vouchers
<i>P. astrogramma</i> Miq. <sup>1,2</sup>	MG, RJ, and SP.	<i>J. F. Soares et al.</i> 153 (ICN!)
<i>P. bradei</i> Soares <sup>1,2</sup>	MG, RJ, and SP.	Holotype, isotypes, and paratypes.
<i>P. carautae</i> M.D.M. Vianna & R.J.V Alves <sup>1,2</sup>	RJ.	<i>M. B. Casari</i> 712 (ICN!).
<i>P. hilariana</i> Wedd. <sup>1</sup>	SP.	<i>A. A. B. Rubens</i> 28 (RB!).
<i>P. hyalina</i> Fenzl	ES, MG, RJ, and SP.	<i>A. A. M. de Barros</i> 3764 (RB!, RFFP)
<i>P. microphylla</i> (L.) Liebm.	ES, MG, RJ, and SP.	<i>Brade et al.</i> 18199 (RB!).
<i>P. pubescens</i> Liebm.	ES, MG, RJ, and SP.	<i>J. F. Soares et al.</i> 145 (ICN!)
<i>P. rhizobola</i> Miq.	ES, MG, RJ, and SP.	<i>C. N. Fraga et al.</i> 2253 (CEPEC!, MBML, RB!, UPCB)

## CAPÍTULO 3

### Typification of the Linnaean names *Parietaria microphylla* and *Urtica grandifolia* based on Sloane's illustrations<sup>3</sup>

#### Typification of Linnaean names in Urticaceae

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#### Abstract

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<sup>3</sup> Formatado de acordo com as normas da Revista TAXON (já submetido).

*Parietaria microphylla* L. and *Urtica grandifolia* L. were published by Linnaeus (1759) based on illustrations present in Sloane (1707), but not in Sloane's and Browne's specimens. For both names, the current lectotypifications do not consider this context and are therefore incorrect. For each of these names we designate as lectotype the original material cited in the protologue, and an epitype.

**Keywords** Epitype; Lectotype; Linnaeus; Systema Naturae; Urticaceae.

## INTRODUCTION

Hans Sloane (1660-1753) was born in Northern Ireland and went out to Jamaica towards the end of 1687 as a physician to the Governor, the Duke of Albemarle, making use of as much time as possible to gather specimens and make observations of nature. His specimens were organized in the *Catalogus Plantarum quae in Insula Jamaica*, etc. (Sloane, 1696), which is considered the starting point for botanical studies in Jamaica, and, later, supported the writing of *A voyage to the islands Madera, Barbados, Nieves, S. Christophers and Jamaica: with the natural history*, etc. by Sloane (1707). This collection gave rise to the Herbarium of the British Museum (BM [Sloane Herb.]), where it remains deposited. Patrick Browne (1720-1790) was born in Ireland and, in addition to being a physician, was also a naturalist who contributed to the knowledge of the natural history and flora of Jamaica. The specimens he collected there supported the writing of *The civil and natural history of Jamaica* (Browne, 1756) and were sold to Linnaeus in 1758 (Savage, 1945), remaining deposited in his Herbarium (LINN).

Linnaeus (1759) published *Parietaria microphylla* L. (basionym of *Pilea microphylla* (L.) Liebmann) and *Urtica grandifolia* L. (basionym of *Pilea grandifolia* (L.) Blume) in his *Systema Naturae*, ed. 10, based exclusively on illustration and their respective phrase names and diagnosis in Sloane (1707). According to Jarvis (2007), Linnaeus (1759) did not consult Sloane's specimens to publish the binomials in *Systema Naturae*, ed. 10. Likewise, there is no evidence in the protologues that Linnaeus consulted for the publication of these names Browne's specimens that were already in the LINN herbarium. For both *P. microphylla* and *U. grandifolia*, the current lectotypifications do not consider this context and are therefore incorrect. For each of these names, we designate as lectotype the only material for which we found evidence of being original, and an epitype, presenting the arguments that support our decision.

## MATERIAL AND METHODS

We consulted the protologues of *Parietaria microphylla* and *Urtica grandifolia* (Linnaeus, 1759a), as well as *A Voyage to the Islands Madera, Barbados, Nieves, S. Christophers and Jamaica*, etc. (Sloane, 1707), which contains the illustration interpreted as an original material indicated by Linnaeus in the protologue of these names. We also consulted *The civil and natural history of Jamaica* (Browne, 1756) to interpret current lectotypes, and studies published after the protologues, in which the names *P. microphylla* and *U. grandifolia* are treated. For the designation of the types we consulted the online herbarium collection of the BM (Sloane Herbarium) and LINN (acronyms according to Thiers, 2021 [continuously updated]), and followed the rules and recommendations of the current edition of the International Code of Nomenclature for algae, fungi, and plants, ICN hereafter (Turland & al., 2018).

## TYPIIFICATION OF THE NAMES

*Parietaria microphylla* L., Syst. Nat., ed. 10, 2: 1308. May-Jun 1759. ≡ *Urtica microphylla* (L.) Sw., Kongl. Vetensk. Acad. Nya Handl., ser. 2, t. 8: 66. 1787. ≡ *Pilea microphylla* (L.) Liebm., Kongel. Danske Vidensk. Selsk. Naturvidensk. Math. Afh., ser. 5, 2: 296. 1851. – **Lectotype (designated here)**: H. Sloane, Voy. Jamaica 1: tab. 93, fig. 2. 1707. – **Epitype (designated here)**: Jamaica. *H. Sloane s.n.* (BM barcode BM000588988 [image!]).

In the protologue of the name *P. microphylla*, Linnaeus (1759: 1308) makes a brief diagnosis (*Parietaria microphylla. fol. oppositis integerrimis obovatis minoribusque mixtis ovatis*) and mentions the illustration (*Sloan. Jam. t. 93, f. 2*) by Sloane (1707) (Fig. 1). This illustration is associated by Sloane (1707:124) with the generic name *Herniaria* followed by the phrase name “*lucida aquatica*” and its description. In addition to Sloane's study predates the starting point for the group's nomenclatural studies (Art. 13.1 and 32.1 of the ICN), a phrase name is not a validly published species name (Art. 23.6 of the ICN), and must be transformed into a binomial, as Linnaeus does when publishes the name *Parietaria microphylla*. Later, Swartz (1787: 66) transferred *P. microphylla* to *Urtica*, and Liebmann (1851: 296) transferred it to *Pilea*.

In *Flora of Suriname*, De Rooij (1975) treated the name *Pilea microphylla* and indicated LINN-1220.8 (LINN) as type, a practice that, according to Prado & al. (2015), is an inadvertent lectotypification. As reported by Monro (2014), it is a *P. Browne s.n.* specimen, collected probably in Jamaica. As this specimen contains the annotation "Urtica Br. 4", it may refer to the *Urtica*'s name 4 from page 336 of Browne (1756), in which is included "*Herniaria lucida aquatica*". However, we do not consider *P. Browne s.n.* as a lectotype because Linnaeus does not mention it in the protologue of *P. microphylla* and there is no evidence that Linnaeus analyzed this material. Page 336 of Browne (1756) is cited under *P. microphylla* only later, in his *Flora Jamaicensis* (Linnaeus 1759a: 22), and, with the phrase name and the illustration by Sloane (1707), in his *Species Plantarum* ed. 2 (Linnaeus, 1763: 1492). Furthermore, Linnaeus does not even cite Sloane's specimen (BM) (Fig. 2), which was faithfully reproduced in the illustration he uses to publish the name.

Given the facts and in accordance with Art. 9.1 (Note 1), 9.3, 9.4, 9.19, Rec. 9A.1 and 9A.2 of the ICN, the illustration by Sloane (1707) (Fig. 1) is the only material for which we found evidence of being original, thus we indicate it as the lectotype of *P. microphylla*. Following Art. 9.9 and Rec. 9B.2 of the ICN, we also indicate the specimen *H. Sloane s.n.* (BM) (Fig. 2) as the epitype of *P. microphylla* to demonstrate it is faithfully reproduced in the illustration, and to complement the lectotype, as the reproductive structures which correspond to the traditional and current application of the name *Pilea* are not well represented in the illustration.

*Urtica grandifolia* L., Syst. Nat., ed. 10, 2: 1266. May-Jun 1759. ≡ *Pilea grandifolia* (L.) Blume, Musée Botanique de M. Benjamin Delessert, 2(1–8): 52. 1856. – **Lectotype (designated here)**: H. Sloane, Voy. Jamaica 1: tab. 83, fig. 2. 1707. – **Epitype (designated here)**: Jamaica. *H. Sloane s.n.* (BM barcode BM000588908 [image!]).

In the protologue of *U. grandifolia*, Linnaeus (1759: 1266) makes a brief diagnosis (*Urtica grandifolia, fol. oppositis ovatis, stipulis cordatis, indivisis, racemis paniculatis logitudine foliorum*) and mentions the illustration (*Sloan. Jam. t. 83, f. 2*) by Sloane (1707) (Fig. 3). This illustration is associated by Sloane (1707:124) with the generic name *Urtica* followed by the phrase name "*iners racemosa sylvatica, folio nervoso*" and its description. In addition to

Sloane's study predates the starting point for the group's nomenclatural studies (Art. 13.1 and Art. 32.1 of the ICN), a phrase name is not a validly published species name (Art. 23.6 of the ICN), and must be transformed into a binomial, as Linnaeus does. Later, Blume (1856: 52) transferred *U. grandifolia* to *Pilea*.

In *Flora of Jamaica*, Fawcett & Rendle (1914) treated the name *Pilea grandifolia* and indicated the specimen *H. Sloane 76* (BM) (Fig. 4) as type, a practice that, according to Prado & al. (2015), is an inadvertent lectotypification. The authors consider the number “76” in the upper right part of the exsiccate is Sloane's collector number, but this information was not confirmed in our analysis. There is no evidence that this specimen *H. Sloane 76* was consulted by Linnaeus for the publication of the name (Jarvis, 2007), even though it was faithfully reproduced in the illustration by Sloane (1707) which is cited by Linnaeus in the protologue of *U. grandifolia*.

In the typification of the Linnaean species of Urticaceae (Monro & Spencer, 2005), Monro neglects this illustration indicated by Linnaeus and designates the specimen *P. Browne s.n.* (LINN-1111.21), which has the annotation “Brown. jam. 336.2” by Solander, as the lectotype of *U. grandifolia*. The authors consider this specimen was analyzed by Linnaeus (1759) for the publication of the name, as it was in his herbarium since 1758 (Savage, 1945). In addition to not being mentioned by Linnaeus in the protologue, there is no evidence that Linnaeus examined the specimen for the publication of *U. grandifolia*. Furthermore, the annotation “Brown. jam. 336.2” in the specimen *P. Browne s.n.*, probably refers to the *Urtica*'s name 2 from page 336 of Browne's study (1756), and the annotation “*Urtica grandifolia* Linn” was not made by Linnaeus, Browne or Sloane. The name 2 on page 336 of Browne (1756) presents in the diagnosis “*The leaves are pretty large...*”, demonstrating the author was probably referring to the material *P. Browne s.n.* (LINN-1111.21), which has very large leaves compared to specimen *H. Sloane s.n.* (BM). Otherwise, the phrase name and the illustration by Sloane (1707) that Linnaeus used to validly publish *U. grandifolia* is cited in the *Urtica*'s name 6 of page 337 of Browne (1756). This information evidences that both Browne and Linnaeus were considering the specimens *Sloane s.n.* (BM) and *P. Browne s.n.* (LINN) as different taxa. Only later, in publications subsequent to the protologue, Linnaeus presents information from Sloane (1707) other than the illustration, and from page 337 of Browne (1756) under the name *U. grandifolia*. In his *Flora Jamaicensis*, Linnaeus (1759a: 21) cites page 337 under *U. grandifolia*, and in his *Species Plantarum* ed. 2, Linnaeus (1763: 1396) cites the phrase name and the illustration by Sloane (1707), and page 337 by Browne (1756) under this name.

Given the facts and in accordance with Art. 9.1 (Note 1), 9.3, 9.4, 9.19, Rec. 9A.1 and 9A.2 of the ICN, the illustration by Sloane (1707) (Fig. 3) is the only material for which we found evidence of being original, thus we indicate it as the lectotype of *U. grandifolia*. Following Art. 9.9 and Rec. 9B.2 of the ICN, we also indicate the specimen *H. Sloane s.n.* (BM) as the epitype of *U. grandifolia* to demonstrate its general appearance, leaves and stipules are faithfully reproduced in the illustration, and to complement the lectotype, as the reproductive structures which correspond to the traditional and current application of the name *Pilea* are not well represented in the illustration.

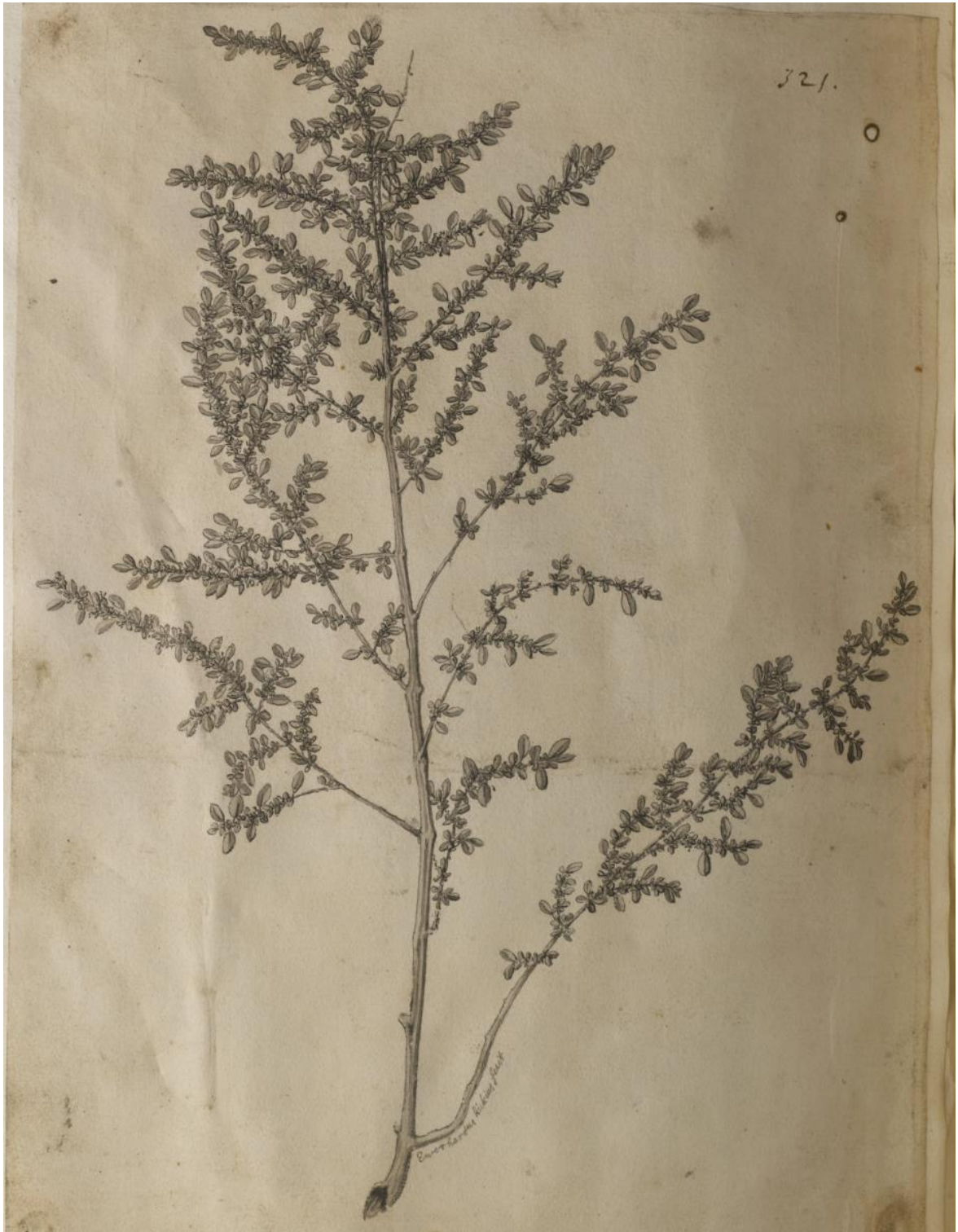
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## FIGURES



**Fig. 1.** Lectotype of *Parietaria microphylla* L.; Voy. Jamaica 1: tab. 93, fig. 2. Sloane (1707).



**Fig. 2.** Epitype of *Parietaria microphylla* L.; Specimen *H. Sloane s.n.* from Jamaica, deposited in the herbarium BM. © Copyright The Trustees of the Natural History Museum, London.



**Fig. 3.** Lectotype of *Urtica grandifolia* L.; *Voy. Jamaica* 1: tab. 83, fig. 2. Sloane (1707).



**Fig. 4.** Epitype of *Urtica grandifolia* L.; Specimen *H. Sloane s.n.* from Jamaica, deposited in the herbarium BM. © Copyright The Trustees of the Natural History Museum, London.

## CONSIDERAÇÕES FINAIS

A realização desta pesquisa, entre abril de 2019 e outubro de 2021, permitiu preencher parte da lacuna de conhecimentos científicos acerca de *Pilea* no Bioma Mata Atlântica, Brasil. Confirmamos a ocorrência de 14 espécies do gênero na região estudada e atualizamos seus dados de distribuição geográfica, período de floração e frutificação e habitat. As principais novidades do ponto de vista taxonômico são: a descrição de *P. bradei* como uma nova espécie para a Ciência; o reconhecimento de *P. microphylla* var. *portulacoides* como sinônimo heterotípico de *P. carautae*, de *P. hyalina* var. *longipes* como sinônimo heterotípico de *P. hyalina*, de *P. peplidifolia* como sinônimo heterotípico de *P. microphylla* e de *P. maximilianii* como sinônimo heterotípico de *P. pubescens*; a decisão de manter *P. aparadensis* como um táxon não resolvido. Destacamos, ainda, as novidades nomenclaturais, isto é, a proposta de correção na lectotipificação de *Urtica grandifolia* (basiônimo de *Pilea grandifolia*, espécie que não ocorre na área estudada) e de *Parietaria microphylla* (basiônimo de *P. microphylla*); a lectotipificação de *P. astrogramma*, *P. gaudichaudiana*, *P. grossecrenata*, *P. hirtella*, *P. hyalina* var. *longipes*, *P. maximilianii*, *P. microphylla* var. *portulacoides* e *P. muscosa*; a designação de um neótipo para *P. hyalina*; e a correção para holótipo do espécime considerado lectótipo de *P. pubescens*.

A maioria das espécies foi amostrada em florestas bastante preservadas e apresentava relativamente poucos registros em comparação a outros grupos de plantas. Dez das 14 espécies são endêmicas do Bioma Mata Atlântica no Brasil, e dentre os Estados incluídos neste Bioma, Santa Catarina e Rio de Janeiro são os que possuem o maior número de espécies, nove e oito, respectivamente. Há uma grande probabilidade, entretanto, de a maioria das espécies, ainda que possam estar ameaçadas e que sejam de distribuição restrita, estarem subamostradas. Por isso, salientamos a importância da contribuição com coletas e registros fotográficos de *Pilea* por parte dos pesquisadores que frequentam locais propícios à ocorrência de suas espécies. Do mesmo modo, ressaltamos a importância da busca por espécimes com flores pistiladas (as quais são ainda menores que os frutos) e estaminadas, e do preenchimento das etiquetas com a informação da presença dessas estruturas (para facilitar eventuais consultas online, nas quais a visualização delas é dificultada) e com outras características que podem ser perdidas no processo de secagem, como a cor e o aspecto da superfície das folhas e se as folhas são opostas cruzadas ou dísticas. Para algumas espécies, a maioria das coletas apresenta apenas espécimes com flores estaminadas e frutos, pois são estruturas mais vistosas, ou quando com flores pistiladas, essas são escassas.

Em função do contexto de pandemia, não foi possível fornecer descrições completas das espécies, pois com o ajuste de cronograma, não houve tempo para medir todos os caracteres. Além disso, nem todas as espécies foram coletadas. Pretende-se concluir essas etapas, e redigir uma revisão taxonômica completa, na qual constem, além desses acréscimos, a lista completa dos espécimes analisados, a análise do estado de conservação das espécies endêmicas do Bioma estudado, fotos e mapas de distribuição geográfica de todas as espécies, e também, a resolução dos problemas nomenclaturais que ficaram pendentes. A conclusão dessas etapas fornecerá mais subsídios para a conservação desses táxons, assim como contribuirá para o prosseguimento da investigação sobre se as variações morfológicas detectadas na atual circunscrição de *P. rhizobola* são suficientes para reconhecer possíveis novas espécies crípticas. Do mesmo modo, permitirá investigar nossa atual hipótese de que *P. microphylla* apresenta espécimes com algumas variações que não são suficientes para considerá-los como pertencentes a espécies distintas e, também, de que *P. aparadensis* foi descrita com base em um espécime com características intermediárias entre *P. hilariana* e *P. hydra* e em espécimes que, por serem inférteis, podem ser intermediários ou pertencentes à *P. hydra*. Reconhecemos, entretanto, que talvez seja necessário utilizar abordagens integrativas, como morfométricas, anatômicas e envolvendo dados moleculares, para resolver esses casos com mais acurácia.