UNIVERSIDADE FEDERAL DO PARANÁ

RAFAEL ROSENSTOCK VÖLTZ

AS ESPÉCIES NATIVAS DA FAMÍLIA SAPOTACEAE JUSS. NO ESTADO DO PARANÁ

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Orientador: Prof. Dr. Renato Goldenberg
Co-orientador: Prof. Dr. Anderson Geyson Alves de Araújo

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Setor de Ciências Biológicas
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As Espécies Nativas da Família Sapotaceae Juss. no Estado do Paraná

por
Rafael Rosenstock Völtz

Dissertação aprovada como requisito parcial para obtenção do grau de Mestre no Programa de Pós-Graduação em Botânica, pela Comissão formada pelos doutores

Dr. Renato Goldenberg

Dr. Paulo Henrique Labiak Evangelista

Dr. Christopher Thomas Blum

Curitiba, 01 de agosto de 2018.

Dedico este trabalho a todos
aqueles que no passado e no presente,
assim como aos vindouros, contribuem
para o conhecimento da flora paranaense.

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Citar nomes seria injusto, pois corremos o risco de esquecermos alguém importante que contribuiu ao longo do trabalho. Mas o mais importante do que ter seu nome listado entre tantos outros é saber que sua contribuição foi primordial na execução desse projeto. Sou muito agradecido a todos, mesmo aqueles que antes desse estudo iniciar, me ensinaram com suas experiências a trilhar os caminhos da ciência.

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Agradeço ao Programa de Pós-Graduação em Botânica da UFPR pela oportunidade e infra-estrutura disponível. Ao CNPq pela concessão da bolsa de estudo e ao Governo do Brasil por inverstir em pesquisa.

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A máxima parcimônia na destruição das florestas virgens recomenda um povo, porque nos denuncia o seu altruísmo e nos atesta sua previdência.

Frederico Carlos Hoehne

RESUMO

Sapotaceae é uma família numerosa de angiospermas, predominantemente arbórea, com distribuição nas regiões tropicais e subtropicais de todo o mudo. O Neotrópico é um dos grandes centros de diversidade de Sapotaceae e no Brasil a família consiste em 12 gêneros e 234 espécies, das quais 103 táxons são endêmicos. Nesse trabalho é apresentado o tratamento taxonômico das espécies de Sapotaceae nativas do Estado do Paraná, com chave de identificação e descrições, distribuição geográfica, fenologia, pranchas fotográficas e o atual status de conservação para todos os táxons. Vinte e três espécies foram documentadas no Paraná, pertencentes a sete gêneros. O gênero mais rico foi *Pouteria* com 12 espécies, seguido por *Chrysophyllum* com cinco espécies e *Pradosia* com duas espécies. Os gêneros *Diploon*, *Ecclinusa*, *Manilkara* e *Sideroxylon* apresentam uma única espécie. *Pouteria guianensis* e *Pouteria ramiflora* foram registradas pela primeira vez no Estado. A Floresta Atlântica *stricto sensu* é a formação mais diversa com seis gêneros e 14 espécies, seguida pela Floresta Estacional Semidecidual com três gêneros e nove espécies. A Floresta com Araucária e a Savana possuem dois gêneros, sendo a primeira com três espécies, enquanto a última com duas espécies. Das 23 espécies registradas, uma é categorizada como “em perigo” (EN), uma “vulnerável” (VU), uma “quase ameaçada” (NT), nove como “menos preocupante” (LC) e dez ainda não foram avaliadas (NE).

Palavras-chave: Biodiversidade. Chrysophylloideae. Mata Atlântica. Sapotoideae. Savana. Sul do Brasil. Taxonomia.

ABSTRACT

Sapotaceae is a large family of angiosperms which has predominantly tree species, and worldwide distribution in subtropical and tropical regions. The Neotropics are one of the greatest centers of diversity of Sapotaceae, and in Brazil, the family comprises 12 genera and 234 species, of which 103 species are endemic. We present here a taxonomic treatment for the native species of Sapotaceae from the State of Paraná, with an identification key, descriptions, geographic distribution, phenology, illustrations, and current conservation status for all taxa. Twenty-three species were documented in Paraná, belonging to seven genera. The richest genus was *Pouteria* with 12 species, followed by *Chrysophyllum* with five species and *Pradosia* with two species. The genera *Diploon*, *Ecclinusa*, *Manilkara*, and *Sideroxylon* have only one species each. *Pouteria guianensis* and *Pouteria ramiflora* are new records for the state. The Atlantic Rain Forest is the richer vegetation with six genera and 14 species, followed by the Seasonal Forest with three genera and nine species. The Araucaria Forest and Cerrado have two genera each, the former with three species and the latter with two species. Out of 23 species, one is mentioned as endangered (EN), one is vulnerable (VU), one is near threatened (NT), nine are least concern (LC), and ten have not been evaluated (NE).

Key-words: Atlantic Forest. Biodiversity. Chrysophylloideae. Sapotoideae. Savanna. Southern Brazil. Taxonomy.

SUMÁRIO

1 INTRODUÇÃO

Sapotaceae Juss. são plantas lenhosas com distribuição predominantemente tropical e subtropical em todo o mundo, com uma riqueza estimada em 1.250 espécies subordinadas a 59 gêneros (PENNINGTON, 1991; GOVAERTS et al., 2001; SWENSON et al., 2007; GAUTIER et al. 2013). Estima-se que ocorram cerca de 400 espécies no Neotrópico, ca. 300 na África e ca. 350 na Ásia tropical e Pacífico, sendo encotradas preferencialmente nas florestas pluviais em terras baixas (PENNINGTON, 2006). No entanto, alguns gêneros podem ser bem representados nas savanas e zonas semi-áridas, como é o caso de *Ecclinusa* nas savanas da Guiana e *Sideroxylon* nas regiões semi-áridas da América Central (PENNINGTON, 1990). A maioria das espécies são árvores e arbustos, embora algumas espécies desenvolveram adaptações a condições adversas de seca e fogo, no qual o caule permanece enterrado deixando emergir do solo apenas as pontas dos ramos (hábito subolífero) (PENNINGTON, 1990; FIGUEIRAS, 2002).

A família pode ser reconhecida pela presença de látex no tronco, ramos e folhas; folhas simples, inteiras, alternas, espiraladas e geralmente congestas no ápice, ou dísticas e espaçadas; inflorescências fascículadas, axilares, ramifloras ou caulifloras; flores unissexuadas (plantas monóicas ou dióicas) ou andróginas; sépalas em um ou dois verticilos; corola gamopétala; estames opostos aos lobos da corola, epipétalos; com ou sem estaminódio; ovário súpero; fruto bacóide, bacáceos ou campomanesoídeos a bacídeos, com pericarpo carnoso, coriáceo ou com paredes enrigecidas (PENNINGTON, 1990; BARROSO et al., 1999).

Algumas espécies de Sapotaceae ofererecem produtos de interesse econômico para o ser humano. Do látex extraído de *Manilkara zapota* (L.) P. Royen é produzido o chicle ou chicletes, ao mesmo tempo em que a espécie é amplamente cultivada para a produção de frutos (PENNINGTON, 1990). A madeira de Sapotaceae é reconhecida por ser pesada, durável, utilizada para obras internas e externas, pilares, dormentes, pisos e acabamentos, como é o caso de *Manilkara* spp. e *Pouteria* spp. (MELO; CAMARGOS, 2016).

Sapotaceae é reconhecido como um grupo monofilético pertencente à ordem Ericales (ANDERBERG; RYDIN; KÄLLERSJÖ, 2002; APG IV, 2016), formando um clado com Primulaceae *sensu lato* e Ebenaceae (SCHÖNENBERGER; ANDERBERG; SYTSMA, 2005). Anderberg, Rydin e Källersjö (2002) posicionaram a

família como grupo-irmão de Lecythidacae, porém essa relação era fracamente suportada pelas análises. Como resultado, a relação filogenética de Sapotaceae dentro de Ericales permanece em aberto, havendo a necessidade de mais dados para a resolução do problema (SCHÖNENBERGER; ANDERBERG; SYTSMA, 2005).

Sistemas de classificação baseados em dados morfológicos foram propostos por Lam (1939), Aubréville (1964), Baehni (1965) e Pennington (1991). Este último autor propôs a divisão da família em cinco tribos: Chrysophylleae, Isonandreae, Mimusopeae, Omphalocarpeae e Sideroxyleae (PENNINGTON, 1991). Contudo, análises filogenéticas baseadas em dados morfológicos e moleculares sugeriram a exclusão das tribos e a classificação em três subfamílias monofiléticas: Sarcospermatoideae, Chrysophylloideae (similar a tribo Chrysophylleae) e Sapotoideae (incluíndo as tribos Isonandreae, Sapoteae, Sideroxyleae e Tseboneae) (ANDERBERG; SWENSON, 2003; SWENSON; ANDERBERG, 2005; SMEDMARK et al., 2006; GAUTIER et al., 2013). Quanto aos estudos filogenéticos em nível de gênero, estes têm demostrado que *Pouteria* e *Chrysophyllum sensu* Pennington (1991) são parafiléticos, havendo a necessidade de divisão e reestabelecimento de alguns gêneros (SWENSON; RICHARDSON; BARTISH, 2008; FARIA et al., 2017).

Estudos biogeográficos inferem que as Sapotaceae tiveram origem no Leste Asiático a (105-) 84,5 (-67,1) milhões de anos (Ma) (RICHARDSON et al., 2014) ou na África a (126-) 107 (-88) Ma (ARMSTRONG et al., 2014). A diversificação e irradiação para as diferentes regiões do globo seguiram padrões distintos para cada grupo. Para as espécies Neotropicais de *Manilkara stricto sensu* os estudos indicam que a origem é africana, com dispersão a longa distância para a América do Sul no Oligoceno-Mioceno entre 26-18 Ma e posterior dispersão para América Central e ilhas do Caribe entre 16-15 Ma e 15-10 Ma, respectivamente (ARMSTRONG et al., 2014). Bartish et al. (2011) estimaram a irradiação e diversificação da subfamília Chrysophylloideae da África para o Neotrópico ca. 64-54 Ma. Diferentemente de táxons abordados em estudos que indicam o caminho Africa-América, o gênero *Sideroxylon* (Sapotoideae) teve sua primeira diversificação na América Central ca. 56,3-52,2 Ma, com posterior expanção para a África e Ásia (STRIDE; NYLINDER; SWENSON, 2014). Quanto ao gênero Neotropical *Pradosia*, as estimativas indicam uma origem na bacia Amazônica ca. 47,5 Ma, com posterior irradiação para a regiões andina e atlântica (TERRA-ARAÚJO et al., 2015).

No Brasil são estimados 12 gêneros e 234 espécies de Sapotaceae, das quais 103 espécies são endêmicas (CARNEIRO et al., 2015). A família é representada em todos os domínios fitogeográficos brasileiros, com especial destaque nas florestas Amazônica e Mata Atlântica (PENNINGTON, 2006).

A bibliografia sobre Sapotaceae no Brasil é relativamente vasta, abrangendo revisões gerais, floras regionais e descrições de novas espécies. O primeiro estudo da família pode ser creditado a Miquel (1863), na “Flora Brasiliensis” de Martius. No Século XX foram importantes os trabalhos de Ducke (1922, 1953, 1957) para a as espécies da região amazônica, principalmente para os gêneros *Pradosia* e *Manilkara*. No entanto, foi Pennington (1990) o autor que realizou o trabalho mais completo sobre as espécies brasileiras de Sapotaceae. Posteriormente, diversos estudos de caráter regional foram desenvolvidos (REITZ, 1968; CARNEIRO; MONTEIRO, 1999; PENNINGTON, 2006; FABRIS; PEIXOTO, 2013; ALVES-ARAÚJO; ALVES, 2013; ALVES-ARAÚJO; SWENSON; ALVES, 2014; SOSSAI; ALVES-ARAÚJO, 2017), ao mesmo tempo em que novas espécies foram descritas (ALVES-ARAÚJO; ALVES, 2011; ALVES-ARAÚJO; ALVES, 2012a; ALVES-ARAÚJO; ALVES, 2012b; TERRA-ARAÚJO; FARIA; VICENTINI, 2012; TERRA-ARAÚJO et al., 2013; SOSSAI et al., 2017). No entanto o Paraná carece de um estudo mais detalhado sobre a família, uma vez que a única abordagem existente até o momento era uma lista reportando a ocorrência de 23 espécies distribuídas em sete gêneros (KAEHLER, 2014).

Pelo exposto, diante da lacuna de conhecimento sobre a família no Estado do Paraná, este trabalho teve como objetivo o levantamento florístico e o tratamento taxonômico das espécies nativas da família Sapotaceae para o Estado do Paraná, fornecendo diagnoses morfológicas, chaves de identificação dos gêneros e espécies, dados de distribuição geográfica e pranchas com imagens, além de mencionar o status de conservação para as espécies listadas nas listas oficiais.

2 MATERIAL E MÉTODOS

2.1.1 Área de Estudo

Localizado na região Sul do Brasil, entre os paralelos 26°43’08”S e 22°30’44”S e os meridianos 54°36’32”W e 48°00’11”W, o Estado do Paraná ocupa

uma área territorial de 199.554 km^2. As principais linhas orográficas formam as grandes paisagens paranaenses: Serra do Mar, Planície Litorânea e o Primeiro, Segundo e Terceiro Planaltos (BIGARELLA, 1954).

Influenciado pela sua posição geográfica e pelas características do relevo, no Paraná são reconhecidos dois tipos climáticos principais. Na maior parte do Estado, compreendida pelas regiões oeste, noroeste, norte, litoral e vale do Ribeira caracteriza-se pelo tipo Cfa, ou seja, clima subtropical, com verões quentes, geadas pouco frequentes sem estação seca definida. Já nas regiões altas do planalto, principalmente na porção centro-sul, ocorre o clima Cfb, clima temperado, com verões frescos, geadas frequentes no inverno e sem estação seca definida (MAACK, 1968; CAVIGLIONE et al., 2000).

A diversificação geológico-climática paranaense propicia a existência de diferentes tipologias vegetais, cada qual com suas comunidades e associações. Sobre a planície litorânea e encostas da Serra do Mar cresce a Floresta Ombrófila Densa. Nos planaltos do interior acima dos 800 m s.n.m., encontra-se a Floresta Ombrófila Mista ou floresta com araucária, que nas regiões do Segundo e Terceiro Planaltos podem formar um mosaico com a Estepe. Nas regiões Norte, Noroeste e Sudoeste do Estado, em altitudes abaixo dos 800 m s.n.m. ocorre a Floresta Estacional Semidecidual. Distribuída de forma disjunta na paisagem do Segundo e Terceiro Planaltos, ocorre a Savana, ocupando cerca de 1% da superfície do Estado (MAACK, 1968; RODERJAN et al., 2002; LABIAK, 2014).

2.1.2 Análise do material botânico

O estudo florístico de Sapotaceae foi baseado nos registros das coleções dos herbários que detem espécimes coletados no Estado do Paraná, somados as observações de campo e coleta de material botânico. Foram consultados as seguintes coleções: EFC, FUEL, HCF, HFC, HUEM, HUEPG, MBM, SPF, SPSF e UPCB (THIERS, 2018), enquanto que imagens dos espécimes disponibilizados *on-line* foram consultados nos herbários INPA, NY e RB (THIERS, 2018). Ao todo foram vistos 728 espécimes, dos quais 29% eram compostos por amostras de *Chrysophyllum gonocarpum*, 18 % de *C. marginatum* e 13% de *C. inornatum*. Os 20

táxons restantes somam 39% dos espécimes depositados nas coleções consultadas.

Foram realizadas cerca de 70 excursões a campo entre agosto de 2016 a julho 2018 procurando abranger todas as unidades fitogeográficas existente no Estado. Ao menos um indivíduo de cada espécie foi observado ao longo do trabalho. O material coletado foi herborizado segundo especificações de Fidalgo e Bonnoni (1984) e depositados nos herbários EFC, UPCB e MBM (THIERS, 2018). Quando disponível, duplicatas foram enviadas para outros herbários. Ao todo foram coletas 61 espécimes, correspondendo cerda de 8 % de espécimes coletadas no Paraná.

A identificação dos espécimes foi baseada em Pennington (1990) e os nomes validos foram verificados nos sítios da Flora do Brasil 2020 (JARDIM BOTÂNICO DO RIO DE JANEIRO, 2018), *The International Plant Names Index* (2018) and *Missouri Botanical Garden* (TROPICOS, 2018).

A terminologia morfológica utilizada foi padronizada segundo Harris e Harris (2006), com excessão da morfologia e do padrão de venação foliar que se basearam em Hickey (1973). Adicionalmente aos padrões de venação propostos por esse último autor, utilizou-se o termo eucampto-broquidódromos para o tipo misto de venação no qual a porção inferior da lâmina é eucamptódroma, enquanto a porção superior se apresenta broquidódroma (ELLIS et al., 2009; ALVES-ARAÚJO; SWENSON; ALVES, 2014). Para o indumento dos ramos e folhas adicionou-se dois tipos de padrão misto: “híspido-tomentoso” e “seríceo-tomentoso” (PENNINGTON, 1990), o primeiro composto por tricomas eriçados enquanto o último por tricomas adpressos.

A descrição dos caracteres de ritidoma e casca interna seguiu a terminologia proposta por Junikka (1994) & Ribeiro et al. (1999). Adicionalmente utilizou-se o termo “fissurado-escamoso” para o tipo de ritidoma no qual predomina o padrão fissurado, porém as cristas se desprendem formando escamas mais ou menos regulares. A caracterização dos aspectos de tronco e casca das espécies arbóreas de Sapotaceae deu-se em campo, por meio da identificação da espécie e leitura dos caracteres avaliados, com o auxílio de uma ficha de campo elaborada pelo Laboratório de Dendrologia/Herbário EFC (ANEXO A). A descrição seguiu as seguintes etapas: 1° fez-se a leitura dos aspectos externos do tronco, como forma, base, aparência do ritidoma e existência de elementos eventuais como lenticelas e cicatrizes, entre outros; 2° realizou-se um corte tangencial no tronco para que a

casca viva fossem exposta, a fim de descrever essas estruturas; 3° outros aspectos complementares, como oxidação, odor e exsudados, também foram avaliados. Procurando reunir as informações obtidas em campo, elaborou-se uma planilha eletronica para compilação e resumo dos dados a fim de identificar padrões que compunham a descrição de tronco e casca. O número de indivíduos analisados para cada espécie e sua localização encontram-se no Apêndice A.

As descrições das espécies se baseou na análise morfológica dos espécimes selecionados, incluindo-se medições das partes vegetativas e reprodutivas do material herborizado, além dos aspectos do tronco e casca observados em campo. As partes florais foram medidas após a reidratação ou por meio de material fixado em álcool etílico 70%. Frutos e sementes foram medidos diretamente nas exsicatas ou em amostras frescas coletadas em campo. Uma planilha eletrônica foi elaborada como roteiro no estudo morfológico, a qual foi sendo preenchida na medida que cada espécime era analisado (APÊNDICE B).

A análise do material foi feita predominantemente sobre material coletado no Paraná, sendo indicado no texto como "*Selected material*". No entanto, no caso de espécies com poucos espécimes, material botânico coletado nos estados vizinhos ou disponíveis na coleção foram utilizados para a complementação das descrições, sendo indicado no texto "*Additional selected material*".

Informações referentes ao hábito, habitat, distribuição geográfica e fenologia foram obtidos junto as etiquetas das exsicatas, quando disponíveis. Observações de campo complementaram e corroboraram os dados das etiquetas.

Para a identificação dos táxons foi elaborada uma chave de identificação baseada nos caracteres vegetativos e reprodutivos e, para cada espécie foi fornecido uma descrição morfológica, distribuição e habitat, caracteres de campo e fenologia reprodutiva, assim como comentários taxonômicos, quando necessário.

O mapa de distribuição das espécies teve como base o material botânico depositado nos herbários consultados, a partir das informações disponíveis nas etiquetas dos espécimes. Para os espécimes de herbário que não continham as coordenadas originais nas suas etiquetas, procurou-se estimar as coordenadas geográficas com maior acurácia possível do ponto original de coleta, através do uso de cartas topográficas e pesquisa na internet. As coordenadas foram obtidas do software *Google Earth* (GOOGLE, 2018).

Por se tratar de um estudo florístico com limites geopolíticos definidos e que não levam em consideração os limites naturais das espécies, optou-se por mencionar o status de conservação dos táxons a partir das listas oficiais do Centro Nacional de Conservação da Flora (CNCFLORA, 2018) e *The IUCN Red List of Threatened Species* (IUCN, 2018). Complementarmente, para cada táxons são listadas as principais ameaças a sua conservação.

As pranchas fotográficas foram elaboradas com o auxílio de um editor de imagens, procurando abordar o hábito, o ritidoma, a casca interna, caracteres florais, o fruto, as sementes, o aspecto geral dos ramos, a venação e seus detalhes, assim como alguma particularidade adicional que auxiliasse na identificação.

3 CAPÍTULO 1. NATIVE SPECIES OF SAPOTACEAE JUSS. IN PARANÁ, BRAZIL

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Native Species of Sapotaceae Juss. in Paraná, Brazil

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Abstract

Sapotaceae is a large family of angiosperms which has predominantly tree species, and worldwide distribution in subtropical and tropical regions. The Neotropics are one of the greatest centers of diversity of Sapotaceae, and in Brazil, the family comprises 12 genera and 234 species, of which 103 species are endemic. We present here a taxonomic treatment for the native species of Sapotaceae from the State of Paraná, with an identification key, descriptions, geographic distribution, phenology, illustrations, and current conservation status for all taxa. Twenty-three species were documented in Paraná, belonging to seven genera. The richest genus was *Pouteria* with 12 species, followed by *Chrysophyllum* with five species and *Pradosia* with two species. The genera *Diploon*, *Ecclinusa*, *Manilkara*, and *Sideroxylon* have only one species each. *Pouteria guianensis* and *Pouteria ramiflora* are new records for the state. The Atlantic Rain Forest is the richer vegetation with six genera and 14 species, followed by the Seasonal Forest with three genera and nine species. The Araucaria Forest and Cerrado have two genera each, the former with three species and the latter with two species. Out of 23 species, one is mentioned as endangered (EN), one is vulnerable (VU), one is near threatened (NT), nine are least concern (LC), and ten have not been evaluated (NE).

Key words: Atlantic Forest. Biodiversity. Chrysophylloideae. Sapotoideae. Savanna. Southern Brazil. Taxonomy.

Introduction

Sapotaceae is a woody tropical and subtropical family with about 1,250 species in 59 genera (Pennington 1991, Govaerts *et al.* 2001, Swenson *et al.* 2007, Gautier *et al.* 2013). The plants in the family are predominantly arboreal, but shrubs and geoxylic subshrubs can also be found. In the Neotropics, the greatest diversity of Sapotaceae is found in the Amazonian basin, Guianas, Venezuela and the foothills of the Andes in Colombia, Ecuador and Peru, besides the coastal Brazil, growing mostly in primary lowland rainforests (Pennington 2006), although many species can be found in drier areas in Central and South America (Pennington 1990, Terra-Araújo *et al.* 2016).

Before the advance of molecular analyses, the infrafamilial classification was not clear, with different classification systems depending on which character or combinations of characters were more or less important for each author (Pennington 1990). For example, Lam (1939) recognized three subfamilies (Madhucoideae, Mimusopoideae and Sideroxyloideae), Aubréville (1964) recognized four subfamilies (Madhucoideae, Mimusopoideae, Omphalocarpoideae and Sideroxyloideae), and one year later Baehni (1965) classified the family in three subfamilies (Croixioideae, Madhucoideae and Mimusopoideae). The last classification system excluded the subfamilies and suggests the recognition of five tribes (Pennington 1991): Chrysophylleae, Isonandreae, Mimusopeae, Omphalocarpae and Sideroxyleae. However, studies based on morphological and molecular data suggest the subdivision of the family into three monophyletic subfamilies: Sarcospermatoideae, Chrysophylloideae (similar to the tribe Chrysophylleae) and Sapotoideae (including tribes Isonandreae, Sapoteae, Sideroxyleae e Tseboneae) (Anderberg & Swenson 2003, Swenson & Anderberg 2005, Smedmark *et al.* 2006, Gautier *et al.* 2013). At the generic level, phylogenetic analyses demostrated that some genera, e.g. *Pouteria* Aubl. and *Chrysophyllum* L. are polyphyletic and can be segregated (Bartish *et al*. 2005., Swenson & Anderberg 2005, Swenson *et al.* 2008, Faria *et al.* 2017).

In Brazil, the family comprises 12 genera and 234 species, of which 103 species are endemic. Sapotaceae is widely distributed throughout the country, though the greatest diversity is found in Amazonian and Atlantic Forest, with about 174 and 83 species respectively (Carneiro *et al.* 2015).

The bibliography on Sapotaceae in Brazil is relatively vast. Pennington (1990) studied the Brazilian species in his monograph on Sapotaceae of the Neotropics. After that, several regional floras were published (Pennington 2006, Fabris & Peixoto 2013, Alves-Araújo &

Alves, 2013, Alves-Araújo *et al.* 2014, Sossai & Alves-Araújo 2017), and new species were described (Alves-Araújo & Alves 2011, Alves-Araújo & Alves 2012a, Alves-Araújo & Alves 2012b, Terra-Araújo *et al.* 2012, Terra-Araújo *et al.* 2013, Sossai *et al.* 2017). For the brazilian state of Paraná, there are no detailed studies for the family, apart from a list of species (Kaehler 2014). In addition, the scarce herbarium material for some especies and several misidentified specimens make it difficult to identify the species in the state, which contributes even more to the lack of knowledge on the family.

The aim of this work was to answer the following questions: (1) How many species of Sapotaceae occur in the State of Paraná? (2) How can we recognize these species? (3) How is their distribution and in what vegetation types do they occur? (4) What is the conservation status and what are the potential threats to these species?

Methods

The State of Paraná is located in Southern Brazil between parallels 22°30'44"S and 26°43'08"S and meridians 48°00'11"W and 54°36'32"W. The main topographic features that characterise Paraná's landscapes are: (1) at east the small stretch of coastal plain and the Atlantic coast mountainous region, surrounded by Serra do Mar, ranging from sea level to 1,877 m elev.; (2) the Southern Brazilian highlands between 200 and 1,250 m elev., which are regionally divided into First, Second and Third Plateaus; and (3) at west the islands and alluvial plains of the Paraná river and his tributaries. Most forests that occur in the State belong to the Atlantic Forest Biome (Brazil 2006, Brazil 2008). Within this biome three different vegetation types can be found: (1) the Atlantic Rain Forest in its *stricto sensu* ("Floresta Ombrófila Densa" according to the Brazilian official classification, IBGE 2012) that occurs on the coastal plain to the upper mountains of the Serra do Mar; (2) the Araucaria Forest ("Floresta Ombrófila Mista") that occurs on plateaus at elevations above 800 m, sometimes forming a mosaic with grasslands ("Estepe"); (3) the Semideciduous Seasonal Forest ("Floresta Estacional Semidecidual") that occurs mainly on the Third Plateau, between 200 and 600 m elev.. Scattered over the Second and Third Plateus and surrounded by grasslands or forests occurs the Cerrado ("Savana"), with floristic composition and physiognomy similar to the one found in central Brazil (Maack 1968, Roderjan *et al.* 2002, Labiak 2014) (Figure 1).

Fieldwork was performed from August 2016 to July 2018 in different places along the study area in order to observe the species in their natural habitats, their habits, bark patterns

and geographic distribution. Procedures for herborization were based on Fidalgo & Bononi (1984), and the specimens were included in UPCB and MBM herbaria. Duplicates when available were sent to EFC, RB, NY and VIES (acronyms following Thiers 2018).

For the taxonomic study, all the collections from the following herbaria were examined or consulted on-line (*): EFC, FUEL, HCF, HFC, HUEM, HUEPG, INPA (*), MBM, NY(*), RB(*), SPF, SPSF and UPCB (acronyms following Thiers 2018). Specimens identification was based on Pennington`s (1990) monograph on Neotropical Sapotaceae, and accepted names were checked in Flora do Brasil 2020 (Jardim Botânico do Rio de Janeiro 2018), The International Plant Names Index (2018) and Missouri Botanical Garden (Tropicos 2018). The infraspecific classification defined by Pennington (1990) was not used in this work, but the infraspecific taxa were briefly mentioned in the comments under each species, when necessary.

The description terminology for bark and inner bark was based on Junikka (1994) and Ribeiro *et al.* (1999), for leaf shape and venation on Hickey (1973), for stem, indument and floral structures on Harris & Harris (2006), and for fruit types and seeds on Barroso *et al*. (1999). However, some terminologies used here have been adapted, i.e. “hispid-tomentose” and “sericeous-tomentose” (Pennington 1990), the former when the indumentum has stiff hairs and the latter when the indumentum has appressed hairs; “fissured-scaly” when the bark pattern was predominantly fissured, but some scales occur in the trunk; and “eucampto-brochidodromous” (Ellis *et al*. 2009, Alves-Araújo *et al.* 2014), a mixed venation type in which the basal part of the leaf is eucamptodromous and the apical part is brochidodromous.

The species distribution maps were based on all herbarium specimens that were consulted, and were georeferenced through data collected in the field, or based on specimens labels when available. For those that did not contain the original coordinates in their labels, we estimated the geographical coordinates as accurately as possible from the original collection point through the use of topographic maps and internet search. Coordinates were obtained from *Google Earth* (GOOGLE, 2018).

Since this is a floristic study defined by geopolitical limits and not by the species natural limits, we decided to mention the presence of each species in official conservation status lists, instead of calculating geographical parameters and discussing each species within ranges delimited by the Brazilian states borders. Therefore, the classification for the taxa studied here was obtained from “Centro Nacional de Conservação da Flora” (CNCFlora 2018) and from “The IUCN Red List of Threatened Species” (IUCN 2018) databases.

Results and Discussion

Twenty-three species in seven genera of Sapotaceae were documented in the State of Paraná. The richest genus was *Pouteria* with 12 species, followed by *Chrysophyllum* (5 spp.) and *Pradosia* (2). The genera *Diploon*, *Ecclinusa*, *Manilkara* and *Sideroxylon* have only one species each.

Taxa previously listed for Paraná (Kaehler 2014, Carneiro *et al.* 2015) were not included in this study because they were misidentifications: *Chrysophyllum flexuosum* Martius (1837: 98), *Manilkara salzmannii* (A. De Candolle 1844: 205) H.J.Lam (1941: 356), *Pouteria gardneriana* (A. De Candolle 1844: 205) Radlkofer (1882: 333), and *Pouteria grandiflora* (A. De Candolle 1838: 169) Baehni (1942: 391). Cultivate and non-native species also were not included: *Chrysophyllum cainito* Linnaeus (1753: 192), *Manilkara zapota* (Linnaeus 1753: 1190) P.Royen (1953: 410), and *Mimusops coriacea* (A. De Candolle 1844: 200-201) Miquel (1863: 44). The latter sometimes occurs as alien-invasive species in natural environments, on the state's coastal plain. On the other hand, some taxa were first mentioned for the State, i.e. *Pouteria guianensis*, which has been incorrectly determined as *Pouteria torta* subsp. *glabra* T.D. Pennington (1990: 484), and *Pouteria ramiflora*, which was collected only in 2014 and has not been identified until now.

Habit:—Most species are medium to large trees ranging from canopy to emergent trees (most species) to understory trees such as *Chrysophyllum inornatum* and *C. paranaense*. Treelets can be found in *Pouteria glomerata*, *P. ramiflora*, *P. salicifolia*, and *Sideroxylon obtusifolium*, which occurs in riversides on alluvial soils, in *Pouteria* sp., which occurs on hill slopes, and in *Pouteria torta,* that grows in Cerrado. Shrubs can be found in drier conditions such as sandy or rocky riversides, e.g. in *Chrysophyllum marginatum* and *Pouteria salicifolia*. The habit of *Chrysophyllum marginatum* depeds on habitat, ranging from shrub to canopy tree. Another species adapted to drier conditions is *Pradosia brevipes,* a geoxylic subshrub, with a subterranean caulinar system and only shoot tips emerging above the ground.

Trunk and inner bark:—The trunk sections are cylindrical/elliptical in the arboreal species, but irregular boles may occur in the lower third of the trunk in large trees. Fluted boles can be found in *Pouteria guianensis*. Bark patterns, in addition to leaf characters, are very useful for field recognition. However, the recognition of main patterns is not so easy because some variation may be found among different patterns and, in many cases, the trunk

is covered by mosses and liverworts. Most species have a scaly bark. *Pradosia lactescens* looses its old bark through thick scales leaving a shallow depression on the surface, sometimes with a different color on the new surface (dippled bark). Fissured barks are typical for *Manilkara subsericea*, *Pouteria bullata*, *P. torta* and *Sideroxylon obtusifolium*. Some species such as *Chrysophyllum gonocarpum*, *C. paranaense*, *Pouteria caimito* and *P. guianensis* have fissured-scaly bark, when the ridges become detached from the bark. Rough bark is found in *Chrysophyllum viride* and *Ecclinusa ramiflora,* and in *Poteria ramiflora* the bark shows more or less regular fissures that form a grid-cracked bark (tessellated). The slash may provide distinctive patterns, with two main types: with alternating, vertically oriented streaks (most species) or with ripple marks as in *Pouteria beaurepairei*, *P. durlandii*, *P. gardneri*, *P. glomerata*, *P. salicifolia* and *Pouteria* sp.. The color of the inner bark may vary from light yellow-orange (most species), orangish in *Pradosia lactescens*, pinkish in *Pouteria venosa*, reddish in *Manilkara subsericea* and *Poteria ramiflora*, and whitish or yellowish-white in *Ecclinusa ramiflora*, *Chrysophyllum gonocarpum* and *C. viride*. Only *Ecclinusa ramiflora* has a discoloured inner bark turning brownish after few minutes. All species exude white latex when the bark is cut, but occasionally the exudate flows slowly, such as in *Chrysophyllum gonocarpum*, *C. viride* and *Pradosia lactescens*.

Leaf:—The lack of stipules is common to all species but *Ecclinusa ramiflora*, in which they are caducous, leaving a scar. All the species have alternate, entire, and simple leaves, but in *Sideroxylum obtusifolium* the leaves are opposite or subopposite in the young shoots, becoming alternate or fasclicled on short shoots. Most species have spiralled leaves, ranging from spaced to loosely or densely clustered at the stem apex. On the other hand, in *Chrysophyllum paranaense*, *C. inornatum* and *Diploon cuspidatum,* the leaves are spaced and distichous, in which the branching form a horizontal pattern. Most species have glabrous leaves. Indumentum on the abaxial leaf surface ranges from pubescent in *Chrysophyllum inornatum* and *Pradosia brevipes*, sericeous-tomentose in *Chrysophyllum paranaense*, to tomentose in *Ecclinusa ramiflora*, *Pouteria bullata* and *P. torta.* In *Pouteria glomerata* and *Manilkara subsericea*, the indumentum on the abaxial leaf surface is short, dense and with closely appressed hairs usually forming a pellicle, although in the latter the leaves become glabrous when older. Leaf venation is very useful for recognition at the species level. Brochidodromous venation occur in *Chrysophyllum inornatum*, *C. marginatum, C. viride*, *Diploon cuspidatum*, *Manilkara subsericea*, *Pouteria salicifolia*, and *Sideroxylon obtusifolium*, while in *Ecclinusa ramiflora*, *Pouteria caimito*, *P. gardneri*, *P. ramiflora*, *P.*

torta and *Pradosia brevipes* they are eucamptodromous. Mixed venation patterns, like eucampto-brochidodromous, occur in *Pouteria beaurepairei*, *P. bullata*, *P. durlandii*, *P. glomerata*, *P. venosa* and *Pradosia lactescens*. Only *Pouteria* sp. does not have predominant pattern, and its leaves may be brochidodromous or eucamptodromous. The presence or absence of intersecondary veins may also be used for recognition at the species level, and may be well-developed in *Chrysophyllum inornatum*, *C. gonocarpum, C. marginatum, C. viride*, *Diploon cuspidatum*, *Manilkara subsericea*, *Pouteria ramiflora*, *P. salicifolia* and *Sideroxylon obtusifolium*. Tertiary veins generally form three patterns: admedial in *Chrysophyllum inornatum*, *C. marginatum*, *C. viride*, *Diploon cuspidatum*, *Manilkara subsericea*, and *Sideroxylon obtusifolium*; reticulate in *Pouteria beaurepairei*, *P. caimito*, *P. durlandii*, *P. ramiflora*, and *P. salicifolia*; percurrent, with branches varying from oblique in *Ecclinusa ramiflora*, *Pouteria bullata*, *P. guianensis*, *Pradosia brevipes*, and *P. lactescens*, to oblique or horizontal in *Pouteria glomerata.*

Flower:—All species have fasciculate inflorescences, varying from axillary (most species) to ramiflorous (considered here as in leafless nodes), like *Ecclinusa ramiflora*, *Pouteria bullata*, *P. guianensis* and *P. torta*. However, *Chrysophyllum gonocarpum*, *C. marginatum*, *Pouteria caimito*, *P. gardneri*, *P. glomerata, P. ramiflora*, *and Pradosia brevipes* may have axillary and ramiflorous inflorescences in the same stem. In *Pradosia lactescens* the inflorescences are cauliflorous (i.e., occurring on the main tree trunk) and in *Pouteria ramiflora* the fascicle sometimes is set in a short aphyllous axillary shoot. Flowers are androgynous in most species, except for *Chrysophyllum gonocarpum*, *Ecclinusa ramiflora* and *Pouteria durlandii,* all with unisexual flowers; the former and the latter are both dioecious, while *Ecclinusa ramiflora* is monoecious. However, in *Pouteria beaurepairei* the flower may be androgynous or unisexual, and when unisexual the anthers fall and the filaments persist in the pistillate flower. The calyx has two whorls in *Manilkara subsericea* and in most species of *Pouteria*, respectively with three and two sepals; all other species, including *Pouteria durlandii* and *P. gardneri*, have the calyx with a single whorl of (4–)5 sepals. The sepals are valvate in *Chrysophyllum inornatum*, *C. marginatum*, *Diploon cuspidatum*, *Ecclinusa ramiflora*, and *Sideroxylon obtusifolium*. In *Chrysophyllum gonocarpum*, *C. paranaense* and *C. viride* the sepals are quincuncial. The corolla may vary from tubulose in *Pouteria beaurepairei*, *P. bullata*, *P. caimito*, *P. guianensis*, *P. salicifolia* and *P.torta*, cyathiform in *Chrysophyllum gonocarpum, C. paranaense, C. viride*, *Ecclinusa ramiflora*, *Pouteria durlandii*, *P. gardneri*, *P. glomerata*, *P. venosa*, and *Pouteria* sp.,

campanulate in *Chrysophyllum inornatum*, *C. marginatum* and *Pouteria ramiflora*, to rotate in *Diploon cuspidatum*, *Manilkara subsericea*, *Pradosia brevipes*, *P. lactescens*, and *Sideroxylon obtusifolium*. Most species have entire lobes, while *Manilkara subsericea* and *Sideroxylon obtusifolium* have the corolla lobes divided into three segments. All species have the stamens opposite to the corolla lobes, and they are included in *Chrysophyllum*, *Ecclinusa* and *Pouteria*, while in *Manilkara*, *Diploon, Pradosia* and *Sideroxylon* the stamens are exserted. All species have epipetalous stamens and the insertion position varies from the base to the top of the corolla tube. Staminodes are an important diagnostic character for genus recognition: they are lacking in *Chrysophyllum*, *Ecclinusa*, *Diploon*, and *Pradosia*, and present in *Manilkara*, *Pouteria*, and *Sideroxylon*. In *Manilkara* the staminodes are irregularly divided into two or more segments, while in *Pouteria* and *Sideroxylon* they are entire. The ovary is lanate in most species, but in *Diploon cuspidatum*, *Manilkara subsericea*, and *Sideroxylon obtusifolium* it is glabrous. The number of locules may vary from one in *Diploon cuspidatum*, two in *Pouteria gardneri*, *P. ramiflora* and *P.durlandii* (sometimes three), four in most species of *Pouteria*, four or five in *Sideroxylon obtusifolium*, five in *Chrysophyllum*, *Ecclinusa*, and *Pradosia*, six in *Pouteria venosa,* and 6–10 in *Manilkara subsericea*.

Fruit and seeds:—All species have bacoid fruits, varying from fleshy (most species) to fruits with a hard thick pericarp, such as *Pouteria beaurepairei*, *P. bullata*, *P. caimito*, *P. guianensis* and *P. torta*. In the fleshy fruits, the exocarp ranges from membranaceous to coriaceous, the mesocarp is often fleshy and the endocarp gelatinous or membranaceous. The numbers of seeds in the fruit ranges from always 1-seeded such as *Diploon cuspidatum*, *Pradosia lactescens*, *Chrysophyllum inornatum*, *C. marginatum*, and *C. paranaense*, to 1–5-seeded in *C. gonocarpum, C. viride*, *Ecclinusa*, *Manilkara* and *Pouteria* spp. The seeds in most species have a smooth testa, but sometimes they are rugulose (*Chrysophyllum paranaense* and *Pouteria beaurepairei)*. *Pouteria glomerata* has an almost absent testa, with the scar covering most of the seed surface. The seed scar may vary in position, from basal in *Diploon cuspidatum*, basi-ventral in *Chrysophyllum inornatum*, *C. paranaense* and *Manilkara subsericea,* to adaxial (most species). In seeds with an adaxial scar, these can be narrow and full-length, like in *Chrysophyllum viride*, *Ecclinusa ramiflora*, *Pouteria guianensis*, and *Pradosia lactescens*, or broad and full-length in *Pouteria beaurepairei*, *P. bullata*, *P. durlandii*, and *P. venosa*.

Distribution and habitat:—Most species found in Paraná are widespread in South America, growing in different types of vegetation, such as lowland rainforest in Amazonia (*Diploon cuspidatum*, *Ecclinusa ramiflora*, *Pouteria caimito*, *P. durlandii*, *P. guianensis*¸ and *P. venosa*), semideciduous forest (*Chrysophyllum gonocarpum*, *C. marginatum*, *Pouteria gardneri*, *P. glomerata*, *P. guianensis*, *P. salicifolia*, and *Sideroxylon obtusifolium*) or in Cerrado (*Pouteria torta* and *Pradosia brevipes)*. On the other hand, eight species are endemic to Brazil (*Chrysophyllum inornatum*, *C. paranaense*, *C. viride*, *Manilkara subsericea*, *Pouteria beaurepairei*, *P. bullata*, and *Pradosia lactescens*), all of them occurring only in Atlantic Rain Forest (Pennington 1990, Carneiro *et al.* 2015). Within the State, the family is richer in the Atlantic Rain Forest, with six genera and 14 species, followed by the Semideciduous Seasonal Forest with three genera and nine species, Araucaria Forest with two genera and three species and by Cerrado with two genera and two species. *Chrysophyllum marginatum* and *C. gonocarpum* are widespread over the State, mainly in Semideciduous Seasonal Forest, but reaching the Araucaria Forest along the tributaries of the Paraná river. There are some collections of these two species (*Hatschbach* 7723 & 11838, *Silva* 763) in Montane and Submontane Atlantic Rain Forest in the Ribeira basin. *Pouteria gardneri* has two disjunct populations, one in the Atlantic Rain Forest along the Ribeira river and its tributaries, and one in the Semideciduous Seasonal Forest on the riverbanks of the Paraná river (Figures 2–4).

Conservation status:—Among the species that occur in Paraná, nine have already been listed as LC-least concern (*Chrysophyllum inornatum*, *Manilkara subsericea*, *Pouteria beaurepairei*, *P. glomerata*, *P. salicifolia*, *P. torta*, *Pradosia brevipes*, *P. lasctescens* and *Sideroxylon obtusifolium*), one as NT-near threatened (*Chrysophyllum viride*), one as VU-vulnerable (*Chrysophyllum paranaense*), and one as EN-endangered (*Pouteria bullata*). Ten species were mentioned as NE-not evaluated (*Chrysophyllum gonocarpum*, *C. marginatum*, *Diploon cuspidatum*, *Ecclinusa ramiflora*, *Pouteria caimito*, *P. durlandii*, *P. gardneri*, *P. guianensis*, *P. ramiflora* and *P. venosa*). However, the state of Paraná has already lost ca. 87% of its natural vegetation cover (Fundação SOS Mata Atlântica & INPE 2017), mainly in areas previously covered with Semideciduous Seasonal Forest, Araucaria Forest and Cerrado. In these three vegetation types, the loss of habitat to agriculture and urbanization has led to fragmentation and isolation of small populations. On the other hand, the Atlantic Rain Forest has most of its area protected in natural reserves, but the region is constantly threatened by urbanization.

Key to the native genera of Sapotaceae in Paraná, Brazil

1. Plants spiny; leaves opposite to subopposite at first, becoming alternate or fascicled on short shoots……..……..... 7. *Sideroxylum*
- Plants unarmed; leaves alternate, distichous or spirraly arranged……...……..…… 2
2. Stipules present, caducous, leaving a scar…… 3. *Ecclinusa*
- Stipules absent…….....…….. 3
3. Geoxylic subshrubs or cauliflorous trees…….. 6. *Pradosia*
- Shrubs or trees, inflorescences axillary and/or ramiflorous……...……...….…… 4
4. Calyx in 2 whorls of 2 or 3 sepals; if calyx in a single whorl of (4–)5 sepals, then staminodes present……...…….. 5
- Calyx in a single whorl of 5 sepals; staminodes absent…….……..… 6
5. Tertiary veins ramified; calyx in 2 whorls of 3 sepals; staminodes bifid or variously divided…….....…….. 4. *Manilkara*
- Tertiary veins reticulate or percurrent; calyx in 2 whorls of 2 sepals or in a single whorl of (4–)5 sepals; staminodes undivided……...…… 5. *Pouteria*
6. Corolla rotate; stamens exserted; ovary 1-locular, glabrous..... 2. *Diploon*
- Corolla tubulose, campanulate or cyathiform; stamens included; ovary 5-locular, lanate…… 1. *Chrysophyllum*

1. *Chrysophyllum* Linnaeus (1753: 192).

Shrub, treelet, understory or canopy tree, unarmed. Stipules absent. Leaves alternate, spirally arranged or distichous, spaced or loosely clustered at the stem apex; venation brochidodromous or eucampto-brochidodromous, secondary veins straight or slightly convergent, sometimes arcuate near the margim, parallel, intramarginal vein present, intersecondaries short, long or absent, interspersed among the secondaries and parallel to them, tertiary veins ramified, parallel to the secondaries and intersecondaries and descending from the margin (admedial) or loosely reticulate, quaternary veins reticulate, loosely reticulate or inconspicuous. Inflorescences axillary or ramiflorous. Flowers unisexual (dioecious) or androgynous; calyx in a single whorl of 5 sepals, free, valvate or quincuncial; corolla tubulose, campanulate or cyathiform, glabrous or with sparse hairs at the tube apex on the abaxial surface, tube shorter, equalling or longer than the lobes, lobes 5, undivided, margin entire; stamens 5, fixed at the base, on the lower third, on the half or at the top of the corolla

tube, included; staminodes absent; ovary 5-locular, lanate. Fruit bacoid, 1–5-seeded, smooth, glabrous or glabrescent, indehiscent. Seeds ellipsoid-fusiform, ellipsoid or suborbiculate, laterally compressed or not, testa smooth or rugulose, shining; scar basi-ventral or adaxial, broad or narrow, covering up to halfway, two-thirds or most of the whole seed length.

Key to the species of *Chrysophyllum* in Paraná, Brazil

1. Leaves distichous; stem not lenticellate..... 2
- Leaves spirally arranged; if distichous, then stem lenticellate……..... 3
2. Venation eucampto-brochidrodomous; tertiary veins loosely reticulate; stamens fixed on half or on the lower third of the corolla tube; anthers sparsely long-haired... 1.4 *C. paranaense*
- Venation brochidrodomous; tertiary veins ramified; stamens fixed at the top of the corolla tube; anthers glabrous..... 1.2 *C. inornatum*
3. Stamens fixed at the top of the corolla tube; fruits ripening black, ca. 0.6 cm long, always 1-seeded…….…..... 1.3 *C. marginatum*
- Stamens fixed in the lower half of the corolla tube; fruits ripening yellowish or yellowish-orange, 1.3–2.5 cm long, 1–5-seeded…….…..... 4
4. Stem lenticellate; venation brochidodromous or eucampto-brochidodromous, tertiary veins loosely reticulate; pedicel 1.3–2.5 mm long …….…..... 1.1 *C. gonocarpum*
- Stem not lenticellate; venation brochidodromous, tertiary veins ramified; pedicel 5.5–9.5 mm long …….....1.5 *C. viride*

1.1 ***Chrysophyllum gonocarpum*** (Martius & Eichler ex Miquel 1863: 60) Engler (1890: 523). Figure 5

Canopy to understory tree or treelet. Trunk section cylindrical, unbuttressed or slightly buttressed; bark grayish-brown to dark grayish-brown, fissured-scaly, fissure shallow or deep, short, V-shaped, parallel or oblique, ridges flattened, scales woody, rectangular or irregular; slash whitish or yellowish-white, tangential section with longitudinal streaks or sometimes with ripple marks, not discoloured, with scanty or occasionally abundant latex. Stems with young shoots grayish to yellowish-brown, soon grayish-brown or yellowish-brown, lenticellate, rough, angled at first, becoming rounded, young shoots pubescent, glabrescent or sometimes glabrous, soon glabrous. Leaves spirally arranged, spaced. Petiole 4.0–18.0(–20) mm long, grooved, pubescent or glabrous. Leaf blade chartaceous, 5.0–16.0 × 1.5–5.5 cm,

oblanceolate, narrow-obovate or rarely narrow-elliptic, apex rounded, obtuse or short-acuminate, rarely acute, sometimes mucronate or retuse, base acute or cuneate, glabrous or with sparse hairs on the midrib on both sides, venation brochidodromous or eucampto-brochidodromous, midrib sunken on the adaxial surface, raised on the abaxial surface, secondaries 11–19(–23) pairs, slightly convergent, slightly raised on the adaxial surface, raised on the abaxial surface, intersecondaries short or long, tertiary veins loosely reticulate, slightly raised on both sides, quaternary veins reticulate. Inflorescences axillary and ramiflorous, 1–8-flowered. Pedicel 1.3–2.5 mm long, sericeous-tomentose or pubescent. Flowers unisexual (dioecious), cream or greenish-cream *in vivo*; sepals quincuncial, 1.5–3.0 mm long, orbiculate, apex rounded, margin entire, abaxial surface pubescent or glabrescent, adaxial surface glabrous or with sparse hairs near the margin, sometimes with a broad glabrous marginal stripe; corolla cyathiform, glabrous, 2.5–4.0 mm long, tube equalling or slightly longer than the lobes, 1.0–2.0 mm long, lobes 1.2–1.9 mm long, ovate, apex acute; stamens fixed in the lower half of the corolla tube, filaments 1.0–1.7 mm long, glabrous, anthers 0.8–1.3 mm long, glabrous, absent in the pistillate flower; ovary ca. 1.0 mm long, conical, style 0.8–1.5 mm long, lanate at base, stigma slightly lobed. Fruit ripening yellowish or yellowish-orange, 1.3–1.9 × 1.5–1.7 cm, globose or orbiculate, glabrous, exocarp membranaceous, mesocarp and endocarp fleshy, calyx persistent, 1–5-seeded. Seed 1.3–1.7 × 0.7 cm, ellipsoid-fusiform, laterally compressed, testa smooth; scar adaxial, 9.5–13.5 mm long, narrow, covering about two-thirds of the seed length, linear.

Selected material:—BRAZIL. Paraná: Bandeirantes, 20 November 1995, *M.V. Ferrari Tomé* 607 (MBM). Cerro Azul, 11 November 1964, *G.G. Hatschbach* 11838 (MBM). Clevelândia, 15 December 1966, *G.G. Hatschbach* 15507 (MBM, NY). Fênix, 19 October 1995, *S.B. Mikich* s.n. (MBM, UPCB 26374). Foz do Iguaçu, 17 May 2017, *R.R. Völtz* 1512 (EFC, UPCB, VIES). Medianeira, 23 October 1969, *G.G. Hatschbach* 22608 (MBM, NY). Nova Cantu, 19 November 2014, *G. Felitto* 864 (HCF, MBM, RB). Rio Branco do Sul, 29 December 1989, *J.M. Silva* 763 (MBM, UPCB).

In Paraná *Chrysophyllum gonocarpum* is widespread, occurring mainly in Semideciduous Seasonal Forest, but reaching the Araucaria Forest in the Second and Third Plateaus, between 180 and 1015 m elev. Some specimens (*Hatschbach* 11838 and 53168, *Silva* 763) were collected in Atlantic Rain Forest in the Ribeira basin, between 370 and 650 m elev. Collected with flowers in January, and in August–December, fruits in March and May–November. This species is commonly found in secondary forest and forest edges. It can be recognized by the fissured-scaly bark, usually covered by mosses and liverworts, the slash

whitish or yellowish-white with scanty or occasionally abundant latex, the leaves spaced and spirally arranged, the yellowish ripening fruits that are sulcate between the seeds. It shares similar leaf morphology with *C. viride*, but it differs from it by the lenticellate stem (*vs*. not lenticellate in *C. viride*), the brochidodromous or eucampto-brochidodromous venation (*vs*. brochidodromous), the secondary veins slightly convergent (*vs*. straight and arcuate near the margin), the tertiary veins loosely reticulate (*vs*. ramified), and the pedicel 1.3–2.5 mm long (*vs*. 5.5–9.5 mm long). The flowers in *C. gonocarpum* are unisexual (*vs*. androgynous), but in the staminate flower pistiloid is present. Only looking at the pistillate flowers it is possible to know that the flowers are unisexual, because the stamens are absent.

Conservation Status:—This species was listed as "Not evaluated" (NE) by CNCFlora (2018). Although widespread in Paraná, its habitat was severely lost and most of the natural areas are small and fragmented.

1.2 *Chrysophyllum inornatum* Martius (1838: 96). Figure 6

Understory tree. Trunk section cylindrical or irregular in the lower third of the trunk, unbuttressed or slightly buttressed; bark light yellowish-brown, fissured-scaly, fissure shallow, short, V-shaped or wavy, parallel or oblique, ridges flattened, scales papyraceous, rectangular; slash light yellow-orange to light-red, tangential section with longitudinal streaks, not discoloured, abundant or scanty white latex. Stems with young shoots ochre, soon light yellowish-brown, not lenticellate, cracked, rounded, young shoots sericeous-tomentose, soon glabrous. Leaves distichous, spaced. Petiole 3.0–11.5 mm long, grooved, sericeous-tomentose, rarely glabrous. Leaf blade chartaceous, (3.0–)4.5–15.0(–19.0) × 2.0–5.5 cm, elliptic to narrow-elliptic, apex short-acuminate, long-acuminate or acute, base acute and slightly decurrent or cuneate, adaxial surface glabrous, abaxial surface pubescent, venation brochidodromous, midrib sunken on the adaxial surface, raised on the abaxial surface, secondaries 10–18 pairs, straight, slightly raised or flat on the adaxial surface, raised on the abaxial surface, intersecondaries long, tertiary veins ramified, flat on the adaxial surface, slightly raised on the abaxial surface, quaternary veins inconspicuous. Inflorescences axillary, 1–5-flowered. Pedicel 5.5–11.0 mm long, sericeous-tomentose. Flowers androgynous, cream or whitish *in vivo*; sepals valvate, ca. 1.2 mm long, lanceolate, apex acute, margin entire, abaxial surface sericeous-tomentose, adaxial surface glabrous or glabrescent, without a broad glabrous marginal stripe; corolla campanulate, glabrous, ca. 3.8 mm long, tube longer than the lobes, ca. 2.3 mm long, lobes ca. 1.4 mm long, ovate, apex acute or rounded; stamens fixed at

the top of the corolla tube, filaments ca. 0.7 mm long, glabrous, anthers ca. 0.6 mm long, glabrous; ovary ca. 1.1 mm long, ovoid, style ca. 0.7 mm long, glabrous, stigma slightly lobed. Fruit ripening black, ca. 2.8 × 1.1 cm, ellipsoid-lanceolate, glabrous, exocarp membranaceous, mesocarp fleshy and endocarp membranaceous, calyx and style persistent, 1-seeded. Seed ca. 2.0 × 0.7 cm, ellipsoid-fusiform, not laterally compressed, testa smooth; scar basi-ventral, 7.0 mm long, narrow, covering about one-thirds of the seed length, cordate.

Selected material:—BRAZIL. Paraná: Adrianópolis, 30 November 2016, *R.R. Völtz* 1088 (MBM, NY, RB, UPCB). Cambé, 18 November 2011, *E.M. Francisco* 461 (FUEL). Guaraqueçaba, 17 September 2016, *R.R. Völtz* 973 (EFC). Guaraqueçaba, 5 May 2018, *R.R. Völtz* 1525 (EFC). Guaratuba, 22 November 2016, *R.R. Völtz* 1089 (UPCB). Morretes, 01 April 1982, *A.C. Cervi* 1979 (UPCB). Morretes, 18 February 1982, *G.G. Hatschbach* 44580 (MBM, UPCB). Sertanópolis, 27 October 2009, *E.M. Francisco* 509 (FUEL).

In Paraná *Chrysophyllum inornatum* occurs in the coastal lowland on alluvial plains and in the mountainous region of the Atlantic coast and Serra do Mar on riversides and creeks between near sea level and 950 m elev., in Atlantic Rain Forest. Some collections have been made at the Third plateau between 570 and 600 m elev., in Semideciduous Seasonal Forest. Collected with flowers in January–April, and October–December, with fruits in April and July–December. It can be recognized by the crown with spreading branches, slash usually with an externally light-red ring and light yellow-orange in the center, the distichous leaves that are bicolored, dark green on the adaxial surface and light green on the abaxial surface (*in vivo*). It shares similar vegetative morphology with *C. marginatum* and *D. cuspidatum* due to the leaves arrangement and shape and the venation pattern. It differs from the latter by the wider spacing between the secondary veins (*vs.* closer veins in *D. cuspidatum*) that does not give the leaves a striate appearance, and from the former by the stem not lenticellate (*vs.* lenticellate in *C. marginatum*), the pedicel 5.5–11.0 mm long (*vs.* 1.0–3.0 mm long), corolla ca. 3.8 mm long (*vs.* 1.7–2.3 mm long), the tube longer than the lobes (*vs.* about equalling the lobes), and fruit ca. 2.8 cm long, ellipsoid-lanceolate (vs. 0.6 cm long, suborbiculate or ellipsoid).

Conservation Status:—This species was listed as “Least concern” (LC) by CNCFlora (2018). In Paraná *C. inornatum* is widespread along the Atlantic Rain Forest and most of its populations are in protected areas. The populations that occur in Semideciduous Seasonal Forest are restricted to a few isolated patches among agricultural/grazing and urban areas, with only one specimen collected in a protected area.

1.3 ***Chrysophyllum marginatum*** (Hooker & Arnott 1834: 283) Radlkofer (1887: 170). Figure 7

Shrub, treelet or canopy tree. Trunk section cylindrical or irregular, slightly buttressed; bark brownish to reddish-brown, scaly, scales papyraceous, woody or suberose, rectangular or irregular; slash ligth-reddish-brown to light-yellow-brown, tangential section with longitudinal streaks, not discoloured, with abundant white or brownish-white latex. Stems with young shoots ochre to reddish-brown, soon grayish-brown, lenticellate, slightly rough or cracked, angled at first, becoming rounded, young shoots sericeous-tomentose or rarely hispid-tomentose, soon glabrous. Leaves spirally arranged or rarely distichous at the stem apex, spaced or loosely clustered at the stem apex. Petiole 2.0–6.5(–8.5) mm long, grooved, sericeous-tomentose or rarely hispid-tomentose at fist, soon glabrescent or glabrous, rarely pubescent. Leaf blade chartaceous, 2.0–6.5 × 0.5–2.0 cm, elliptic or narrow-elliptic, apex acute, retuse or obtuse, base acute, adaxial surface glabrous, abaxial surface puberulent or glabrous, rarely pubescent, but sometimes with sparse hairs on the midrib, venation brochidodromous, midrib sunken on the adaxial surface, raised on the abaxial surface, secondaries 9–17 pairs, straight, flat or slightly sunken on the adaxial surface, slightly raised or rarely flat on the abaxial surface, intersecondaries long, tertiary veins ramified, flat on both sides, quaternary veins incospicuous. Inflorescences axillary and ramiflorous, 3–20-flowered. Pedicel 1.0–3.0 mm long, sericeous-tomentose or rarely pubescent. Flowers androgynous, cream or greenish-cream *in vivo*; sepals valvate, ca. 0.8 mm long, ovate, apex rounded, but sometimes obtuse or acute, margin entire, abaxial surface pubescent or rarely sericeous-tomentose, adaxial surface glabrous or with sparse hairs, sometimes with a broad glabrous marginal stripe; corolla campanulate, glabrous or with sparse hairs at the tube apex on the abaxial surface, 1.7–2.3 mm long, tube about equalling the lobes, 0.7–1.2 mm long, lobes ca. 1.1 mm long, wide-elliptic, apex rounded; stamens fixed at the top of the corolla tube, filaments ca. 0.5 mm long, glabrous, anthers ca. 0.5 mm long, glabrous; ovary ca. 0.5 mm long, globose, style ca. 0.3 mm long, glabrous, stigma slightly lobed. Fruit ripening black, 0.6 × 0.5 cm, suborbiculate or ellipsoid, glabrous or glabrescent, pericarp fleshy, calyx persistent, 1-seeded. Seed 0.5 × 0.4 cm, suborbiculate, not laterally compressed, testa smooth; scar basi-ventral, ca. 2.5 mm long, broad, covering up to halfway of the seed length, cordate.

Selected material:—BRAZIL. Paraná: Capitão Leônidas Marques, 21 March 1993, *S.M. Silva* s.n. (UPCB 20578). Cerro Azul, 6 February 1961, *G.G. Hatschbach* 7723 (MBM, UPCB). Fênix, 20 February 1999, *S.B. Mikich* s.n. (UPCB 37557). Guaíra, 13 November

1979, *E. Buttura* 315 (MBM). Icaraíma, 23 March 2018, *R.R. Völtz* 1488 (EFC, RB, UPCB). Tijucas do Sul, 10 April 1963, *G.G. Hatschbach* 10141 (MBM, UPCB).

In Paraná *Chrysophyllum marginatum* is widespread, occurring mainly in Semideciduous Seasonal Forest, but reaching the Araucaria Forest in the First, Second and Third Plateaus, between 180 and 1015 m elev. It can also be found in Cerrado and only one specimen (*Hatschbach* 7723) was collected in Submontane Atlantic Rain Forest along the Ribeira river. Its habit varies from shrubs in sandy and rocky riversides to canopy trees in the forest. Collected with flowers in January–June, in August–October, and in December, immature fruits in March and May–August and ripening fruits in September–December. It can be recognized by the brochidodromous venation, the intersecondaries long, and the ramified tertiary veins. The leaves are usually spirally arranged, but sometimes distichous at the stem apex. *Chrysophyllum marginatum* is vegetatively similar to *Diploon cuspidatum* and it can be distinguished by the leaves spirally arranged (*vs*. distichous in *D. cuspidatum*), the lenticellate stem (*vs*. not lenticellate), and the acute, retuse or obtuse apex (*vs*. long acuminate). It is also similar to *C. inornatum* and the differences between them are described under the latter. The collections from Paraná belong to *C. marginatum* subsp. *marginatum,* according to Pennignton (1990), which differs from *C. marginatum* subsp. *tomentosum* (Miquel 1863: 100) Cronquist (1946: 303) by the adaxial surface of the leaf puberulent or glabrous (*vs*. tomentose or pubescent), and abaxial surface of the corolla glabrous or with sparse hairs at the tube apex (*vs*. glabrous). However, some specimens (*Hatschbach* 10141, 16164 and 26620) have the abaxial surface of the leaf pubescent with stiff and spreading hairs. Pennington (1990) mentioned that specimens from Paraná with this character are more closely related to the subsp. *marginatum* than to the subsp. *tomentosum*.

Conservation Status:—This species was listed as “Not evaluated” (NE) by CNCFlora (2018). Although widespread in Paraná, its habitat was severely lost and the most of the natural areas are small and fragmented.

1.4 *Chrysophyllum paranaense* T.D. Pennington (1990: 578). Figure 8

Understory tree. Trunk section cylindrical, unbuttressed; bark light yellowish-brown, fissured-scaly, fissure shallow, short, V-shaped, parallel, ridges flattened, scales papyraceous, rectangular; slash light yellow-orange or light-red, tangential section with longitudinal streaks, not discoloured, abundant white latex. Stems with young shoots ochre to golden, soon light yellowish-brown, not lenticellate, angled or slightly fissured at first, becoming rounded

when older, young shoots sericeous-tomentose, soon glabrous. Leaves distichous, spaced. Petiole 3.5–10.5 mm long, grooved, sericeous-tomentose. Leaf blade chartaceous, (3.5–)4.0–17.0(–19.0) × (2.0–)3.0–7.0 cm, oblong, elliptic or rarely narrow-obovate, apex short-acuminate, rarely obtuse or long-acuminate, base obtuse or rounded, adaxial surface sericeous-tomentose or pubescent at first, soon glabrescent or glabrous, abaxial surface sericeous-tomentose or pubescent, but sericeous-tomentose on the midrib and secondaries, venation eucampto-brochidodromous, midrib sunken on the adaxial surface, raised on the abaxial surface, secondaries 8–15 pairs, slightly convergent and arcuate near the margin, slightly sunken or flat on the adaxial surface, raised on the abaxial surface, intersecondaries long, short or absent, tertiary veins loosely reticulate, inconspicuous or rarely flat on the adaxial surface, slightly raised on the abaxial surface, quaternary veins loosely reticulate. Inflorescences axillary, 2–7-flowered. Pedicel 7.5–19.0 mm long, sericeous-tomentose. Flowers androgynous, greenish-cream *in vivo*; sepals quincuncial, 3.0–4.0 mm long, ovate to suborbiculate, apex obtuse or rounded, margin entire, abaxial surface sericeous-tomentose, adaxial surface glabrous or pubescent at apex, with a broad glabrous marginal stripe; corolla cyathiform, glabrous, 6.0–7.5 mm long, tube longer than the lobes, 3.5–4.5 mm long, lobes 2.0–2.5 mm long, oblong, apex rounded; stamens fixed on half or on the lower third of the corolla tube, filaments 1.8–2.6 mm long, glabrous, anthers 1.0–1.5 mm long, sparsely long-haired; ovary 1.2–1.6 mm long, conical, style 3.5–5.0 mm long, pubescent at base, stigma slightly lobed. Fruit ripening dark-red (wine), ca. 3.1 × 1.7 cm, lanceolate, glabrescent, exocarp membranaceous, mesocarp fleshy and endocarp membranaceous, calyx and style persistent, 1-seeded. Seed ca. 1.8 × 0.8 cm, ellipsoid-fusiform, not laterally compressed, testa rugulose; scar basi-ventral, 13 mm long, broad, covering about two-thirds of the seed length, cordate.

Selected material:—BRAZIL. Paraná: Guaraqueçaba, 02 December 1998, *A.C. Cervi* 6497 (UPCB). Guaraqueçaba, 05 May 2017, *R.R. Völtz* 1483 (UPCB). Guaraqueçaba, 9 July 2017, *R.R. Völtz* 1511 (EFC). Guaratuba, 02 April 2016, *R.R. Völtz* 1526 (EFC, UPCB). Matinhos, without date, *S.R. Ziller* 1425 (HFC, MBM). Paranaguá, 26 January 1963, *G.G. Hatschbach* 9709 (MBM). Paranaguá, 31 January 1966, *G.G. Hatschbach* 13630 (MBM, NY, UPCB).

In Paraná *Chrysophyllum paranaense* occurs in the coastal lowland on alluvial plains and in the mountainous region of the Atlantic coast on the base of the hill slopes, near sea level to 120 m elev., in Alluvial and Submontane Atlantic Rain Forest. Collected with flowers in January, February, November and December, and fruit in April, May and July. It can be

recognized by the distichous leaves with the abaxial surface sericeous-tomentose or pubescent with hyaline to golden appressed hairs. The leaves are bicolored, green on the adaxial surface and light yellowish-green on the abaxial surface (*in vivo*), with eucampto-brochidodromous venation, and the tertiary and quaternary veins are loosely reticulate. This species shares similar morphology with *C. flexuosum,* and they are usually confused (Pennington, 1990). The morphology of the specimens collected in Paraná is similar to the one described by Pennington (1990) for *C. paranaense*. According to this autor, *C. paranaense* differs from *C. flexuosum* by the stem not lenticellate (*vs*. lenticellate or not in *C. flexuosum*), the base usually obtuse or rounded (*vs*. narrowly attenuate), the abaxial surface of the leaves sericeous-tomentose or pubescent with hyaline to golden hairs (*vs*. subglabrous with silvery appressed hairs), the tertiary veins loosely reticulate (*vs.* parallel to secondaries or reticulate), the corolla tube longer than the lobes (*vs*. tube equalling the lobes).

Conservation Status:—This species was listed as "Data Deficient" (DD) by CNCFlora (2018) and as "Vulnerable" (VU) by IUCN (2018). In Paraná *C. paranaense* is irregularly distributed along the Atlantic Rain Forest and few populations are in the protected areas. The loss of habitat to agriculture or urbanization is the main problem to its conservation.

1.5 *Chrysophyllum viride* Martius & Eichler (1863: 102). Figure 9

Canopy tree. Trunk section cylindrical, slightly buttressed or unbutressed; bark grayish to grayish-brown, rough; slash whitish or yellowish-white, tangential section with longitudinal streaks, not discoloured, with scanty white latex or absent. Stems with apical buds and young shoots ochre or grayish-yellowish-brown, soon grayish, not lenticellate, slightly rough, rounded, young shoots tomentose or pubescent, soon glabrous. Leaves spirally arranged, spaced. Petiole 10.0–26.0 mm long., grooved, tomentose, glabrescent or glabrous. Leaf blade chartaceous, 5.0–14.5 × 1.5–4.5 cm, narrow-elliptic, oblanceolate, narrow-obovate or elliptic, apex short-acuminate or acute, rarely rounded or emarginated, base acute to cuneate, adaxial surface glabrous, abaxial surface pubescent or glabrous, but sometimes with sparse hairs on the midrib, venation brochidodromous, midrib sunken on the adaxial surface, raised on the abaxial surface, secondaries 14–28 pairs, straight and arcuate near the margin, slightly raised on both sides, intersecondaries long, tertiary veins ramified, slightly raised on both sides, quaternary veins incospicuous. Inflorescences axillary, 3–12-flowered. Pedicel 5.5–9.5 mm long, pubescent. Flowers androgynous, whitish to greenish-cream *in vivo*; sepals quincuncial,

ca. 2.6 mm long, wide-ovate or suborbiculate, apex rounded or obtuse, margin entire, abaxial surface pubescent, adaxial surface glabrous, sometimes with a broad glabrous marginal stripe; corolla cyathiform, glabrous, ca. 3.5 mm long, tube shorter than the lobes, ca. 1.4 mm long, lobes ca. 2.1 mm long, wide-ovate, apex obtuse, sometimes auriculate at the base; stamens fixed in the lower third of the corolla tube, filaments ca. 1.5 mm long, glabrous, anthers 1.0 mm long, glabrous; ovary ca. 1.1 mm long, ovoid, style ca. 1.4 mm long, glabrous, stigma slightly lobed. Fruit ripening yellowish or yellowish-orange, 2.5 × 2.2 cm, globose or suborbiculate, glabrous, exocarp membranaceous, mesocarp and endocarp fleshy, calyx persistent, 1–4-seeded. Seed 2.3 × 1.1 cm, ellipsoid, laterally compressed, testa smooth; scar adaxial, ca. 1.8 mm long, narrow, covering most of the whole seed length, linear.

Selected material:—BRAZIL. Paraná: Adrianópolis, 23 November 2004, *J.M. Silva* 4234 (MBM). Campina Grande do Sul, 26 May 1969, *G.G. Hatschbach* 22224 (MBM). Guaraqueçaba, 21 November 1968, *G.G. Hatschbach* 20357 (MBM, NY). Guaratuba, 13 June 2017, *R.R. Völtz* 1262 (EFC, MBM, RB, UPCB). Morretes, 01 November 1968, *G.G. Hatschbach* 20181 (MBM). Morretes, 13 May 2017, *R.R. Völtz* 502 (MBM, UPCB). Morretes, 22 October 1968, *G.G. Hatschbach* 20086 (MBM). Rio Branco do Sul, 23 August 1961, *R.M. Klein* 2484 (MBM).

In Paraná *Chrysophyllum viride* occurs in the mountainous region of the Atlantic coast and Serra do Mar at the base of hill slopes and valleys until 1100 m elev., in Submontane and Montane Atlantic Rain Forest. It can reach the First Plateau along to the tributaries of the Ribeira river and Serra do Mar until the contact with the Araucaria Forest. Collected with flower buds in September and October, flowers in November, immature fruits in January and April and ripening fruits in April, May, June and August. It can be recognized by the rough bark, usually covered by mosses and liverworts, the slash whitish or yellowish-white with scanty or absent latex, the leaves spaced and spirally arranged, and a venation pattern that gives the leaves a striate appearance. The ripening fruit is yellowish and usually sulcate between the seeds. During the fruiting period, abundant fruits can be observed on the ground around the tree. It shares similar leaf morphology with *C. gonocarpum*, and the differences between them are discussed under the latter species.

Conservation Status:—This species was listed as “Near threatened” (NT) by CNCFlora (2018). In Paraná *C. viride* is widespread along the Atlantic Rain Forest and most of its populations are in protected areas. The loss of habitat to agriculture or urbanization is the main problem to its conservation.

2. *Diploon* Cronquist (1946: 466).

Canopy tree, unarmed. Stipules absent. Leaves alternate and distichous, spaced; venation brochidodromous, secondary veins straight, parallel, intramarginal vein present, intersecondaries long, interspersed among the secondaries and parallel to them, often extending to the margin, tertiary veins ramified, parallel to the secondaries and intersecondaries and descending from the margin (admedial), quaternary veins inconspicuous. Inflorescences axillary. Flowers androgynous; calyx in a single whorl of 5 sepals, free, valvate; corolla rotate, glabrous, tube shorter than the lobes, lobes 5, undivided, margin entire; stamens 5, fixed at the top of corolla tube, exserted; staminodes absent; ovary 1-locular, glabrous. Fruit bacoid, 1-seeded, smooth, glabrous, indehiscent. Seeds broadly ellipsoid, not laterally compressed, testa smooth, shining; scar basal, broad, covering up to one third of the length.

2.1 *Diploon cuspidatum* (Hoehne 1933: 302) Cronquist (1946: 466). Figure 10

Trunk sections cylindrical or slightly fluted, buttressed; bark light-brown to reddish-brown, scaly, scales papyraceous, rectangular; slash light-yellow-orange, tangential section with longitudinal streaks, not discoloured, with abundant or seldom scanty latex. Stems grayish, not lenticellate, slightly fissured, rounded, sericeous-tomentose, pubescent or glabrescent at first, soon glabrous. Petiole 2.5–6.5 mm long, slightly grooved, glabrescent or glabrous. Leaf blade chartaceous, 5.0–10.5 × 1.5–4.0 cm, narrow-elliptic or narrow-oblong, apex long acuminte, base acute to slightly decurrent, adaxial surface glabrous, abaxial surface glabrescent or glabrous, midrib flat or slightly raised on the adaxial surface, raised on the abaxial surface, secondaries 13–24 pairs, secondaries and tertiaries flat or slightly sunken on the adaxial surface, flat or slightly raised on the abaxial surface. Inflorescences 2–10-flowered. Pedicel 1.0–4.0 mm long, tomentose. Flowers whitish to cream *in vivo*; sepals 1.2–1.8 mm long, ovate, apex rounded, margin entire, abaxial surface tomentose or pubescent, adaxial surface with sparse hairs, without a broad glabrous marginal stripe; corolla 2.1–3.6 mm long, tube 0.4–1.2 mm long, lobes 1.6–2.6 mm long, ovate, apex rounded; filaments 0.7–1.4 mm long, glabrous, anthers 0.6–0.9 mm long, glabrous; ovary ca. 0.8 mm long, ovoid, style 0.3–0.7 mm long, glabrous, stigma simple. Fruit ripening black, ca. 2.2 × 1.9 cm, globose, exocarp coriaceus, mesocarp fleshy, endocarp gelatinous, calyx persistent. Seed 1.5 × 1.2 cm; scar 6.7–7.9 mm long, rounded.

Selected material:—BRAZIL. Paraná: Guaraqueçaba, 13 November 1994, *S.F. Athayde 200* (UPCB). Guaraqueçaba, 4 August 2017, *R.R.Völtz 1302* (EFC, HCF, MBM, NY, RB, UPCB, VIES). Guaraqueçaba, 1 September 2017, *R.R.Völtz 1367* (EFC, NY, RB, UPCB). Guaraqueçaba, 9 January 2018, *R.R.Völtz 1465* (EFC, MBM, NY, RB, SP, UPCB, VIES). Morretes, 12 August 1968, *G.G. Hatschbach* 19595 (MBM, INPA, RB, UEC, UPCB). Morretes, 24 January 1969, *G.G. Hatschbach* 20921 (MBM, NY).

Additional selected material:—BRAZIL. Santa Catarina: Joinville, 27 September 2013, *M.E. Engels* 1667 (MBM). São Paulo: Pariquera-Açu, 21 September 1996, *N.M. Ivanauskas* 894 (MBM, UEC). São Paulo, 28 September 1960, *O. Handro* 956 (HUEFS, MBM).

In Paraná *Diploon cuspidatum* occurs in the Atlantic coast mountainous regions and Serra do Mar on hill slopes up to 700 m elev., in Submontane Atlantic Rain Forest. Collected with flowers in August and September and with fruits in December and January. It can be recognized by the leaves spaced, alternate and distichous, long acuminate apex, a venation pattern that gives the leaves a striate appearance, and the slash with a yellowish-brown ring below the bark that distinguishes it from the light-yellow-orange inner bark. The ripening fruit is black and has a sweet jelly adherent to the seed. During the fruiting period, abundant fruits can be observed on the ground around the tree.

Conservation Status:—This species was listed as “Not evaluated” (NE) by CNCFlora (2018). In Paraná *D. cuspidatum* is irregularly distributed along the Atlantic Rain Forest and most of the populations are in protected areas. The loss of habitat to agriculture or urbanization is the main problem to its conservation.

3. *Ecclinusa* Martius (1839: 2).

Canopy tree, unarmed. Stipules present, caducous, leaving a scar. Leaves alternate and spirally arranged, loosely clustered or clustered at the stem apex; venation eucamptodromous, secondary veins straight and arcuate near the margin, parallel, intramarginal vein absent, intersecondaries absent, tertiary veins percurrent, branches oblique, quaternary veins inconspicuous. Inflorescences ramiflorous. Flowers unisexual (monoecious); calyx in a single whorl of 5–(6) sepals, free, valvate; corolla cyathiform, glabrous or pubescent at the top of tube on the adaxial surface, tube shorter than the lobes, lobes 5–(6), undivided, margin entire; stamens 5, fixed at the top of corolla tube, included, absent in the pistillate flower; staminodes absent; ovary 5-locular, lanate. Fruit bacoid, 4–5-seeded, immature velutinous, ripening

glabrous with tufts of residual loose indumentum, indehiscent. Seed ellipsoid, laterally compressed, testa smooth, shining; scar adaxial, narrow, covering the whole seed length.

3.1 ***Ecclinusa ramiflora*** Martius (1839: 2). Figure 11

Trunk section cylindrical or occasionally slightly fluted, unbuttressed or sligtly buttressed; bark pale-grayish to light brownish-gray, rough; slash whitish, tangential section with longitudinal streaks, discoloured to brownish, with abundant latex. Stems with young shoots light brownish-yellow, soon pale-grayish, not lenticellate, angled at first, becoming rounded, young shoots tomentose, soon glabrous. Stipules 2.3–3.4 mm long, lanceolate or narrow-ovate, abaxial surface tomentose or pubescent, margin ciliate. Petiole 11.5–18.0 mm long., grooved and narrowly winged, tomentose. Leaf blade chartaceous, 8.0–20.0 × 2.5–6.5 cm, narrow-elliptic, elliptic or oblanceolate, apex acute or shortly acuminate, base acute to cuneate, adaxial surface glabrous, but tomentose on the midrib and secondaries, abaxial surface tomentose or pubescent, midrib sunken on the adaxial surface, raised on the abaxial surface, secondaries 14–22 pairs, slightly sunken on the adaxial surface, raised on the abaxial surface, tertiaries flat on the adaxial surface, raised on the abaxial surface. Inflorescences 6–10-flowered. Pedicel absent. Flowers greenish *in vivo*; sepals ca. 2.5 mm long, lanceolate, apex acute, margin entire, abaxial surface sericeous-tomentose, adaxial surface sericeous-tomentose or pubescent, without a broad glabrous marginal stripe; corolla in staminate flowers ca. 4.0 mm long, tube ca. 1.0 mm long, lobes ca. 3.0 mm long, in pistillate flowers ca. 3.5 mm long, tube ca. 1.0 mm long, lobes ca. 2.5 mm long, ovate, apex acute or obtuse; filaments ca. 1.5 mm long, glabrous, anthers 0.8 mm long, glabrous; ovary ca. 1.5 mm long, ovoid, style absent, stigma 5-lobed. Fruit ripening brown-orange, ca. 3.8 × 5.2 cm, oblate, exocarp chartaceous, mesocarp fleshy, calyx persistent. Seeds ca. 2.0 × 1.3 cm; scar ca. 20 mm long, narrow-obovate.

Selected material:—BRAZIL. Paraná: Guaraqueçaba, 3 December 2016, *R.R. Völtz* 1106 (EFC, MBM, NYBG, RB, UPCB). Guaraqueçaba, 1 September 2017, *R.R. Völtz* 1368 (EFC, MBM, NY, RB, UPCB, VIES). Guaraqueçaba, 9 January 2018, *R.R. Völtz* 1466 (MBM, RB).

Additional selected material:—BRAZIL. São Paulo: Cananéia, 29 November 1989, *M.R.F. Melo* 730 (SP, UPCB).

In Paraná *Ecclinusa ramiflora* have been found only in its Northestern portion, in the Atlantic coast mountainous region on hill slopes up to 400 m elev., in Submontane Atlantic

Rain Forest. Collected with flowers in December, immature fruits in September and ripening fruits in January. Although the bark pattern is vary variable, ranging from wavy fissured to lenticellate or with dippled marks, it can be recognized by the whitish slash that turns into brownish, evidencing the longitudinal striations on the surface. The caducous stipules that leave a scar (sometimes obscured by the indument), the leaves with percurrent, oblique tertiary veins strongly raised on the abaxial surface, the absence of intersecondaries veins, and flowers and fruits directly attached on the stems are important features for field recognition. During the fruiting period, abundant fruits can be observed in the ground around the tree.

Conservation Status:—This species was listed as "Not evaluated" (NE) by CNCFlora (2018). There is only known population of *E. ramiflora* in Paraná are inside a protected area. The loss of habitat to agriculture or urbanization is the main problem to its conservation.

4. ***Manilkara*** Adanson (1763: 166, 574).

Canopy to emergent tree, unarmed. Stipules absent. Leaves alternate and spirally arranged, clustered at the stem apex; venation brochidodromous, secondary veins straight, parallel, intramarginal vein present, intersecondaries long, interspersed among the secondaries and parallel to them, often extending to the margin, tertiary veins ramified, parallel to the secondaries and intersecondaries and descending from the margin (admedial), quaternary veins inconspicuous. Inflorescences axillary. Flowers androgynous; calyx in 2 whorls of 3 sepals, free, valvate; corolla rotate, glabrous, tube shorter than the lobes, lobes 6, divided to the base into 3 segments, margin entire; stamens 6, fixed at the top of corolla tube, exserted; staminodes 6, bifid or variously divided; ovary 6–10-locular, glabrous. Fruit bacoid, 1–2-seeded, smooth, glabrous, indehiscent. Seeds ellipsoid, laterally compressed, testa smooth, shining; scar basi-ventral, narrow, covering up to half of the seed length.

4.1 ***Manilkara subsericea*** (Martius 1839: 3) Dubard (1915: 22). Figure 12

Trunk sections cylindrical, buttressed or not; bark ligth-reddish-brown or pinkish-gray, fissured, fissures deep, long, V-shaped, parallel or oblique, ridges flattened or rounded, sometimes scales are visible on ridges; slash reddish, tangential section with longitudinal streaks, not discoloured, with abundant latex. Stems with young shoots dark-brown, becoming grayish, scarcely lenticellate, slightly fissured or seldom reticulate, rounded, glabrous. Petiole

9.5–27.0 mm long, grooved at the apex and rouded at the base, glabrescent or glabrous. Leaf blade chartaceous or coriaceous, (3.5–)5.0–11.5 × (1.5–)2.5–6.5 cm, narrow-obovate, wide-obovate or seldom oblanceolate, apex rounded, obtuse, truncate, emarginate or shortly acuminate, base acute or cuneate, adaxial surface glabrous, abaxial surface sericeous at first with whitish hairs forming a pellicle, becoming glabrous or occasionally with sparse hairs, midrib slightly raised but recessed on the adaxial surface, raised on the abaxial surface, secondaries 12–27 pairs, flat on the adaxial surface, slightly sunken on the abaxial surface, tertiaries inconspicuous on the adaxial surface, slightly sunken on the abaxial surface. Inflorescences 2–7-flowered. Pedicel 6.5–16.0 mm long, glabrescent or glabrous. Flowers whitish to yellowish-white *in vivo*; sepals ca. 4.3–4.8 mm long, the outer ones lanceolate or oblong, apex acute or obtuse, margin ciliate, abaxial surface sericeous, adaxial surface glabrous, the inner ones oblong or elliptic, apex obtuse, margin ciliate, abaxial surface sericeous, adaxial surface glabrous or with sparse trichomes at the apex, both without a broad glabrous marginal stripe; corolla ca. 5.0 mm long, tube ca. 1.5 mm long, lobes 3.3–3.7 mm long, median segment elliptic, apex obtuse, lateral segments lanceolate, apex acute, equalling the median segment; filaments 1.5–2.7 mm long, glabrous, anthers 1.4–2.1 mm long, glabrous; staminodes 1.6–2.5 mm long, glabrous, margin variously divided; ovary ca. 1.0 mm compr., ovoid, style 3.0–5.3 mm long, glabrous, stigma simple. Fruit ripening red, 1.4–2.0 × 1.3–2.0 cm, globose, exocarp coriaceous, mesocarp or endocarp gelatinous, calyx and style persistent. Seed 1.1–1.7 × 0.8–1.1 cm; scar 8 mm long, ellipsoid.

Selected material:—BRAZIL. Paraná: Antonina, 16 September 1965, *G.G. Hatschbach* 12764 (MBM, UPCB). Guaraqueçaba, 23 December 1999, *C.B. Jaster* s.n. (UPCB 41162). Guaratuba, 10 August 1987, *G.G. Hatschbach* 51302 (MBM, UPCB). Matinhos, 9 August 1989, *S.R. Ziller* 67 (MBM, EFC). Morretes, 6 November 1968, *G.G. Hatschbach* 20213 (MBM). Morretes, 20 February 2017, *R.R. Völtz* 1188 (MBM, UPCB) Paranaguá, 31 January 1997, *G. Gatti* 91 (MBM, UPCB, EFC). Pontal do Paraná, 1 November 1966, *G.G. Hatschbach* 13648 (MBM, UPCB).

In Paraná *Manilkara subsericea* occurs in the coastal plain, in the Atlantic coast mountainous region and Serra do Mar between sea level and 500 m elev., in Atlantic Rain Forest. In the coastal plain it grows on sandy soils in Restinga and Lowland forests, while in the mountainous region on clay soil on Submontane forest. Collected with flowers in May and August and fruits in November, December, January and February. It can be recognized by the fissured bark, slash with the outer bark thick, suberose, light-brown to reddish-brown that is distinct from the reddish inner bark. The venation pattern gives the leaves a striate

appearance, easily recognizeble by the fallen leaves on the ground. The ripening fruit is red and has a sweet jelly adherent to the seed. During the fruiting period, abundant fruits can be observed on the ground around the tree. Pennington (1990) considers *M. subsericea* similar to *M. salzmannii*, and distinguished the former by the whitish or grayish sericeous indumentum on the abaxial surface of the leaf, and by the variously divided staminodes, which may be equal or longer than the stamens. Fabris & Peixoto (2013) did not observe the differences in the staminode and stamen morphology, and distinguished *M. subsericea* by the young leaves sparsely pilose on the abaxial surface, with whitish or grayish to eventually brownish hairs, while *M. salzmannii* has young leaves glabrous or sub-glabrous on the abaxial surface, with brownish hairs when present. Hovewer, the leaves usually become glabrous or occasionally with sparse hairs on the abaxial surface with age, making it difficult to identify the species using these characters.

Conservation Status:—This species was listed as "Least concern" (LC) by CNCFlora (2018). In Paraná *M. subsericea* is widespread along the Atlantic Rain Forest, although its distribution is irregular. Most of its populations are in protected areas, but nowadays the main problem to its consevation is the loss of habitat to urbanization, mainly in Lowland Atlantic Rain Forest.

5. *Pouteria* Aublet (1775: 85–86).

Treelet or tree, unarmed. Stipules absent. Leaves alternate and spirally arranged, loosely clustered or clustered at the stem apex or spaced; venation eucamptodromous, eucampto-brochidodromous or brochidodromous, secondaries straight or convergent, parallel or acuate, intramarginal vein present or poorly developed, intersecondaries long, poorly developed or absent, tertiary veins reticulate or percurrent, branches oblique or horizontal, quaternary veins reticulate or incospicuous. Inflorescences axillary, ramiflorous or set in a short aphyllous axillary shoot. Flowers unisexual (dioecious) or androgynous; calyx in a single whorl of (4–)5 sepals or in 2 whorls of 2 sepals, free, imbricate; corolla tubulose or cyathiform, glabrous or with sparse hairs at the base on the adaxial surface, tube shorter, slightly equal or longer than the lobes, lobes 4–6(–7), undivided, margin entire, ciliate, papillose or seldom erose; stamens 4–6(–7), fixed at the base, in the lower third, halfway, in the upper third or at the top of the corolla tube, included; staminodes 4–6(–7), undivided; ovary 4–6-locular, lanate. Fruit bacoid, 1–3-seeded, tomentose, pubescent, puberulent or glabrescent, indehiscent. Seed

ellipsoid or laterally compressed when two or more in a fruit; testa smooth or rugulose, shining or matt; scar adaxial, broad or narrow, covering all or most of the whole seed length.

Key to the species of *Pouteria* in Paraná, Brazil

1. Leaves linear or narrow-oblanceolate (the length-width ratio equal or more than 6:1); venation brochidodromous..... 5.9 *P. salicifolia*
- Leaves narrow-obovate, oblanceolate, wide-elliptic, elliptic, narrow-elliptic or oblong (the length-width ratio less than 6:1); venation eucamptodromous or eucampto-brochidodromous..... 2
2. Abaxial leaf surface pubescent, but tomentose on the midrib and secondaries, or tomentose..... 3
- Abaxial leaf surface sericeous, pubescent, puberulent, glabrescent or glabrous; if pubescent, then not tomentose on the midrib and secondaries……..... 4
3. Leaves bullate; venation eucampto-brochidodromous: lobes of the corolla with ciliate margins; filaments 3.7-5.0 mm long……..……...…. 5.2 *P. bullata*
- Leaves not bullate; venation eucamptodromous; lobes of the corolla with sparsely ciliate margins; filaments 2.5–3.3 mm long..... 5.10 *P. torta*
4. Calyx with a single whorl of (4–)5 sepals……..… 5
- Calyx with 2 whorls of 2 sepals……...…… 6
5. Venation eucampto-brochidodromous, secondary veins convergent, arcuate; pedicel 1.0–2.5 mm long…… 5.4 *P. durlandii*
- Venation eucamptodromous, secondary veins straight and arcuate near the margin, parallel; pedicel 5.8–8.7 mm long……...……..…… 5.5 *P. gardneri*
6. Tertiary veins percurrent, branches oblique or horizontal; if loosely reticulate, then corolla lobes 6(–7)-merous, these papillose…….…….. 7
- Tertiary veins loosely reticulate or reticulate……...…...… 10
7. Abaxial leaf surface pubescent or puberulent and sericeous; corolla 2.3–3.0 mm long; fruit oblate; seed scar covering most of the seed surface…….....… 5.6 *P. glomerata*
- Abaxial leaf surface glabrescent or glabrous; corolla 5.0–10.0 mm long; fruit suborbiculate or globose; seed scar not covering most of the seed surface (fruit and seed not seen in *Pouteria* sp.).....….. 8
8. Flowers with 6(–7) corolla lobes, these papillose..... 5.11 *P. venosa*
- Flowers with 4 corolla lobes, these not papillose……..... 9

9. Petiole weakly grooved, hispid-tomentose; pedicel 0.0–0.7 mm long; corolla ca. 8.0 mm long, lobes with sparsely ciliate margins; stamens fixed at the upper third of the corolla tube...……..... 5.7 *P. guianensis*
- Petiole flat, sericeous-tomentose, puberulent or glabrous; pedicel 1.7–2.9 mm long; corolla ca. 5.1 mm long, lobes with ciliate margins; stamens fixed on half or on the lower third of the corolla tube……...…… 5.12 *Pouteria* sp.
10. Corolla lobes with entire margins; stamens fixed in the upper third or at the top of the corolla tube …..... 5.8 *P. ramiflora*
- Corolla lobes with ciliate margins; stamens fixed on half of the corolla tube..……..…. 11
11. Venation eucampto-brochidodromous; staminodes oblong, with ciliate margins; fruits yellowish, orangish or reddish, puberulent or glabrescent…...……..... 5.1 *P. beaurepairei*
- Venation eucamptodromous or seldom brochidodromous; staminodes narrow-lanceolate, with entire margins; fruits brownish or ferrugineous, tomentose……. 5.3 *P. caimito*

5.1 ***Pouteria beaurepairei*** (Glaziou & Raunkiaer 1889:7) Baehni (1942: 241). Figure 13

Canopy tree. Trunk section cylindrical, buttressed; bark reddish-brown, brown or grayish-brown, scaly, scales papyraceous, rectangular; slash light yellow-orange or light-red, tangential section with ripple marks, not discoloured, with abundant or scanty latex. Stems with young shoots reddish-brown, soon yellowish-brown or reddish-brown, not lenticellate, cracked and scaling with irregular scales, slightly angled at fist, becoming rounded when older, young shoots sericeous-tomentose or glabrous, seldom glabrescent, soon glabrous. Leaves spaced or loosely clustered at the stem apex. Petiole (2.0–)3.0–9.5(–16.0) mm long, flat or narrowly winged to grooved, sericeous-tomentose, pubescent or glabrous at first, becoming glabrous. Leaf blade chartaceous or thinly coriaceous, 5.0–16.0 × 1.5–6.0 cm, narrow-obovate, oblanceolate, seldom oblong or narrow-elliptic, apex obtuse, acuminate or rounded, seldom shortly acuminate or acute, base cuneate or acute, narrowly decurrent, glabrous on both sides or with sparse hairs on the midrib on the abaxial surface, venation eucampto-brochidodromous, midrib flat or slightly raised on the adaxial surface, raised on the abaxial surface, secondaries 4–13 pairs, convergent, arcuate, slightly raised on the adaxial surface, raised on the abaxial surface, thin intramarginal vein present, intersecondaries absent or poorly developed, tertiary veins loosely reticulate, slightly raised on both sides, quaternary veins reticulate. Inflorescences axillary or ramiflorous, 1–5(–7)-flowered. Pedicel 2.0–5.0 mm long, sericeous-tomentose, pubescent or glabrescent. Flowers androgynous or unisexual (in

this case lacking the anthers, but with persistent filaments in the pistillate flower), pinkish or cream *in vivo*; calyx in 2 whorls of 2 sepals, 2.5–3.5 mm long, the outer ones narrow-ovate or ovate, apex rounded, margin entire, abaxial surface pubescent or puberulent, adaxial surface glabrous, without a broad glabrous marginal stripe, the inner sepals wide-elliptic or ovate, apex obtuse or rounded, margin sparsely ciliate, abaxial surface pubescent, puberulent or glabrous, adaxial surface glabrous, with a broad glabrous marginal stripe; corolla tubulose, glabrous, 3.0–4.5 mm long, tube slightly longer or longer than the lobes, 2.0–3.0 mm long, lobes 4, 1.0–2.5 mm long, oblong, apex rounded or truncate, margin ciliate; stamens 4, fixed halfway to the corolla tube, filaments 1.0–2.5 mm long, glabrous, anthers ca. 1.0 mm long, glabrous; staminodes 4, 1.0–2.0 mm long, oblong, margin ciliate; ovary 4-locular, 0.8–1.7 mm long, globose, style 2.0–3.0 mm long, glabrous, stigma slightly lobed. Fruit ripening yellowish, orangish or reddish, when older grayish-brown, ca. 2.5–3.0 × 2.5–3.2 cm, globose, puberulent or glabrescent, hard thick pericarp, calyx persistent, 1–3-seeded. Seed ca. 1.9 × 1.4 cm, ellipsoid and laterally compressed when two or more in a fruit; testa smooth or rugulose, matt; scar 19 mm long, broad, covering the whole seed length, ellipsoid.

Selected material:—BRAZIL. Paraná: Congonhinhas, 10 February 1999, *E.M. Francisco* s.n. (ESA, FUEL 23769, MBM). Guaraqueçaba, 15 April 2017, *R.R. Völtz* 23 (EFC, MBM, NY, UPCB, VIES). Guaratuba, 6 January 1999, *M. Borgo* 367 (EFC, NY, UPCB). Londrina, *E. Bianchini* s.n. (FUEL 35055). Ortigueira, 6 September 2012, *C. Michelon* 1533 (MBM). Paranaguá, 2 November 1965, *G.G. Hatschbach* 13074 (MBM). Paranaguá, 19 January 1980, *R. Kummrow* 1326 (MBM, NY). Paula Freitas, 25 June 2014, *P. Hoffmann* s.n. (EFC 14374). Pitanga, 19 February 2005, *A.E. Bianek* 233 (HCF, MBM).

Additional selected material:—BRAZIL. Santa Catarina: Araquari, 22 January 2008, *M.S. Weiers* 22 (MBM).

In Paraná *Pouteria beaurepairei* occurs at two regions: one at the Atlantic coast between sea level and 20 m elev., in Lowland Atlantic Rain Forest on sandy soils; another at the Second and Third plateau between 500 and 960 m elev., in Araucaria Forest and the Semideciduous Seasonal Forest. Collected with flowers in December, January, February, and March. The fruits usually remain in the tree and in many cases the older fruits persist for a long time, so they are collected throughout the year. Fruit collections have been made in March to July and September to December. It can be recognized by the leaves glabrous on both sides, the venation eucampto-brochidodromous with few convergent, arcuate secondary veins, tertiaries loosely reticulate, and yellowish to reddish fruits. The specimens at the Atlantic Rain Forest show a scaly bark, and the slash with concentric rings of white and dark

colors in the outer bark. We did not see the bark of specimens that occur at the Plateaus. There are slight morphological differences between populations in these two regions: the specimens at the Atlantic coast usually have glabrous young shoots, flat petioles, obtuse to rounded leaf apices, and fewer secondary veins (4–9); the specimens at the Second and Third Plateaus have sericeous-tomentose to glabrescent young shoots, narrowly winged to grooved petioles, acuminate to obtuse leaf apices, and more secondary veins (6–13). It shares similar morphology to *Pouteria* sp. and the differences between them are described under the latter.

Conservation Status:—This species was listed as "Least concern" (LC) by CNCFlora (2018). In Paraná *P. beaurepairei* is widespread along the Lowland Atlantic Rain Forest, and few individuals are in protected areas. The populations that occur at the Second and Third plateaus are scattered along the borders between Araucaria Forest and the Semideciduous Seasonal Forest, and few individuals are in protected areas. Nowadays the main problem to its conservation is the loss of habitat to urbanization, mainly in the Lowland Atlantic Rain Forest, and to agriculture at the Second and Third plateaus.

5.2 *Pouteria bullata* (S. Moore 1925: 205) Baehni (1942: 257). Figure 14

Canopy to emergent tree. Trunk section cylindrical or irregular in the lower third of the trunk, buttressed or not; bark reddish-brown or dark-brown, fissured, fissure deep, long, V-shaped, parallel or oblique, ridges flattened or rounded, sometimes fissured-scaly, scales woody, suberose or papyraceous, rectangular; slash light yellow-orange, tangential section with longitudinal streaks, not discoloured, with abundant latex. Stems with young shoots ferrugineous, soon reddish-brown or grayish-brown, not lenticellate, cracked and scaly, angled or rounded at first, becoming rounded when older, young shoots hispid-tomentose, soon glabrous. Leaves clustered at the stem apex. Petiole 10.7–44.1 mm long, grooved, hispid-tomentose or seldom glabrescent. Leaf blade coriaceous or chartaceous, 9.3–33.6 × 4.7–14.8 cm, narrow-obovate or seldom elliptic, apex shortly acuminate, rounded or obtuse, base cuneate to acute, adaxial surface glabrous, but tomentose on the midrib, abaxial surface pubescent, but tomentose on the midrib and secondaries, venation eucampto-broquidodromous, midrib slightly raised but recessed on the adaxial surface, raised on the abaxial surface, secondaries 13–25 pairs, straight and arcuate near the margin, parallel, slightly raised but recessed on the adaxial surface, raised on the abaxial surface, intramarginal vein present, intersecondaries absent, tertiary veins percurrent, branches oblique, slightly sunken or flat on the adaxial surface, raised on the abaxial surface, quaternary veins reticulate.

Inflorescences ramiflorous 2–5-flowered. Pedicel 1.0–2.4 mm long, sericeous-tomentose. Flowers androgynous, greenish *in vivo*; calyx in 2 whorls of 2 sepals, 4.0–6.1 mm long, ovate, apex obtuse, the outer ones with margin entire or sparsely ciliate, abaxial surface pubescent or sericeous-tomentose, adaxial surface glabrous, the inner ones with margin sparsely ciliate, abaxial surface sericeous-tomentose, adaxial surface glabrous, with a broad glabrous marginal stripe; corolla tubulose, glabrous, 7.1–8.3 mm long, tube longer than the lobes, 4.3–6.1 mm long, lobes 4, ca. 3.0 mm long, wide-oblong, apex rounded or obtuse, margin ciliate; stamens 4, fixed halfway or in the lower third of the corolla tube, filaments 3.7–5.0 mm long, glabrous, anthers ca. 1.5 mm long, glabrous; staminodes 4, ca. 2.5 mm long, narrow-oblong, margin entire or sparsely ciliate; ovary 4-locular, 1.2–4.0 mm long, ovoid, style 3.7–10.5 mm long, glabrous, stigma simple or slightly lobed. Fruit ripening yellowish, ca. 4.5 × 4.0 cm, subglobose, globose or wide-ellipsoid, tomentose, hard thick pericarp, style and calyx persistent, 1-seeded. Seed ca. 3.0 × 2.0 cm, ellipsoid; testa smooth, shining; scar ca. 25 mm long, broad, covering all or most of the whole seed length, oblong.

Selected material:—BRAZIL. Paraná: Adrianópolis, 21 March 2017, *R.R. Völtz* 1203 (EFC, HCF, MBM, RB, UPCB, VIES). Adrianópolis, 26 September 2016, *R.R. Völtz* 1156 (MBM). Bocaiúva do Sul, 30 October 1990, *G.G. Hatschbach* 54792 (MBM). Campina Grande do Sul, 24 September 1969, *G.G. Hatschbach* 22242 (MBM). Guaratuba, 22 October 1971, *G.G. Hatschbach* 27567 (MBM). Piraquara, 1 May 1949, *G.G. Hatschbach* 1399 (MBM, UPCB).

Additional selected material:—BRAZIL. São Paulo: Barra do Turvo, 6 April 2002, *O.S. Ribas* 4603 (MBM).

In Paraná *Pouteria bullata* occurs in the mountainous region of the Atlantic coast and Serra do Mar on hill slopes up to 1100 m elev., in Submontane and Montane Atlantic Rain Forest. It can be mainly found above 650 m elev. along the tributaries of the Ribeira river until the contact with the Araucaria Forest. Collected with flower buds in January and June, flowers in March and May, immature fruits in June and July and ripening fruits in August, September and November. It can be recognized by the deep fissured bark, slash with the outer bark thick with whitish spots or lines on the surface, the leaves densely clustered at the stem apex, the large and bullate leaves, and the erect two-branched hairs on the abaxial surface of the leaf. *Pouteria bullata* and *P. torta* have been confused util now becase they share similar vegetative morphology, such as the hispid-tomentose ferrugineous indumentum on the young shoots, the leaves densely clustered at the stem apex, the strongly raised veins, and the pubescent to tomentose abaxial surface of the leaf. However, *P. bullata* differs by the midrib

and secondary veins slightly raised but recessed and tertiaries slightly sunken or flat on the adaxial leaf surface , making it looks like bullate (*vs*. not bullate in *P. torta*), the abaxial surface of the leaf with erect two-branched hairs (*vs*. with tangled and matted hairs), the corolla lobes with ciliate margins (*vs*. sparsely ciliate), and filaments 3.7-5.0 mm long (*vs*. 2.5–3.3 mm long). Pennington (1990) suggested that the floral characters of *P. bullata,* such as the densely ciliate corolla margins, short filaments, and short included style differ from the ones from *P. torta*, which has a sparsely ciliate corolla margin, larger filaments, and a longer exserted style. However, in the specimens from Paraná, some of these floral characters were not found: although it is clear the difference between the densely and sparsely ciliate corolla margins, the filaments in *P. bullata* are longer than in *P. torta*, and the style in *P. bullata* is exserted. Furthermore, *P. bullata* is a large tree occurring in the Atlantic Rain Forest, while *P. torta* is a small tree growing in the Cerrado. *Pouteria bullata* is similar to *P. guianensis* and the differences between them are discussed under the latter species.

Conservation Status:—This species was listed as "Endangered" (EN) by CNCFlora (2018) and "Vulnerable" (VU) by IUCN (2018). In Paraná *P. bullata* is irregularly distributed along the Submontane and Montane Atlantic Rain Forest and most populations are in protected areas. The loss of habitat to agriculture/pastures/forest plantation is the main problem to its conservation.

5.3 *Pouteria caimito* (Ruiz & Pavón 1802: 18) Radlkofer (1882: 333). Figure 15

Canopy to emergent tree. Trunk section cylindrical or irregular in the lower third of the trunk, buttressed or not; bark reddish-brown, scaly, scales woody, rectangular, sometimes fissured-scaly, fissure shallow or deep, short or long, irregular, oblique, ridges flattened; slash light yellow-orange, tangential section with longitudinal streaks, not discoloured, with abundant or seldom scanty latex. Stems with apical bud ferrugineus, becoming blackish when young, soon grayish, grayish-brown or yellowish-brown, not lenticellate, slightly scaly, rounded, sericeous-tomentose or pubescent at first, becoming glabrous when older. Leaves loosely clustered at the stem apex. Petiole (5.0–)7.0–22.0(–26.0) mm long, slightly grooved at the apex, rounded at the base, sericeous-tomentose or pubescent, sometimes glabrous. Leaf blade chartaceous, 4.0–18.0 × 1.0–5.0 cm, oblanceolate or narrow-elliptic, apex acute or obtuse, seldom acuminate, base acute, cuneate or narrowly decurrent, glabrous on both sides or with sparse hairs on midrib on the abaxial surface, venation eucamptodromous or seldom brochidodromous, midrib slightly raise but recessed on the adaxial surface, raised on the

abaxial surface, secondaries 9–15 pairs, convergent, arcuate, flat or slightly raised on the adaxial surface, raised on the abaxial surface, intramarginal vein present, intersecondaries absent, tertiary veins loosely reticulate, slightly raised on both sides, quaternary veins reticulate. Inflorescences axillary or ramiflorous, sometimes densely clustered, 1–5-flowered. Pedicel 0.8–2.5 mm long, sericeous-tomentose or glabrous. Flowers androgynous, greenish-white or greenish-cream *in vivo*; calyx in 2 whorls of 2 sepals, 2.4–4.0 mm long, the outer ones wide-ovate or ovate, apex obtuse, margin entire or ciliate, abaxial surface sericeous-tomentose or glabrous, adaxial surface glabrous, the inner ones elliptic, apex obtuse, margin ciliate, abaxial surface sericeous-tomentose, adaxial surface glabrous, with a broad glabrous marginal stripe; corolla tubulose, glabrous, 5.2–6.3 mm long, tube longer or slightly equal than the lobes, 3.0–4.3 mm long, lobes 4, 2.0–3.0 mm long, oblong or wide-oblong, apex truncate or obtuse, margin ciliate; stamens 4, fixed halfway to the corolla tube or with a sligh variation below or above, filaments 2.5 mm long, glabrous, anthers 1.1–1.7 mm long, glabrous; staminodes 4, 1.0–1.7 mm long, narrow-lanceolate, margin entire; ovary 4-locular, 0.7–1.8 mm long, ovoid, style 2.7–5.0 mm long, glabrous, stigma slightly lobed. Fruit brownish or ferrugineous, 1.4–2.3 × 1.1–1.7 cm, narrow-elliptic or ovate, tomentose, hard thick pericarp, calyx persistent. Seed not available.

Selected material:—BRAZIL. Paraná: Guaraqueçaba, 5 May 2017, *R.R. Völtz* 211 (MBM, UPCB). Morretes, 4 October 1968, *G.G. Hatschbach* 19899 (MBM, NY). Paranaguá, 26 March 1975, *G.G. Hatschbach* 36582 (MBM).

Additional selected material:—BRAZIL. São Paulo: Cajati, 30 September 2002, *J.M. Silva* 3648 (MBM). Pariquera-Açu, 29 June 1996, *N.M. Ivanauskas* 838 (MBM). São Miguel Arcanjo, 20 April 2002, *A.P. Savassi* 231 (MBM). São Paulo, 10 April 1932, *P. Gonçalves* s.n. (MBM 215813).

In Paraná *Pouteria caimito* occurs in the mountainous region of the Atlantic coast and Serra do Mar on hill slopes between 20 and 800 m elev., in Lowland, Submontane and Montane Atlantic Rain Forest. Collected with flower buds in February and flowers in March and April, with fruits in May, July, August and October. It can be recognized by the scaly or sometimes fissured-scaly bark, the slash with outer bark light-brown or dark-brown that, in many cases, shows whitish spots or lines on the surface, the leaf with loosely reticulate tertiary veins and finely reticulate quaternary veins, and the fruits with a ferruginous tomentose indumentum. The fruits sometimes remain in the tree for a long time. Pennington (1990) considered *P. caimito* vegetatively similar to *P. guianensis*. Both species share similar bark pattern and slash, although the trunk of *P. guianensis* is usually strongly fluted.

However, the leaf morphology of *P. caimito* is very distinctive, with the petiole slightly grooved at the apex and rounded at the base (*vs*. weakly grooved in all its length in *P. guianensis*), much narrower leaves (1.0–5.0 cm wide, *vs*. broader leaves, 4.0–9.5 cm wide), leaf base usually acute or cuneate (*vs*. obtuse or rounded), and tertiary venation loosely reticulate (*vs*. clearly differentiated into oblique tertiaries and reticulate quaternaries), besides the distinct geographic occurrence.

Conservation Status:—This species was listed as "Not evaluated" (NE) by CNCFlora (2018). In Paraná *P. caimito* is irregularly distributed on hill slopes and occasionally on the coastal plain in the Atlantic Rain Forest. Most of its populations are in protected areas, but the loss of habitat to agriculture/pastures is the main problem to its conservation.

5.4 *Pouteria durlandii* (Standley 1925: 5) Baehni (1942: 422). Figure 16

Canopy tree. Trunk section cylindrical or irregular in the lower third of the trunk, slightly buttressed or not; bark reddish-brown or brown, scaly, scale papyraceous or seldom woody, retangular or irregular; slash light yellow-orange, light reddish-brown or pinkish, tangential section with ripple marks, not discoloured, with abundant or seldom scanty latex. Stems with apical bud and young shoots reddish-brown, soon grayish-bronw or grayish, without or seldom scarce lenticels, rough or sometimes poorly scaly, angle at first, becoming rounded when older, young shoots sericeous-tomentose, pubescent or glabrous, soon glabrous. Leaves spaced or loosely clustered at the stem apex. Petiole 7.5–20.9 mm long, flat, glabrous or with sparse hairs, seldom tomentose. Leaf blade chartaceous, (5.5–)7.5–15.5(19.0) × 2.0–6.6 cm, oblanceolate, apex acuminate or shortly acuminate, base cuneate or acute, glabrous on both sides or with sparse hairs on midrib and secondaries on the abaxial surface, venation eucampto-brochidodromous, midrib slightly raised on the adaxial surface, raised on the abaxial surface, secondaries 5–11 pairs, convergent, arcuate, slightly raised on the adaxial surface, raised on the abaxial surface, thin intramarginal vein present, intersecondaries absent or poorly developed, tertiary veins loosely reticulate, slightly raised on both sides, quaternary veins reticulate. Inflorescences axillary and ramiflorous, 1–4-flowered. Pedicel 1.0–2.5 mm long, tomentose or pubescent. Flower unisexual (dioecious), whitish *in vivo*; calyx in a single whorls of (4–)5-sepals, 2.0–3.6 mm long, lanceolate or oblong, apex acute or obtuse, margin entire, abaxial surface tomentose, adaxial surface glabrous, without a broad glabrous marginal stripe; corolla cyathiform, glabrous, flower staminate 4.0–4.7 mm long, tube shorter than the lobes, 1.3–2.1 mm long, lobes 5, ca. 2.5 mm long; flower pistillate ca. 3.5 mm long, tube

shorter than the lobes, ca. 1.0 mm long, lobes 5, ca. 2.5 mm long, ovate, apex acute or rounded, sometimes auriculate at the base, margin entire; stamens 5, fixed at the top of the corolla tube, filaments 1.2 mm long, glabrous, anthers 1.0–1.8 mm long, glabrous; stamens absent in pistillate flower; staminodes 5, 0.6–1.3 mm long, lanceolate, margin entire; staminodes reduced in pistillate flower; ovary 2–3-locular, ca. 0.5 mm long, ovoid, style 1.7–2.7 mm long, glabrous, stigma slightly lobed. Fruit ripening greenish-yellow, yellow or reddish-yellow, ca. 2.5 × 2.6 cm, globose to subglobose, glabrous, exocarp coriaceus, mesocarp fleshy, endocarp gelatinous, calyx persistent, 1–3-seeded. Seed ca. 2.1 × 1.7 cm, ellipsoid; testa smooth, matt; scar 16–20 mm long, broad, covering most of the seed length, elliptic.

Selected material:—BRAZIL. Paraná: Antonina, 12 January 1968, *G.G. Hatschbach* 18282 (MBM, NY, UPCB). Antonina, 22 September 1982, *G.G. Hatschbach* 45419 (INPA, MBM). Guaraqueçaba, 29 January 1968, *G.G. Hatschbach* 18498 (MBM, NY). Guaraqueçaba, 4 March 2017, *R.R. Völtz* 1170 (UPCB). Guaraqueçaba, 10 January 2018, R.R. Völtz *1467* (EFC, MBM, NY, RB, UPCB, VIES).

Additional selected material:—BRAZIL. Santa Catarina: São Francisco do Sul, 4 January 2017, *R.R. Völtz* 1209 (MBM, RB, UPCB, VIES). São Francisco do Sul, 1 March 2017, *R.R. Völtz* 1187 (MBM, NY, RB, UPCB, VIES).

In Paraná *Pouteria durlandii* occurs in the Atlantic coast mountainous region and Serra do Mar on hill slopes between 50 and 400 m elev., in Submontane Atlantic Rain Forest. Collected with flower buds in December, with flowers in January and one single record in September (*Hatschbach* 45419), with fruits in March, May and August. The trees usually have trunks sprouting at the base, the leaves are bicolored, dark green on the adaxial surface and light green on the abaxial surface (*in vivo*), and the leaves usually show orange spots probably caused by fungi. It can be recognized by the scaly bark, the tangential slash section with ripple marks, the venation eucampto-brochidodromous with secondary veins convergent and arcuate, and tertiary veins loosely reticulate. The collections from Paraná belong to *P. durlandii* subsp. *durlandii* (as defined by Pennignton 1990), which differs from *P. durlandii* subsp. *pubicarpa* T.D. Pennington (1990: 325) by the leaves 7.5–20 cm long (*vs*. 15–30 cm long), secondary veins 7–14 pairs (*vs*. 13–20 pairs), fruits 2.0–2.5 cm long, glabrous (*vs*. fruits 3.0–3.5 cm long, velutinous).

Conservation Status:—This species was listed as “Not evaluated” (NE) by CNCFlora (2018). In Paraná *P. durlandii* is irregularly distributed on hill slopes, and most populations

are in protected areas. The loss of habitat to agriculture/pastures is the main problem to its conservation.

5.5 *Pouteria gardneri* (Martius & Miquel 1863:102) Baehni (1942:233). Figure 17

Tree or treelet. Trunk section cylindrical, unbuttressed; bark whitish-gray, rough; slash light yellow-orange, tangential section with ripple marks, not discoloured, with abundant latex. Stems with young shoots ochre, soon grayish, lenticellate, slightly fissured, rounded, tomentose or pubescent at first, becoming glabrous when older. Leaves spaced or loosely clustered at the stem apex. Petiole 4.0–8.0 mm long, flat or grooved, tomentose or pubescent, seldom glabrous. Leaf blade chartaceous, 4.5–12.5 × 2.0–3.0 cm, narrow-elliptic, oblanceolate or elliptic, apex acuminate, base acute to shortly decurrent, glabrous on both sides or with sparse hairs at the base of the midrib on the abaxial surface, venation eucamptodromous, midrib raised on both sides, secondaries 8–19 pairs, straight and arcuate near the margin, parallel, slightly raised on the adaxial surface, raised on the abaxial surface, thin intramarginal vein present, intersecondaries absent or poorly developed, tertiary veins percurrent, branches oblique, or reticulate, slightly raised on both sides, quaternary veins reticulate. Inflorescences axillary and ramiflorous, 1–3-flowered. Pedicel 5.8–8.7 mm long, pubescent. Flowers androgynous, greenish *in vivo*; calyx in a single whorls of 5 sepals, 2.5–3.0 mm long, ovate or oblong, apex rounded, margin entire or occasionly ciliate, abaxial surface pubescent, adaxial surface glabrous or with sparse hairs at the base, without a broad glabrous marginal stripe; corolla cyathiform, glabrous or with sparse hairs at the base on the abaxial surface, ca. 3.5 mm long, tube shorter than the lobes, ca. 1.5 mm long, lobes 5, 2.2–2.8 mm long, wide-ovate or suborbiculate, apex rounded, margin entire or erose; stamens 5, fixed at the top of the corolla tube, filaments ca. 1.5 mm long, glabrous, anthers ca. 2.0 mm long, glabrous; staminodes 5, ca. 1.5 mm long, narrow-lanceolate, margin entire; ovary 2-locular, 1.2 mm long, subglobose, style ca. 1.5 mm long, glabrous, stigma simple or slightly 2-lobed. Fruit and seed not available.

Selected material:—BRAZIL. Paraná: Adrianópolis, 6 November 2016, *R.R. Völtz* 1113 (EFC, HCF, MBM, NY, RB, UPCB, VIES). Cerro Azul, 25 February 2015, *J.M. Silva* 8755 (MBM).

In Paraná *Pouteria gardneri* occurs at two regions: one in the mountainous region of Ribeira river between 120 and 300 m elev., in Submontane Atlantic Rain Forest; another in the riverbanks of Paraná river at 245 m elev., in Alluvial Semideciduous Seasonal Forest.

Collected with flowers in November and February and with fruits in November and December. It can be recognized by the eucamptodromous venation with secondary veins straight, parallel and arcuate near the margin, the glaucous abaxial surface of the leaf, and the flowers with long pedicels (5.8–8.7 mm long). Pennington (1990) mentioned that *P. gardneri* has unisexual flowers (dioecious), but the specimens from Paraná have stamens and ovary in the same flowers, thus we considered them as androgynous flowers.

Conservation Status:—This species was listed as "Not evaluated" (NE) by CNCFlora (2018). In Paraná *P. gardneri* the two main populations are disjunct, none of them in protected areas. The loss of habitat to agriculture/pastures, the decline in quality of habitat, and the construction of dams are the main problem to its conservation.

5.6 *Pouteria glomerata* (Miquel 1863: 81) Radlkofer (1882: 333). Figure 18

Treelet. Trunk section cylindrical or occasionally irregular, unbuttressed or slightly buttressed; bark dark-brown, scaly, scales papyraceous, rectangular or irregular, sometimes fissured-scaly, fissure shallow, short, V-shaped, oblique, ridges flattened; slash light yellow-orange, tangential section with ripple marks, not discoloured, with abundant latex. Stems with young shoots light yellowish-brown, soon grayish, not lenticellate, cracked and scaly in longitudinal scales, rounded, sericeous-tomentose at first, becoming glabrous when older. Leaves loosely clustered or clustered at the stem apex. Petiole 4.0–10.8 mm long, flat, sericeous-tomentose or sericeous-tomentose at the base and glabrous at the apex. Leaf blade chartaceous, 3.5–14.5 × 1.5–6.0 cm, oblanceolate, narrow-elliptic or narrow-obovate, seldom elliptic, apex obtuse, acute, shortly acuminate or rounded, base acute, obtuse or cuneate, adaxial surface glabrescent or glabrous, but with sparse hairs on midrib, abaxial surface pubescent or puberulent and sericeous, venation eucampto-brochidodromous, midrib flat on the adaxial surface, raised on the abaxial surface, secondaries (6–)8–12 pairs, convergent, slightly arcuate, flat on the adaxial surface, raised on the abaxial surface, thin intramarginal vein present, intersecondaries absent, tertiary veins percurrent, branches oblique to horizontal, flat on the adaxial surface, slightly raised on the abaxial surface, quaternary veins reticulate. Inflorescences axillary and ramiflorous, 1–13-flowered. Pedicel 0.5–1.3 mm long, sericeous-tomentose. Flowers androgynous, cream *in vivo*; calyx in 2 whorls of 2 sepals, 2.3–3.3 mm long, oblong or wide-elliptic, apex obtuse, margin entire or the inner ones occasionally sparsely ciliate, the outer ones with abaxial surface tomentose, adaxial surface glabrous, the inner ones with abaxial surface glabrous or with sparse hairs, adaxial surface glabrous, both

without a broad glabrous marginal stripe; corolla cyathiform, glabrous, 2.3–3.0 mm long, tube longer than the lobes, ca. 1.5 mm long, lobes 4, 0.6–1.2 mm long, oblong, apex rounded, obtuse or truncate, margin entire or occasionally ciliate; stamens 4, fixed at the base or in the lower third of the corolla tube, filaments 1.1–1.8 mm long, glabrous, anthers ca. 1.0 mm long, glabrous; staminodes 4, ca. 0.5 mm long, oblong, margin entire or occasionally sparsely ciliate; ovary 4-locular, 0.5–1.2 mm long, subglobose, style 1.0–1.9 mm long, glabrous, stigma simple or slightly 4-lobed. Fruit yellowish, 2.9–3.2 × 3.5–3.8 cm, oblate, tomentose when immature, glabrous or with residual indumentum when ripe, calyx persistent, 1–3-seeded. Seed 1.6–2.6 × 0.8–1.8 cm, ellipsoid; testa almost absent, smooth, shining; the scar covering most of the seed surface, rugose.

Selected material:—BRAZIL, Paraná: Icaraíma, 21 January 1967, *G.G. Hatschbach* 15813 (MBM, NY, RB, UPCB). Marilene, 21 March 2018, *R.R. Völtz* 1524 (HCF, RB, SP, UPCB, VIES). Porto Basílio, 14 August 2006, *E.M. Alves* 513 (HUEM, RB, UPCB). Porto Rico, 23 November 1986, *J.M. Margarido* 14 (HUEM, UPCB). São Jorge do Patrocínio, 2 October 2014, *M.G. Caxambu* 5536 (HCF, UPCB).

Additional selected material:—BRAZIL. São Paulo: Teodoro Sampaio, 11 March 1981, *C.F.S. Muniz* 316 (SP).

In Paraná *Pouteria glomerata* occurs in riverbanks and periodically flooded forests between 220 and 350 m elev., in Alluvial Semideciduous Seasonal Forest. Collected with flower buds in August and October, with flowers in November and January and with fruits in January and March. It can be recognized by the slash with concentric whitish and dark-brown rings in the outer bark, the tertiary veins percurrent with oblique to horizontal branches, the abaxial surface of the leaf sericeous, with whitish hairs forming a pellicle and resulting in a grayish lower surface. Pennington (1990) mentioned that *P. glomerata* has unisexual flowers, but the specimens from Paraná have stamens and ovary in the same flowers, thus we considered them as androgynous flowers. The collections from Paraná belong to *P. glomerata* subsp. *glomerata* according to Pennignton (1990), which differs from *P. glomerata* subsp. *stylosa* (Pierre 1891:42) T.D. Pennington (1990: 420) by the acute, obtuse or rounded leaf base, and the apex often obtuse (vs. leaf base and apex narrowly attenuate in *P. glomerata* subsp. *stylosa*), and the abaxial surface of the leaf usually sericeous with whitish hairs (*vs*. sericeous with yellowish hairs).

Conservation Status:—This species was listed as “Least concern” (LC) by CNCFlora (2018). In Paraná *P. glomerata* is widespread along riverbanks and islands of the Paraná river,

and some individuals are in protected areas. Nowadays the main problem to its conservation are the decline in the quality of habitat, the construction of dams, and urbanization.

5.7 ***Pouteria guianensis*** Aublet (1775: 86). Figure 19

Canopy tree or occasionally treelet. Trunk section fluted or cylindrical, buttressed and fluted; bark reddish-brown, scaly, scales papyraceous, rectangular or irregular, or fissured-scaly, fissure shallow or occasionally deep, short, V-shaped, oblique, ridges V-shaped; slash light yellow-orange, tangential section with longitudinal streaks, discoloured to dark yellow-orange or not, with abundant or seldom scanty latex. Stems with young shoots ferrugineous, soon yellowish-brown or grayish-brown, not lenticellate, cracked and scaly, rounded, hispid-tomentose at first, becoming glabrous when older. Leaves clustered at the stem apex. Petiole 4.5–17.0(–20.0) mm long, weakly grooved, hispid-tomentose. Leaf blade chartaceous, 7.0–19.0 × 4.0–9.5 cm, elliptic, narrow-obovate or oblanceolate, seldom narrow-elliptic, apex rounded, obtuse or weakly retuse, seldom acute or shortly acuminate, base obtuse, rounded or cuneate, seldom truncate or acute, glabrous, but with sparse hairs on midrib and secondaries on both sides, venation eucamptodromous, sometimes eucampto-brochidodromous, midrib slightly raised but recessed on the adaxial surface, raised on the abaxial surface, secondaries 11–18 pairs, straight and slighlty arcuate near the margin, parallel, slightly raised on the adaxial surface, raised on the abaxial surface, intramarginal vein present, intersecondaries absent or poorly developed, tertiary veins percurrent, branches oblique, flat on the adaxial surface, slightly raised on the abaxial surface, quaternary veins reticulate. Inflorescences ramiflorous, 2–4-flowered. Pedicel 0.0–0.7 mm long, sericeous-tomentose. Flowers androgynous; calyx in 2 whorls of 2 sepals, 4.4–5.3 mm long, the inner ones longer than the outer ones, suborbiculate or wide-elliptic, apex acute, margin ciliate, abaxial surface sericeous-tomentose, adaxial surface glabrous, the inner ones with a broad glabrous marginal stripe; corolla tubulose, glabrous, ca. 8.0 mm long, tube longer than the lobes, ca. 5.5 mm long, lobes 4, ca. 3.0 mm long, suborbiculate, apex rounded, margin sparsely ciliate; stamens 4, fixed in the upper third of the corolla tube, filaments 2.6 mm long, glabrous, anthers ca. 2.5 mm long, glabrous; staminodes 4, ca. 2.0 mm long, oblong, margin entire or sparsely ciliate; ovary 4-locular, 0.8 mm long, globose, style 7.2 mm long, glabrous, stigma slightly lobed. Fruit ripening yellowish, ca. 5.4 × 3.9 cm, suborbiculate or globose, when immature tomentose, becoming pubescent or glabrescent, hard thick pericarp, calyx persistent, 1-seeded.

Seed ca. 1.9 × 1.0 cm, ellipsoid; testa smooth, shining; scar ca. 18.5 mm long, narrow, covering most of the seed length, narrow-oblong.

Selected material:—BRAZIL. Paraná: Alto Paraíso, 5 December 1995, *J. Carneiro* 95 (MBM). Diamante do Norte, 17 October 2001, *C.I.L.F. Rosa* 19 (HUEM, UPCB). Diamante do Norte, 19 September 2011, *H.C. Belan* 16 (HUEM, UPCB). Icaraíma, 21 January 1967, *G.G. Hatschbach* 15815 (MBM, UPCB). Querência do Norte, 16 December 2005, *E.M. Alves* 248 (HUEM, RB, UPCB).

Additional selected material:—BRAZIL. Mato Grosso do Sul: Amambaí, 2 August 2000 *G.G. Hatschbach* 58703 (MBM).

In Paraná *Pouteria guianensis* occurs in the riverside and alluvial plains of the Paraná river and his tributaries, between 220 and 400 m elev., in Seasonal Semideciduous Forest. Collected with flowers in September, October and December and with fruits in December and January. It can be recognized by the fluted trunk, especially at the base in larger specimens, the scaly bark or sometimes fissured-scaly bark with grooves and ridges anastomosing along the trunk, the glabrous abaxial surface of the leaves, and the conspicuous differentiation between the oblique terciaries from reticulate quaternaries. Before this work, *P. guianensis* was not recorded for Paraná. It was either misidentified as *P. caimito*, or as *P. torta*, and consequently this becomes the first record in Paraná. The specimens from Paraná fit as *P. torta* subsp. *glabra* (according to Pennigton 1990), which differs from *P. torta* subsp. *torta* and *P. torta* subsp. *tuberculata* (Sleumer 1938: 18) T.D. Pennington (1990: 483) by the glabrous abaxial leaf surface (*vs*. pubescent or tomentose). Currently *P. torta* subsp. *glabra* is a synonym of *P. guianensis* (Alves-Araújo 2014). *Pouteria guianensis* is similar to *P. bullata* due to the leaves densely clustered at the stem apex, and leaf shape and width. It can be distinguished from the latter by the glabrous abaxial leaf surface (*vs*. tomentose in *P. bullata*), the leaves not bullate (*vs*. bullate), and the corolla lobes with sparsely ciliate margins (*vs*. ciliate), besides the distinct geographic occurrence.

Conservation Status:—This species was listed as “Not evaluated” (NE) by CNCFlora (2018). In Paraná *P. guianensis* is irregularly distributed on riverside and alluvial plains of the Paraná river and his tributaries, and few individuals are in protected areas. Nowadays the main problem to its conservation are the decline in the quality of habitat, the construction of dams and urbanization.

5.8 *Pouteria ramiflora* (Martius 1838: 93) Radlkofer (1882: 333). Figure 20

Treelet. Trunk section cylindrical or irregular in the lower third of the trunk, buttressed; bark grayish-brown, tessellated; slash reddish, tangential section with longitudinal streaks, not discoloured, with scanty latex. Stems with young shoots ferrugineous, soon grayish-brown, not lenticellate, slightly fissured or fairly suberose, slightly angled at first, becoming rounded when older, young shoots hispid-tomentose, soon glabrous. Leaves spaced or loosely clustered at the stem apex. Petiole (4.0–)6.5–16.0 mm long, grooved or flat at the base and grooved at the apex, hispid-tomentose or puberulent. Leaf blade chartaceous, 4.0–14.0 × 2.0–5.5 cm, elliptic or narrow-elliptic, apex obtuse or shortly-acuminate, base acute to weakly decurrent, adaxial surface glabrescent to glabrous or with sparse hairs on midrib, abaxial surface puberulent, glabrescent or glabrous, venation eucamptodromous, midrib sunken at the base and slightly raised at the apex on the adaxial surface, raised on the abaxial surface, secondaries 11–13 pairs, straight and arcuate near the margin, parallel, flat or slightly raised on the adaxial surface, slightly raised on the abaxial surface, thin intramarginal vein present, intersecondaries short or long, tertiary veins reticulate, flat on both sides, quaternary veins reticulate. Inflorescences axillary, ramiflorous or is set in a short aphyllous axillary shoot, 1–12-flowered. Pedicel 3.5–6.5(–7.5) mm long, hispid-tomentose or puberulent. Flowers androgynous, greenish *in vivo*; calyx in 2 whorls of 2 sepals, 2.0–2.8 mm long, suborbiculate, apex acute, obtuse or rounded, margin entire or sparsely ciliate, abaxial surface tomentose or puberulent, adaxial surface glabrous or with sparse hairs at the apex, without a broad glabrous marginal stripe; corolla tubulose, glabrous, 2.8–3.6 mm long, tube slightly longer or longer than the lobes, 1.5–2.2 mm long, lobes 4, ca. 1.5 mm long, wide-elliptic, apex rounded, margin entire; stamens 4, fixed in the upper third or at the top of the corolla tube, filaments ca. 0.5 mm long, glabrous, anthers ca. 0.5 mm long, glabrous; staminodes 4, ca. 0.5 mm long, oblong or elliptic, margin entire; ovary 2-locular, ca. 1.0 mm long, subglobose, style 1.0–1.6 mm long, glabrous, stigma simple. Fruit and seed not avaiable.

Selected material:—BRAZIL. Paraná: Icaraíma, 15 October 2014, *M.G. Caxambú* 5571 (HCF, RB, UPCB).

Additional selected material:—BRAZIL. Mato Grosso do Sul: Nova Andradina, 25 October 1986, *U. Pastore* 142 (MBM).

This is the first record for *Pouteria ramiflora* in Paraná, based in only one specimen collected in Ilha Grande National Park. The species occurs in the shrubland-grassland mosaic at the islands in the Paraná river, in Alluvial Semidecidal Seasonal Forest. Collected with

flowers in October. It can be recognized by the grayish-brown tessellated bark, the slash reddish with whitish latex, the eucamptodromous venation with secondary veins straight and arcuate near the margin, parallel, the intersecondaries usually well-developed, and the flowers sometimes set in a short axillary shoot resembling a raceme. Pennington (1990) mentioned that *P. ramiflora* has unisexual flowers (dioecious plants), but the specimen studied here has stamens and ovary in the same flower, thus we consider them as androgynous.

Conservation Status:—This species was listed as "Not evaluated" (NE) by CNCFlora (2018). *Pouteria ramiflora* is known from one individual, occurring in a protected area.

5.9 *Pouteria salicifolia* (Sprengel 1825: 419) Radlkofer (1882: 333). Figure 21

Treelet. Trunk section cylindrical, buttressed; bark reddish-brown, scaly, scales papyraceous, rectangular or irregular; slash light yellow-orange, tangential section with ripple marks, not discoloured, with scanty latex. Stems with young shoots ferrugineous, soon yellowish-brown, not lenticellate, rounded, sericeous-tomentose at first, becoming glabrous when older. Leaves loosely clustered at the stem apex. Petiole 3.0–7.0 mm long, flat, sericeous-tomentose or glabrous. Leaf blade chartaceous, 7.5–18.0 × 0.7–1.5 cm, linear or narrow-oblanceolate, apex acute, sometimes mucronate, base cuneate and decurrent, adaxial surface glabrous, abaxial surface tomentose or pubescent at first, becoming glabrous when older, venation brochidodromous, midrib raised on both sides, secondaries (17–)23–44 pairs, straight or slightly convergen, parallel, slightly raised on both sides or flat on the abaxial surface, intramarginal vein present, intersecondaries long, tertiary veins loosely reticulate, slightly raised on both sides or flat on the abaxial surface, quaternary veins inconspicuous. Inflorescences axillary, 1–2-flowered. Pedicel 5.5–7.5 mm long, tomentose. Flowers androgynous, cream *in vivo*; calyx in 2 whorls of 2 sepals, ca. 6.0 mm long, the outer ones ovate, apex obtuse, margin entire, the inner ones wide-elliptic, apex rounded, margin ciliate, both with abaxial surface tomentose, adaxial surface glabrous, the inner ones with a broad glabrous marginal stripe; corolla tubulose, glabrous, 9.2 mm long, tube longer than the lobes, 5.6 mm long, lobes 4, ca. 3.5 mm long, oblong, apex rounded or truncate, margin ciliate; stamens 4, fixed halfway of the corolla tube, filaments 4.2 mm long, glabrous, anthers ca. 2.5 mm long, glabrous; staminodes 4, ca. 3.0 mm long, oblong, margin entire; ovary 4-locular, 1.6 mm long, ovoide, style 7.4 mm long, glabrous, stigma slightly lobed. Fruit when immature greenish-brown, ca. 5.9 × 1.3 cm, wide-ellipsoid, tomentose or pubescent, calyx and style persistent. Seed not avaiable.

Selected material:—BRAZIL. Paraná: Nova Cantu, 2014, *G. Felito* 898 (HCF, MBM, RB). Três Barras do Paraná, 17 October 1997, *J.M. Silva* 2141 (HFC, MBM, NY).

Additional selected material:—BRAZIL. Rio Grande do Sul: Santana do Boa Vista, 16 December 1997, *E.N. Garcia* 262 (MBM).

In Paraná *Pouteria salicifolia* occurs in riversides and periodically flooded forests between 170 and 850 m elev., in Semideciduos Seasonal Forest. Collected with flowers in October and with immature fruits in December. It can be recognized by the reddish-brown scaly bark, the slash with tangential section with ripple marks, the linear or narrow-oblanceolate leaf (the length-width ratio equal or more than 6:1), and the wide-ellipsoid fruits with a slender beak and a narrowed base.

Conservation Status:—This species was listed as "Least concern" (LC) by CNCFlora (2018). In Paraná *P. salicifolia* is irregularly distributed on riverside and alluvial plains, and few individuals are in protected areas. The main problems to its conservation are the decline in the quality of habitat and the construction of dams.

5.10 *Pouteria torta* (Martius 1838: 94) Radlkofer (1882: 333). Figure 22

Treelet. Trunk section cylindrical, unbuttressed; bark dark-brown, fissured, fissure deep, short, V-shaped, oblique, ridges rounded or flattened; slash light yellow-orange, tangential section with longitudinal streaks, discoloured to dark yellow-orange, with abundant latex. Stems with young shoots ferrugineous, soon grayish-brown or grayish, not lenticellate, corky and cracked in irregular scales, angled at first, becoming rounded when older, young shoots hispid-tomentose, soon glabrous. Leaves clustered or loosely clustered at the stem apex. Petiole (6.0–)8.0–19.0 mm long, slightly grooved, hispid-tomentose or puberulent, seldom glabrescent. Leaf blade coriaceous, (4.5–)9.0–17.0 × (3.5–)6.0–9.0 cm, elliptic, wide-elliptic or narrow-obovate, apex rounded or weakly retuse, seldom emarginate, truncate or obtuse, base obtuse or cuneate, seldom truncate, adaxial surface puberulent, glabrescent or glabrous, but usually tomentose on midrib and secondaries, abaxial surface tomentose, venation eucamptodromous, midrib flat or slightly raised at the apex on the adaxial surface, raised on the abaxial surface, secondaries 13–19 pairs, straight and arcuate near the margin, parallel, flat or slightly raised on the adaxial surface, raised on the abaxial surface, intramarginal vein present, intersecondaries absent or poorly developed, tertiary veins percurrent, branches oblique, or loosely reticulate, flat or occasionally inconspicuous on the adaxial surface, raised on the abaxial surface, quaternary veins reticulate. Inflorescences ramiflorous, 1–9-flowered.

Pedicel 0.0–3.5 mm long, tomentose. Flowers androgynous, greenish or yellowish *in vivo*; calyx in 2 whorls of 2 sepals, 4.0–6.7 mm long, the inner ones longer than the outer ones, elliptic, apex acute or obtuse, the outer ones with margin entire, abaxial surface tomentose, the inner ones with margin ciliate, abaxial surface sericeous-tomentose, both glabrous or with sparse hairs at the apex on the adaxial surface, the inner ones with a broad glabrous marginal stripe; corolla tubulose, glabrous, 6.9–9.5 mm long, tube longer tha the lobes, 4.3–7.0 mm long, lobes 4, ca. 2.5 mm long, suborbiculate, apex rounded, margin sparsely ciliate; stamens 4, fixed halfway or in the upper third of the corolla tube, filaments 2.5–3.3 mm long, glabrous, anthers ca. 2.0 mm long, glabrous; staminodes 4, ca. 2.0 mm long, lanceolate, margin entire or sparsely ciliate; ovary 4-locular, 1.2–2.2 mm long, globose, style 6.3–8.3 mm long, glabrous, stigma simple or slightly lobed. Fruit ripening brown, ca. 5.9 × 5.1 cm, ovoid or globose, tomentose, hard thick outer pericarp, endocarp gelatinous, calyx persistent, 1-seeded. Seed ca. 3.1 × 1.9 cm, ellipsoid; testa smooth, shining; scar ca. 25 mm long, narrow, covering most of the seed length, narrow-oblong.

Selected material:—BRAZIL. Paraná: Campo Mourão, 19 July 2005, *M.G. Caxambu* 814 (HCF). Campo Mourão, 24 March 2018, *R.R. Völtz* 1490 (HCF, MBM, RB).

Additional selected material:—BRAZIL. São Paulo: Botucatu, 2 August 2010, *I.S. Gottsberger* 11-29672 (MBM). Itapirana, August 1989, *L.P. Queiroz* 2382 (MBM, HUEFS). Tocantins: Mateiros, 2 August 2010, *M.G. Caxambú* 3211 (HCF).

In Paraná *Pouteria torta* has been found only in the Municipality of Campo Mourão, in Cerrado. Collected with flower buds in July and with fruits in March. It can be recognized by the deeply fissured corky bark with fissures oblique and spiralled, corky and cracked stems, the eucamptodromous venation with secondaries straight and arcuate near the margin, and the tangled hairs on the abaxial surface of the leaf. Specimens of *Pouteria torta* have been confused with *P. bullata*, because they share similar vegetative morphology, and with *P. guianensis.* The differences between *P. torta* and *P. bullata* are described under the latter. The specimens collected in Paraná belong to *P. torta* subsp. *torta* (according to Pennignton 1990), which differs from *P. torta* subsp. *tuberculata* by the indumentum with tangled hairs on the abaxial surface of the leaf (*vs*. stiff, erect two-branched hairs in *P. torta* subsp. *tuberculata*), the leaves usually 7–15 cm long (*vs*. usually 15–45 cm long), rounded or emarginate apex (*vs*. narrowly attenuate to obtusely cuspidate apex), the higher order venation open-reticulate, with no clear distinction between tertiary and quaternary veins (*vs*. clearly differentiated into oblique tertiaries and finely reticulate quaternaries), and the smooth, densely pubescent fruit (*vs*. verrucose with hairy projections).

Conservation Status:—This species was listed as “Least concern” (LC) by CNCFlora (2018). In Paraná *P. torta* is known from only one individual confined to a small patch of Cerrado surrounded by an urban area, which, until now, is not a protected area.

5.11 ***Pouteria venosa*** (Martius 1839: 4) Baehni (1942: 393). Figure 23

Canopy tree. Trunk section cylindrical or irregular in the lower third of the trunk, buttressed; bark brown, scaly, scales papyraceous or woody, rectangular; slash pinkish, tangential section with longitudinal streaks, not discoloured, with abundant latex. Stems with apical buds and young shoots ferrugineous, soon light yellowish-brown or grayish-brown, not lenticellate, slightly fissured or seldom scaly, rounded, sericeous-tomentose or pubescent at first, becoming glabrous when older. Leaves clustered at the stem apex. Petiole 7.0–28.0 mm long, rounded or flat, sericeous-tomentose, pubescent or glabrous, sometimes sparse hairs at the base. Leaf blade chartaceous, (5.5–)7.0–17.5 × 2.0–6.5 cm, oblanceolate, narrow-elliptic or elliptic, seldom narrow-obovate, apex acute, obtuse or shortly acuminate, seldom acuminate or rounded, base acute or cuneate, weakly decurrent, adaxial surface glabrous, abaxial surface glabrescent or glabrous, but sometimes with sparse hairs on midrib, venation eucampto-brochidodromous, midrib slightly raised or flat on the adaxial surface, raised on the abaxial surface, secondaries 7–15 pairs, straight or slightly convergent and arcuate near the margin, parallel, slightly raised or flat on the adaxial surface, raised on the abaxial surface, thin intramarginal vein present, intersecondaries absent or poorly developed, tertiary veins percurrent, branches oblique, or loosely reticulate, slightly raised or flat on the adaxial surface, slightly raised on the abaxial surface, quaternary veins reticulate. Inflorescences axillary, 1–6-flowered. Pedicel 5.5–9.5 mm long, hispid-tomentose. Flowers androgynous, greenish or greenish-cream *in vivo*; calyx in 2 whorls of 2 sepals, 4.0–6.8 mm long, the inner ones frequently longer than the outer ones, suborbiculate or wide-elliptic, apex obtuse or rounded, margin entire or sometimes ciliate, abaxial surface tomentose or seldom pubescent, adaxial surface glabrous or the outer ones with some hairs on margin, the inner ones with a broad glabrous marginal stripe; corolla tubulose, glabrous, 8.4–10.0 mm long, tube shorter or seldom longer than the lobes, 3.2–5.4 mm long, lobes 6(–7)-merous, 4.4–5.3 mm long, oblong or wide-elliptic, apex obtuse or rounded, margin papillose; stamens 6–(7), fixed at the top of the corolla tube, filaments 1.8–2.5 mm long, glabrous, anthers 1.6–2.2 mm long, glabrous; staminodes 6–(7), 2.5–3.0 mm long, subulate, margin papillose; ovary 6-locular, 2.3–3.8 mm long, globose, style 5.0–9.6 mm long, glabrous or lanate at the base, stigma slightly lobed.

Fruit ripening greenish-yellow or yellowish, ca. 2.5 × 2.6 cm, globose, glabrous, exocarp coriaceous, mesocarp and endocarp farinaceous, calyx persistent, 1-seeded. Seed ca. 2.0 × 2.2 cm, globose; testa smooth, shining; scar ca. 20 mm long, broad, covering the whole seed length, wide-elliptic.

Selected material:—BRAZIL. Paraná: Guaratuba, 8 January 1993, *G.G. Hatschbach* 58514 (MBM, RB, NY). Guaratuba, 25 June 1968, *G.G. Hatschbach* 19431 (MBM). Matinhos, 16 August 1959, *G.G. Hatschbach* 6204 (MBM). Morretes, 22 July 2007, *R.R. Völtz* 1309 (EFC, HCF, MBM, NY, RB, UPCB, VIES). Paranaguá, 10 August 1985, *R.M. Britez* s.n. (HFC, MBM, UPCB 13179).

Additional selected material:—BRAZIL. São Paulo: Cananéia, 5 July 1989, *F. de Barros* 1684 (SP, UPCB). Santa Catarina: São Francisco do Sul, 4 January 2018, *R.R. Völtz* 1451 (EFC, FUEL, FURB, HCF, INPA, JOI, MBM, NY, RB, SP, UPCB, VIES).

In Paraná *Pouteria venosa* occurs in the Atlantic coast mountainous region and Serra do Mar on hill slopes up to 970 m elev., in Submontane and Montane Atlantic Rain Forest. Only one specimen (*Jönsson* 512a) was collected in Araucaria Forest in the Second Plateau. Collected with flowers in June, July and August and with fruits in January. It can be recognized by the slash with the yellowish outer bark, contrasting with the pinkish inner bark, the glabrous leaves that are densely clustered at the stem apex, and the corolla with 6(–7) lobes and papillose margin. The collections from Paraná belong to *P. venosa* subsp. *venosa* (according to Pennignton 1990), which differs from *P. venosa* subsp. *amazonica* T.D. Pennington (1990: 399) by the young shoots and inflorescences shortly crisped-pubescent (*vs*. densely appressed-puberulous), the adaxial surface of the sepals glabrous or with some hairs on the margin (*vs*. uniformly appressed-puberulous in *P. venosa* subsp. *amazonica*), the anthers 1.0–1.3 mm long (*vs*. 1.7–2.0 mm long), the fruits 1.8–2.5 cm long (*vs*. 4.0–8.0 cm long), and the seed scar covering about one-third of seed surface (*vs*. often covering up two-thirds of seed surface). However, the specimens studied here have young shoots with an appressed indumentum and anthers longer than described from *P. venosa* subsp. *venosa* by Pennington (1990).

Conservation Status:—This species was listed as “Not evaluated” (NE) by CNCFlora (2018). In Paraná *P. venosa* is irregularly distributed on hill slopes in the Atlantic Rain Forest, and most individuals are in protected areas. The main problem to its conservation is the loss of habitat to agriculture or pastures.

5.12 *Pouteria* sp.. Figure 24

Treelet. Trunk section cylindrical, unbuttressed; bark dark reddish-brown to reddish-brown, scaly, scales papyraceous, rectangular or irregular; slash light yellow-orange, tangential section with ripple marks, not discoloured, with scanty latex. Stems with apical buds ferrugineous, young shoots reddish-brown, soon yellowish-brown or grayish-brown, not lenticellate, cracked and scaly, slightly angled at first, becoming rounded when older, apical buds sericeous-tomentose, young shoots puberulent, soon glabrous. Leaves loosely clustered at the stem apex. Petiole 8.0–16.5(–21) mm long, flat, sericeous-tomentose or puberulent at first, soon glabrous. Leaf blade chartaceous or thinly coriaceous, 9.5–20.0 x 2.5–4.5 cm, oblanceolate, apex shortly acuminate or acute, seldom obtuse or emarginate, base cuneate, weakly decurrent, sericeous-tomentose at first, soon glabrous on both sides, venation brochidodromous or eucamptodromous, midrib raised on both sides, secondaries 10–19 pairs, straight and slighlty arcuate near the margin, parallel, slightly raised on the adaxial surface, raised on the abaxial surface, intramarginal vein present, intersecondaries absent or poorly developed, tertiary veins percurrent, branches oblique, slightly raised on both sides, quaternary veins reticulate. Inflorescences axillary and ramiflorous, 1–4-flowered. Pedicel 1.7–3.0 mm long, sericeous-tomentose to puberulent. Flowers androgynous, pinkish *in vivo*; calyx in 2 whorls of 2 sepals, 3.5–3.9 mm long, the outer ones ovate, apex acute or obtuse, margin entire, the inner ones suborbiculate or elliptic, apex obtuse or rounded, margin ciliate, both with abaxial surface sericeous-tomentose, adaxial surface glabrous, the inner ones with a broad glabrous marginal stripe; corolla cyathiform, glabrous, 4.9–5.2 mm long, tube longer than the lobes, 2.9–3.5 mm long, lobes 4, ca. 2.0 mm long, wide-oblong, apex truncate, obtuse or rounded, margin ciliate; stamens 4, fixed halfway or in the lower third of the corolla tube, filaments ca. 2.6 mm long, glabrous, anthers ca. 1.5 mm long, glabrous; staminodes 4, 1.7–2.0 mm long, oblong or wide-oblong, margin ciliate; ovary 1.0–1.8 mm long, subglobose, style 2.4–2.7 mm long, glabrous or lanate at the base, stigma simple. Fruit and seed not avaiable.

Selected material:—BRAZIL. Paraná: Morretes, 25 August 2010, *M. Verdi* 5527 (FURB, RB, FLOR). Morretes, 26 August 2017, *R.R. Völtz* 1562 (EFC, MBM, NY, UPCB, VIES).

Pouteria sp. is known from only two specimens collected in Marumbi State Park. It occurs in the Serra do Mar slopes between 850 and 950 m elev, in Montane Atlantic Rain Forest. Collected with flowers in August. Its floral morphology is similar to *P. beaurepairei*, but it differs by the secondary veins straight and slightly arcuate near the margin, parallel (*vs*.

convergent, arcuate in *P. beaurepairei*), the tertiary veins oblique (*vs*. loosely reticulate), the secondary veins 10–19 pairs (*vs*. 4–13 pairs), sepals 3.5–3.9 mm long (*vs*. 2.5–3.5 mm long), and corolla 4.9–5.2 mm long (*vs*. 3.0–4.5 mm long). This species is similar to *Pouteria gardneriana* (which does not occur in Paraná) and it can be distinguished from it by the oblanceolate leaves (*vs*. narrow-oblong, elliptic or oblanceolate in *P. gardneriana*), the apex usually shortly acuminate or acute (*vs*. acute or rounded), the intersecondary veins absent or poorly developed (*vs*. well-developed), the tertiary veins oblique (*vs*. loosely reticulate), petiole 8.0–16.5(–21) mm long (*vs*. 2.0–10.0 mm long), inflorescences 1–4-flowered (*vs*. 5–15-flowered), pedicel 1.7–3.0 mm long (*vs*. 3.0–7.0 mm long), and the pinkish flower (*vs*. greenish flower). It may be a new species, but further investigations are necessary to determine its real identity.

6. *Pradosia* Liais (1872: 614).

Canopy tree or geoxylic subshrub, unarmed. Stipules absent. Leaves alternate and spirally arranged, clustered at the stem apex; venation eucamptodromous or eucampto-brochidodromous, secondary veins straight and arcuate near the margin and parallel or convergent and arcuate, intramarginal vein present or not, intersecondaries absent, tertiary veins percurrent, branches oblique, quaternary veins reticulate. Inflorescences axillary, ramiflorous or cauliflorous. Flowers androgynous; calyx in a single whorl of 5 sepals, free, valvate; corolla rotate, glabrous or indument restricted to the base on the abaxial surface, tube shorter than the lobes, lobes 5, undivided, margin entire; stamens 5, fixed at the top of corolla tube, exserted; staminodes absent; ovary 5-locular, lanate. Fruit bacoid, 1-seeded, smooth, velutinous, tomentose or glabrous, indehiscent. Seeds ellipsoid, testa smooth, shining; scar adaxial, narrow, covering the whole seed length.

Key to the species of *Pradosia* in Paraná, Brazil

1. Geoxylic subshrub; leaf blade pubescent on the abaxial surface……..……... 6.1 *P. brevipes*
- Canopy tree; leaf blade glabrous on the abaxial surface.....… 6.2 *P. lactescens*

6.1 ***Pradosia brevipes*** (Pierre 1891: 57) T.D. Pennington (1990: 641). Figure 25

Geoxylic subshrub. Stems light-brown, not lenticellate, slightly fissured and rough, rounded, young shoots pubescent, soon glabrous. Petiole 3.0–11.5(–14.0) mm long, grooved, tomentose. Leaf blade coriaceous, (2.5–)7.0–20.5 × 3.5–6.5 cm, elliptic, narrow-elliptic, oblanceolate or narrow-oblanceolate, apex shortly acuminate, acute, rounded, emarginate or mucronate, base cuneate or acute, adaxial surface glabrescent or glabrous, but pubescent on midrib and secondaries, abaxial surface pubescent, venation eucaptodromous, midrib sunken on the adaxial surface, raised on the abaxial surface, secondaries 10–23 pairs, straight and arcuate near the margin, parallel, slightly sunken on the adaxial surface, raised on the abaxial surface, without intramarginal veins, tertiaries inconspicuous on the adaxial surface, raised on the abaxial surface. Inflorescences axillary or ramiflorous, 3–7-flowered. Pedicel 6.0–18.0 mm long, tomentose. Flowers purple *in vivo*; sepals ca. 2.5 mm long, elliptic, ovate or oblong, apex acute, margin entire, abaxial surface hispid-tomentose or indument restricted to the base, adaxial surface glabrous, without a broad glabrous marginal stripe; corolla glabrous or indument restricted to the base on the abaxial surface, ca. 4.0 mm long, tube ca. 1.5 mm long, lobes 2.3–3.7 mm long, oblong, apex rounded; filaments 1.8–3.1 mm long, glabrous, anthers 0.8–1.6 mm long, glabrous; ovary ca. 2.0 mm long, ovoid, style ca. 1.5 mm long, glabrous, stigma simple. Fruit ripening yellowish-orange, 1.4–2.2 × 0.8–1.5 cm, ellipsoid, tomentose, calyx and style persistent. Seeds not available.

Selected material:—BRAZIL. Paraná: Jaguariaíva, 31 October 1997, *S.M. Silva* s.n. (UPCB 33610). Jaguariaíva, 30 September 1999, *A.C. Cervi* 6832 (UPCB). Jaguariaíva, 27 January 1990, *G.G. Hatschbach* 52579 (MBM). Palmeira, 12 June 1969, *G.G. Hatschbach* 21621 (MBM). Palmeira, 10 November 1951, *G.G. Hatschbach* 2566 (MBM). Ponta Grossa, 23 August 1964, *G.G. Hatschbach* 11349 (MBM). Tibagi, 13 November 2016, *R.R Völtz* 989 (UPCB, EFC).

In Paraná *Pradosia brevipes* occurs in the grassy and open low tree Cerrado, mainly on sandy and deep soils between 800 and 1060 m elev.. Collected with flowers in September, October and November, with a single record in March (*Hatschbach* 18822), with immature fruits in December, January and March and ripening fruits in June and August. It can be recognized by the geoxylic habit with a subterranean caulinar system and only shoot tips emerging above the ground, the leaves densely clustered at the stem apex, the stem rough due to dense leaf scars, and flowers with purple corolla, white stamens and greenish gynoecium.

Conservation Status:—This species was listed as "Least concern" (LC) by CNCFlora (2018). In Paraná *P. brevipes* is irregularly distributed on small patches of Cerrado, and most of the individuals are in protected areas. The main problem to its conservation is the loss of habitat to agriculture or forest plantations, leading to small, isolated populations.

6.2 *Pradosia lactescens* (Vellozo 1825: 81) Radlkofer (1888: 407). Figure 26

Canopy tree. Trunk sections cylindrical, unbuttressed; bark gray to greenish-gray, dippled; slash orange, tangential section with longitudinal streaks, not discoloured, with scanty latex. Stems yellowish-brown, grayish-brown to pale-graywish, lenticellate or not, rough, rounded, young shoots sericeous-tomentose or pubescent, soon glabrous. Petiole (4.5–)6.0–20.0 mm long, grooved, pubescent or glabrous. Leaf blade chartaceous, 5.5–14.0(–18.0) × 1.5–5.0 cm, narrow-elliptic, elliptic or oblanceolate, apex acute, shortly acuminate or emarginate, base cuneate and slightly decurrent, glabrous, venation eucampto-brochidodromous, midrib sunken on the adaxial surface, raised on the abaxial surface, secondaries 6–11 pairs, convergent, arcuates, flat or slightly sunken on the adaxial surface, raised on the abaxial surface, thin intramarginal vein present, tertiaries flat on the adaxial surface, slightly raised on the abaxial surface. Inflorescences cauliflorous, 3–8-flowered. Pedicel ca. 4.0 mm long, tomentose. Flowers purple *in vivo*; sepals ca. 1.5 mm long, ovate, apex rounded, margin entire or sparsely ciliate, abaxial surface sericeous-tomentose, adaxial surface glabrous, without a broad glabrous marginal stripe; corolla glabrous, ca. 5.5 mm long, tube ca. 1.5 mm long, lobes ca. 4.0 mm long, oblong to broadly lanceolate, apex rounded; filaments ca. 4.0 mm long, glabrous, anthers ca. 2.0 mm long, glabrous; ovary ca. 1.5 mm long, ovoid, style ca. 1,0 mm long, glabrous, stigma simple. Fruit ripening yellow to orange, ca. 2.8 × 1.4 cm, ellipsoid, tomentose or glabrous, exocarp coriaceous, mesocarp fleshy, endocarp gelatinous, calyx and style persistent. Seeds ca. 3.1 × 1.3 cm; scar ca. 30 mm long, linear.

Selected material:—BRAZIL. Paraná: Antonina, 14 December 1978, *G.G. Hatschbach* 41775 (MBM, RB). Antonina, 19 January 1966, *G.G. Hatschbach* 13521 (INPA, MBM, NY). Guaraqueçaba, 4 August 2017, *R.R. Völtz* 1301 (EFC, HCF, MBM, NY, RB, UPCB, VIES). Paranaguá, 20 June 1998, *J.M. Silva* 2411 (BHCB, MBM).

Additional selected material:—BRAZIL. São Paulo: Iguape, 18 December 1990, *M.C.H. Mamede* 381 (SP). Iguape, 15 May 1991, *M. Kawal* 65 (SP).

In Paraná *Pradosia lactescens* occurs in the Atlantic coast mountainous region and Serra do Mar on hill slopes between 40 and 800 m elev., in Submontane and Montane

Atlantic Rain Forest. Collected with flowers in December and January, with fruits in June, July and August, with a single record in January (*Hatschbach* 13521). It can be recognized by the shallow depression on the surface of the bark caused by scaled-off old bark, sometimes leaving a different color on the new surface (dippled bark), the glabrous leaf, the eucampto-brochidodromous venation with convergent and arcuate secondary veins, and the flowers and fruits inserted on the main tree trunk (cauliflorous).

Conservation Status:—This species was listed as "Least concern" (LC) by CNCFlora (2018). In Paraná *P. lactescens* is irregularly distributed on hill slopes in the Atlantic Rain Forest, and most of the individuals are in protected areas. The main problem to its conservation is the loss of habitat to agriculture or pastures.

7. *Sideroxylon* Linnaeus (1753: 192).

Treelet, spiny. Stipules absent. Leaves opposite to subopposite at first, becoming alternate or fascicled on short shoots, spaced; venation brochidodromous, secondary veins straight, parallel, intramarginal vein present, intersecondaries long, interspersed among the secondaries and parallel to them, tertiary veins ramified, parallel to the secondaries and intersecondaries and descending from the margin (admedial), or occasionally reticulate, quaternary veins inconspicuous. Inflorescences axillary. Flowers androgynous; calyx in a single whorl of 5 sepals, free, valvate; corolla cyathiform, glabrous, tube shorter than the lobes, lobes 5, divided to the base into 3 segments, margin entire or erose; stamens 5, fixed at the top of corolla tube, exserted; staminodes 5, undivided; ovary 4–5-locular, pubescent at the base. Fruit immature glabrous. Seeds not available.

7.1 *Sideroxylon obtusifolium* (Humboldt ex Roemer & Schultes 1819: 802) T.D. Pennington (1990: 113). Figure 27

Treelet. Trunk section cylindrical or slightly irregular, weakly buttressed or not; bark grayish-brown, fissured, fissure deep, short, V-shaped, oblique to slightly reticulate, ridges flattened or reticulate; slash light yellow-orange, tangential section with longitudinal streaks, not discoloured, with abundant latex. Stems with young shoots light brownish-yellow, soon grayish-brown, lenticellate, rough and scaling in thin scales, rounded, tomentose or puberulent at first, becoming glabrous when older. Petiole 3.0–9.0(–11.0) mm long, grooved, tomentose or puberulent at first, soon glabrous or pubescent at the base. Leaf blade chartaceous or thinly

coriaceous, 1.5–5.5 × 1.0–2.5 cm, oblanceolate, narrow-obovate, narrow-elliptic, elliptic or seldom wide-elliptic, apex obtuse, rounded or slightly retuse, base acute or cuneate, adaxial surface sericeous-tomentose at first, soon glabrous, but sometimes with sparse hairs on midrib, abaxial surface puberulent or glabrous, midrib sunken on the base turning flat at the apex on the adaxial surface, raised on the abaxial surface, secondaries 6–12 pairs, flat or slightly raised on the adaxial surface, slightly raised or seldom inconspicuous on the abaxial surface, tertiaries flat or slightly raised on the adaxial surface, flat or slightly raised or occasionally inconspicuous on the abaxial surface. Inflorescences 1–11-flowered. Pedicel 2.4–5.6 mm long, puberulent. Flowers whitish *in vivo*; sepals 2.2 mm long, elliptic, apex rounded, margin entire, abaxial surface glabrous or puberulent on the base, adaxial surface glabrous, with a broad glabrous marginal stripe; corolla 3.2–4.2 mm long, tube 1.2 mm long, lobes 2.0–3.0 mm long, median segment elliptic, apex truncate or rounded, lateral segments narrow-lanceolate, apex acute, slightly shorter than the median segment; filaments 1.2–2.3 mm long, glabrous, anthers 1.2–1.8 mm long, glabrous; staminodes 2.2–2.6 mm long, lanceolate, margin erose; ovary 0.9–1.2 mm long, ovoid, style 2.5–3.0 mm long, glabrous, stigma simple or slightly lobed. Fruit immature greenish, globose, calyx and style persistent.

Selected material:—BRAZIL. Paraná: Assaí, 4 November 1999, *E.M. Francisco* s.n. (FUEL 26601, UPCB). Jataizinho, 22 August 1998, *E.H. Camargo* s.n. (FUEL 25898, HUEFS). Leópolis, 21 May 1999, *O.C. Pavão* s.n. (FUEL 25899, INPA).

Additional examinated material:—BRAZIL. Rio Grande do Sul: Capão do Leão, 23 November 1986, *J.A. Jarenkow* 522 (MBM, UEC). Santa Catarina: Laguna, 27 September 2000 *G.G. Hatschbach* 27527 (MBM).

In Paraná *Sideroxylon obtusifolium* has been found only in its Northern portion, in riversides and alluvial plains or ocassionaly on drier hillsides, in Semideciduos Seasonal Forest between 365 and 670 m elev. Collected with flower buds in August and immature fruits in March, May and November. It can be recognized by the grayish-brown fissured bark, fissures deep, short, oblique to slightly reticulate, young shoots with leaves opposite or subopposite, soon alternate or fascicled in short shoots, the stems commonly spiny (the spine a sharp end of the branch), and the corolla divided to the base into three segments. The collections from Paraná belong to *S. obtusifolium* subsp. *obtusifolium* (according to Pennignton 1990), which differs from *S. obtusifolium* subsp. *buxifolium* (Roemer & Schultes 1819: 802) T.D. Pennington (1990: 113) by the leaves opposite to subopposite at first, becoming fascicled on short shoots (vs. opposite, no becoming fascicled in *S. obtusifolium* subsp. *buxifolium*), the leaves oblanceolate, narrow-obovate, narrow-elliptic, elliptic (the

length-width ratio equal or more than 2:1) (vs. ovate or wide-ovate (the length-width ratio less than 2:1), and corolla 4.0–4.5 mm long (vs. 3.9-3.5 mm long), besides the distinct geographic occurrence. However, the specimens studied have corolla 3.2–4.2 mm long, causing an overlap with that described from *S. obtusifolium* subsp. *buxifolium* by Pennington (1990).

Conservation Status:—This species was listed as "Least concern" (LC) by CNCFlora (2018). In Paraná *S. obtusifolium* is irregularly distributed on alluvial plains in Semideciduous Seasonal Forest, and none of the individuals are in protected areas. The main problem to its conservation are the decline in the quality of habitat and habitat loss to agriculture or pastures.

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Collectors List

Acildo 909 (1.1); **Adenesky-Filho, E.** 69 (1.1), MBM 385547 (1.3); **Aguiar, T.H.** 32 (1.2), 77 (1.2); **Alburquerque, E.A.** 25 (5.6); **Alves, E.M.** 165 (5.6), 248 (5.7), 513 (5.6); **Amâncio, A.M.D.** 199 (1.1); **Athayde, S.F.** 200 (2.1), 208 (1.4), 247 (1.4); **Barbosa, E.** 264 (5.1), 748 (5.11), 963 (1.1), 2228 (1.1), 2651 (1.3); **Barros, F.de** 2120 (1.1), 2145 (1.3); **Belan, H.C.** 16 (5.7), 62 (1.1); **Bento Fernandes, C.E.** 115 (5.5); **Bianchini, E.** FUEL 35017 (1.3), FUEL 35055 (5.1); **Bianek, A.E.** 233 (5.1); **Blum, C.T.** 1416 (1.3), 1801 (6.2); **Bolson, M.** 232 (1.1), 289 (1.1); **Bonaldi, R.A.** 617 (5.1), 981 (1.2); **Borges-Júnior, S.S.** HCF 9996 (1.1); **Borgo, M.** 59 (5.9), 367 (5.1), 2009 (1.2), 2304 (1.2); **Britez, R.M.** 885 (4.1), 1265 (1.2), 1267 (1.2), 1750 (4.1), 1822 (1.2), MBM 128039 (1.2), UPCB 13179 (5.11), UPCB 20597 (1.1); **Brotto, M.L.** 856 (1.2), 1314 (5.2), 1809 (5.2), 1966 (4.1), 2389 (1.5); **Buttura, E.** 163 (1.3), 315 (1.3), 784 (1.3); **Camargo, E.H. de** 53 (1.1), FUEL 25898 (7.1); **Carneiro, J.** 95 (5.7), 254 (1.1), 359 (1.1), 721 (1.1), 1510 (1.2); **Carvalho, P.E.R.** 43 (1.3), 153 (1.1), 176 (5.2); **Caxambu, M.G.** 35 (1.3), 378 (1.3), 417 (1.3), 499 (1.3), 524 (1.1), 594 (1.1), 797

(5.10), 814 (5.10), 950 (1.1), 1419 (1.1), 3270 (1.1), 3794 (1.2), 4188 (1.3), 5166 (1.1), 5513 (1.1), 5536 (5.6), 5562 (1.3), 5565 (1.3), 5571 (5.8), 5884 (1.1), 6916 (1.1), 6974 (1.1), 7138 (1.3), 7566 (1.1), 7705 (5.9); **Cervi, A.C.** 1979 (1.2), 2121 (1.2), 2749 (1.1), 3042 (1.1), 3192 (1.1), 3951 (1.1), 6085 (1.1), 6376 (6.1), 6459 (1.4), 6471 (1.2), 6497 (1.4), 6548 (1.4), 6832 (6.1), 8125 (1.2), 8793 (1.2), 9332 (1.2); **Cervigne, N.S.** 118 (5.1); **Chagas-Silva, F.** 886 (1.1), 1017 (1.3), 1381 (5.6), 1566 (5.1), 1676 (5.1), 1681 (5.1), FUEL 10955 (5.1), FUEL 11786 (5.1); **Chahad, S.** 1 (1.1); **Cielo-Filho, R.** 1280 (1.3), 1634 (1.3); **Claudinéia** 11 (5.6); **Cloclet, F.A.** FUEL 21198 (1.1); **Colli, S.** FUEL 12266 (1.3), FUEL 17147 (1.3); **Cordeiro, J.** 732 (1.2); **Corrêa Gomes, J.** 278 (1.1); **Corsi, A.M.J.** 408 (1.1), 532 (1.1); **Cotarelli, V.M.** 681 (1.2); **Cruz, J.M.** 287 (1.3); **Custodio Filho, A.** 1555 (1.1); **Dias, M.C.** 465 (1.1), FUEL 3521 (1.1), FUEL 3613 (1.1), FUEL 11846 (1.3); **Domingos** 17 (1.1); **Duarte, A.P.** 1739 (1.3); **Dusén, P.K.H.** 10122 (5.3), 10191 (6.2), 10513 (6.1), 10741 (1.1), 11994 (1.5), 12053 (4.1), 13115 (1.3), 13211 (1.3), 13808 (1.2), 14284 (1.2), 15319 (2.1), 15321 (5.11), 15389 (4.1), 16289 (1.3), 16396 (1.3), 16762 (1.3), 17099 (1.1), NY 1081529 (5.2), NY 375099 (4.1), NY 375761 (5.11); **Dziewa, A.** 144 (1.2); **Engels, M.E.** 978 (5.11), 1828 (1.2); **Estevan, D.A.** 364 (5.1), 1053 (6.1), 1099 (1.3), 1792 (1.3); **Fadelli, L.** 279 (1.3), 391 (1.1); **Faria, A.D.** 2013/01 (1.3), 2014/33 (1.1); **Felitto, G.** 864 (1.1), 898 (5.9), 927 (1.1), 951 (1.3), 965 (1.1); **Ferrari Tomé, M.V.** 92 (1.1), 94 (1.1), 111 (1.1), 258 (1.1), 316 (1.1), 319 (1.1), 340 (1.1), 504 (1.1), 607 (1.1), 622 (1.1), 693 (1.1), 694 (1.3), 723 (1.1), 865 (1.3), 1010 (1.3), 1110 (1.3), 1126 (1.3), 1127 (1.3), 1225 (1.1); **Ferreira Jr, M.** 408 (1.1); **Ferreira, F.B.** HCF 12832 (1.1); **Ferreira, J.A.** FUEL 42695 (1.1); **Ferreira, P.C.** 70 (1.2); **Fontella, J.** 1149 (1.3), 1217 (1.3); **Francisco, E.M.** 147 (1.3), 276 (1.2), 320 (1.3), 386 (1.3), 461 (1.2), 484 (5.1), 509 (1.2), 510 (1.2), FUEL 21020 (1.1), FUEL 23769 (5.1), FUEL 26216 (1.3), FUEL 26601 (7.1), FUEL 26817 (5.1), FUEL 26818 (5.1), FUEL 29781 (5.1), FUEL 30688 (1.3), FUEL 30871 (1.3), FUEL 30872 (1.3), FUEL 30877 (1.1), FUEL 30887 (1.1), FUEL 41288 (1.3); **Furtado, P.P.** 169 (1.1); **Garcia, L.M.** 98 (1.3), 317 (1.1); **Gatti, A.L.S.** 125 (1.2); **Gatti, G.** 91 (4.1), 572 (1.2), MBM 276810 (5.2); **Geraldino, H.C.L.** 187 (1.3), 360 (1.3); **Gomes, A.V.** EFC 652 (1.2); **Guapyassu, M.** 193 (5.11), 303 (1.1), 317 (1.1); **Hashimoto, G.** 708 (1.1); **Hatschbach, G.G.** 1399 (5.2), 1722 (1.2), 2125 (1.4), 2126 (1.2), 2566 (6.1), 3978 (1.2), 4263 (1.3), 4576 (4.1), 6204 (5.11), 6395 (1.2), 7197 (6.1), 7723 (1.3), 7955 (1.3), 9195 (4.1), 9203 (5.11), 9709 (1.4), 10006 (1.2), 10131 (4.1), 10141 (1.3), 11063 (1.2), 11137 (1.2), 11216 (1.3), 11349 (6.1), 11838 (1.1), 12764 (4.1), 13074 (5.1), 13408 (1.2), 13521 (6.2), 13527 (1.2), 13630 (1.4), 13646 (5.1), 13648 (4.1), 14313 (1.1), 15507 (1.1), 15748 (1.3), 15813 (5.6), 15815 (5.7), 16164 (1.3), 16543 (1.3), 16884 (1.2), 16905

(1.5), 17056 (1.1), 17454 (1.2), 17961 (1.4), 18080 (1.2), 18235 (5.4), 18265 (5.4), 18282 (5.4), 18484 (1.3), 18498 (5.4), 18602 (1.2), 18822 (6.1), 19317 (1.3), 19431 (5.11), 19440 (4.1), 19595 (2.1), 19616 (5.11), 19899 (5.3), 19970 (6.1), 20086 (1.5), 20132 (4.1), 20181 (1.5), 20213 (4.1), 20357 (1.5), 20519 (5.9), 20574 (1.1), 20921 (2.1), 20954 (1.2), 21504 (1.1), 21621 (6.1), 22123 (5.2), 22224 (1.5), 22242 (5.2), 22587 (5.9), 22608 (1.1), 22877 (5.1), 23150 (5.9), 23329 (1.4), 25810 (1.2), 26234 (1.2), 26269 (1.4), 26378 (1.3), 26620 (1.3), 27567 (5.2), 27688 (3.1), 28536 (4.1), 29733 (1.2), 29766 (5.2), 30313 (1.1), 30947 (4.1), 31091 (1.2), 32253 (4.1), 32255 (5.1), 32587 (6.1), 33746 (1.2), 33778 (1.2), 34546 (5.9), 35175 (5.9), 35586 (5.2), 36582 (5.3), 37362 (1.1), 39758 (1.2), 39821 (1.1), 39860 (1.1), 40020 (1.2), 40026 (5.1), 41584 (5.1), 41775 (6.2), 41830 (1.2), 43936 (5.1), 43973 (4.1), 44344 (6.1), 44580 (1.2), 44841 (1.3), 45419 (5.4), 46816 (1.2), 47186 (1.2), 47661 (1.2), 50589 (1.1), 50661 (1.1), 51302 (4.1), 51718 (1.2), 51911 (1.1), 52394 (1.1), 52579 (6.1), 52792 (1.3), 53168 (1.1), 54792 (5.2), 54894 (1.4), 58447 (1.2), 58514 (5.11), 59411 (1.1), 64430 (1.3), 68763 (1.1), 68903 (1.2), 69253 (1.1), 69803 (1.2), 70601 (3.4), 72318 (1.3), 79506 (1.2); **Hoffmann, P.M.** EFC 14374 (5.1); **Imaguire, N.** 5415 (1.3); **Isernhagen, I.** 76 (1.1), 241 (1.2); **Jaster, C.B.** UPCB 41162 (4.1); **Jönsson, G.** 512a (5.11), 710a (1.2); **Kaehler, M.** 309 (1.1), 347 (1.1); **Kiem, S. Z.** UPCB 80704 (1.1); **Kinupp, V.F.** 57 (1.1), 172 (1.3), 349 (1.1), 479 (1.1), 943 (1.1), 1067 (1.1); **Klein, R.M.** 11848 (1.3), 2484 (1.5); **Kozera, C.** 1703 (5.6), 3616 (1.1), 3649 (1.1), 3679 (1.1), 3702 (1.1), 3805 (1.1), 3848 (1.1), 3891 (1.1); **Krieger, P.L.** CESJ 11056 (5.1), CESJ 11090 (5.1); **Kuhlmann, J.G.** RB 57761 (1.3), RB 57762 (1.1), RB 150034 (5.1); **Kummrow, R.** 1326 (5.1), 1670 (1.2), 2717 (1.2); **Kuniyoshi, Y.S.** 4048 (1.1), 4223 (1.2), 4697 (1.1), 4733 (5.2), 5779 (1.3), 5807 (1.4), 6031 (1.2); **Labiak, P.H.E.** 3196 (1.1), 3319 (1.1); **Landgraf, G.O.** 77 (1.1), 116 (1.1); **Landrum, L.R.** 2868 (1.2); **Libanori, R.A.** FUEL 1845 (1.1); **Lima, J.M.** 56 (1.3); **Lima, R.X.** 162 (1.2), 171 (1.2); **Lindeman, J.C.** 561 (1.1), 678 (1.1), 906 (1.3), 919 (1.1), 1009 (1.3), 1243 (1.3), 1296 (1.1), 1330 (1.1), 1698 (5.7), 1753 (1.3), 2011 (1.1), 2203 (1.1), 2274 (1.2), 3312 (1.3), 3494 (5.9), 3557 (1.3), 4922 (1.3), 5278 (5.1), 5330 (5.1), 5361 (1.1), 5438 (1.1); **Lorini, M.L.** MBM 300654 (5.1), MBM 300655 (4.1); **Lovato, M.C.** 206 (1.1), 207 (1.1), 208 (1.1), 209 (1.1), 210 (1.1), 211 (1.1), 212 (1.1), 213 (1.3), 215 (1.3), 341 (1.1); **Lozano, E.D.** 998 (1.1), 1838 (1.3); **Luz, A.** HUEM 10573 (1.1); **Luz, B.B.** FUEL 22955 (1.1); **Maieski, E.A.** 60 (1.3); **Marestoni, T.M.** 15 (1.1), 61 (1.1), 112 (1.1); **Margarido, J.M.** 14 (5.6); **Marinero, F.** 306 (1.2); **Marques, M.C.M.** MBM 167485 (1.3), UPCB 20677 (1.3); **Matos, W.H.** 77 (1.3), 84 (1.1); **Melo, E.** 4258 (1.2); **Melo, M.M.R.F.** 331 (1.3); **Michelon, C.** 1454 (1.3), 1472 (1.1), 1533 (5.1); **Mikich, S.B.** UPCB 13938 (1.3), UPCB 25971 (1.1),

UPCB 26374 (1.1), UPCB 26377 (1.3), UPCB 26813 (1.3), UPCB 30186 (1.1), UPCB 30212 (1.3), UPCB 32225 (1.1), UPCB 37557 (1.3), UPCB 37567 (1.1); **Motta, J.T.** 2352 (1.2), MBM 267114 (4.1); **Muniz, C.F.S.** 379 (1.3); **Nobre, J.K.** HCF 2706 (5.3); **Nuno, P.S.** HUPG 10281 (5.1); **Oliveira, V.P. de** 8 (1.1), 51 (1.1), MBM 272482 (1.1); **Paiva, M.R.C.** EFC 9450 (1.1); **Paula, G.B.N.** 16 (1.1); **Pavão, O.C.** FUEL 24293 (1.1), FUEL 25325 (1.1), FUEL 25899 (7.1), FUEL 30870 (1.1), FUEL 30880 (1.1), FUEL 31030 (1.3), FUEL 34283 (1.3), FUEL 34862 (7.1); **Pereira, E.** 6180 (6.1), 7778 (1.1), 7855 (5.6); **Pereira, J.S.** HCF 2429 (1.3); **Perret, L.** 32 (1.1); **Pilati, R.** 6 (5.6); **Pimenta, J.A.** FUEL 12265 (1.3), UPCB 40417 (1.1); **Pinto, M.B.** EFC 13618 (5.1); **Pizzaia, L.N.** 73 (1.1); **Poliquesi, C.B.** 274 (1.3); **Portes, M.C.** 70 (1.1); **Previdello, M.E.** 39 (5.7); **Queiroz, L.E.** 6 (1.1), 14 (1.1); **Reginato, M.** 392 (1.5), 727 (1.5), 885 (1.2); **Reitz, R.** 12085 (1.3); **Ribas, O.S.** 773 (1.2), 4313 (1.2), 5602 (1.1), 8615 (6.1), MBM 296822 (1.1); **Ribeiro, C.L.** 196 (1.2); **Ritter, L.M.O.** HUEPG 2974 (6.1); **Rodas, L.A.C.** 43A (1.1); **Roderjan, C.V.** 83 (4.1), 92 (1.1), 216 (1.1), 485 (1.2), 543 (4.1), 614 (1.2), 1650 (1.3); **Rodolfo, A.M.** 22 (1.1); **Rodrigues Souza, B.** HCF 21186 (1.1); **Rodrigues, S.** EFC 295 (5.2); **Rodrigues, W.A.** 11309 (5.1), 11323 (5.1); **Roher, D.** MBM 397410 (1.5); **Romagnolo, M.B.** 360 (1.3), 361 (1.3), HUEM 25872 (1.3), HUEM 26871 (1.3); **Rosa, C.I.L.F.** 19 (5.7), 261 (1.1), 272 (1.1); **Rosa, G.S.** 225 (5.5), 228 (5.5); **Rossetto, E.F.S.** 42 (1.2); **Sá, K.L.V.R. de** 15 (1.1); **Sakuragui, C.M.** 668 (1.1); **Santos, C.W.** 12 (1.3); **Schwacke, C.A.W.** 2894 (6.1); **Selusniaki, M.** 3504 (1.1); **Silva, A.R.** HCF 2381 (1.1); **Silva, E.A.** 65 (1.1); 111 (1.1); **Silva, E.M.** HCF 5827 (1.1); **Silva, F.C.** UPCB 13097 (1.5), UPCB 13107 (1.2); **Silva, J.M.** 273 (5.4), 763 (1.1), 1680 (4.1), 1891 (1.1), 1908 (1.3), 2087 (1.1), 2129 (1.3), 2141 (5.9), 2411 (6.2), 2504 (1.1), 2840 (1.2), 3028 (1.3), 4234 (1.5), 6389 (1.5), 8745 (1.2), 8755 (5.5); **Silva, S.M.** 1495 (5.1), MBM 128032 (5.1), UPCB 20578 (1.3), UPCB 20685 (1.3), UPCB 32155 (4.1), UPCB 33610 (6.1); **Silveira, M.** 356 (1.3), 368 (1.1), 379 (1.1); **Siqueira, E.L.** 193 (1.1), 363 (1.1), 1110 (1.1), 1113 (1.1), 1130 (1.1), 1229 (1.1), 1265 (1.1), 1964 (1.1), 2108 (1.1); **Slusarski, S.R.** 321 (1.1); **Soares, A.** 91 (1.5), 99 (4.1), 121 (5.4), 193 (1.3), 204 (1.1), 223 (4.1), 306 (1.1); **Soares-Silva, L.H.** 132 (1.1), 184 (1.3); **Sousa Silva, S.** 560 (1.3); **Souza, L.R.M.** FUEL 21143 (1.1), FUEL 21147 (1.3), FUEL 22951 (1.1); **Souza, W.S.** 832 (5.1), 1041 (5.11); **Souza-Stevaux, M.C.** 22 (5.6), 257 (5.7), 385 (5.6), 695 (5.6), 708 (1.3), 773 (1.3), 773 (5.6), 777 (5.6), 791 (1.3), 792 (5.6), 987 (1.1), 1739 (5.5), 2539 (5.5), 2975 (5.6), 2976 (5.6), 3466 (1.1), HUEM 28280 (1.3); **Svolenski, A.C.** 35 (1.2), 487 (5.1), 520 (4.1), EFC 7975 (5.1); **Temponi, L.G.** 683 (1.1); **Tessmann, G.** 59 (1.3), MBM 17512 (5.1), MBM 75166 (1.2); **Tiepolo, G.** 399 (1.1), 617 (1.2); **Toderke, M.L.** 9 (1.1); **Trevisan, R.** HCF 347 (4.1); **Uhlmann, A.** 75 (6.1); **Urben-**

Filho Castilho, M.V. 180 (1.1), 262 (1.1); **Verdi, M.** 5527 (5.12); **Vicentini, A.** 34 (1.1), 192 (1.3), 213 (1.1); **Vieira, A.O.S.** 541 (5.1), FUEL 11716 (1.3); **Vieira, G.P.** HCE 4002 (1.3); **Villhena, A** 12 (1.3); **Völtz, R.R.** 23 (5.1), 55 (4.1), 211 (5.3), 213 (5.4), 502 (1.5), 765 (1.2), 832 (1.4), 913 (1.4), 970 (5.2), 972 (1.5), 973 (1.2), 976 (5.3), 982 (1.1), 989 (6.1), 990 (6.1), 1031 (5.1), 1033 (5.1), 1088 (1.2), 1089 (1.2), 1106 (3.1), 1107 (5.4), 1113 (5.5), 1156 (5.2), 1170 (5.4), 1171 (1.2), 1188 (4.1), 1203 (5.2), 1218 (1.5), 1262 (1.5), 1301 (6.2), 1302 (2.1), 1309 (5.11), 1310 (6.2), 1354 (5.2), 1360 (1.5), 1367 (2.1), 1368 (3.1), 1404 (6.2), 1464 (2.1), 1465 (2.1), 1466 (3.1), 1467 (5.4), 1483 (1.4), 1484 (5.3), 1485 (6.1), 1486 (6.1), 1487 (5.6), 1488 (1.3), 1489 (5.6), 1490 (5.10), 1491 (7.1), 1511 (1.4), 1512 (1.1), 1524 (5.6), 1525 (1.2), 1526 (1.4), 1527 (1.4), 1562 (5.12); **Without collector** HUEPG 13728 (6.1), HUEPG 13746 (6.1); **Ziller, S.R.** 67 (4.1), 651 (1.2), 1086 (1.3), 1091 (5.6), 1125 (5.7), 1369 (1.3), 1425 (1.4), 1452 (1.3), 1824 (1.1).

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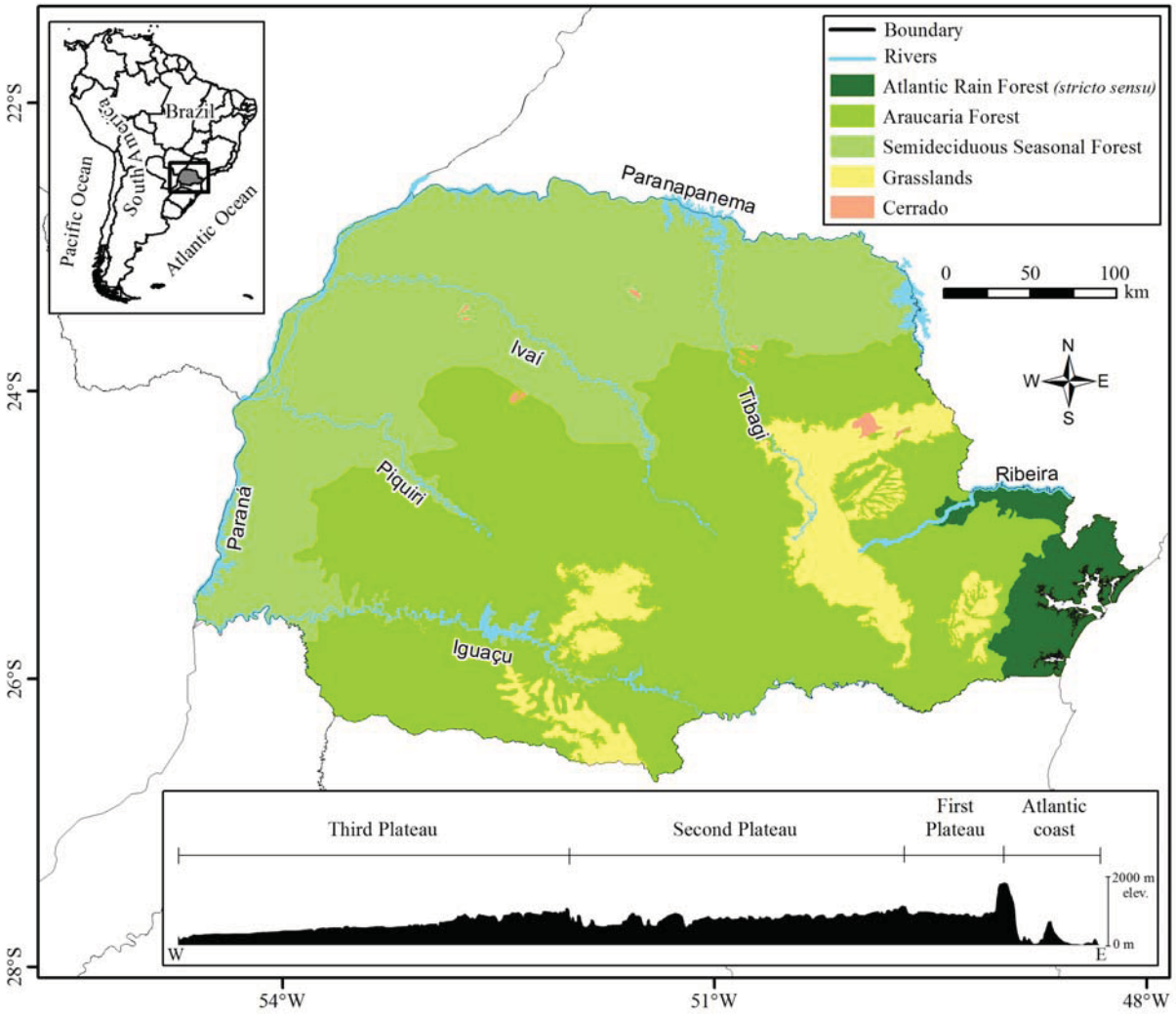

Figure 1: Map of the State of Paraná, showing the different vegetation types and the main topographic landscapes (ITCG 2018, adapted from Maack 1950).

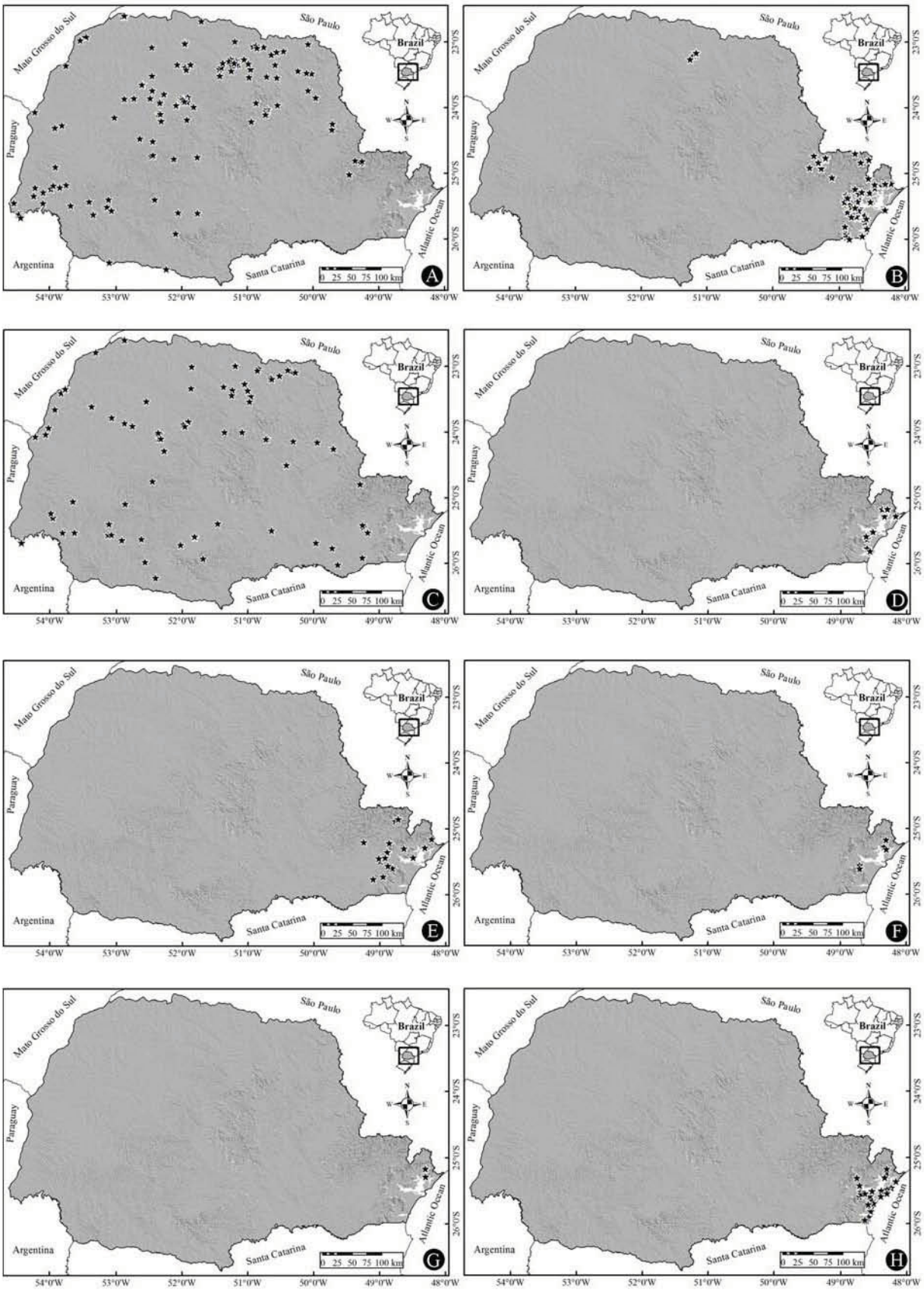

Figure 2: Species distributions. A. *Chrysophyllum gonocarpum*. B. *C. inornatum*. C. *C. marginatum*. D. *C. paranaense*. E. *C. viride*. F. *Diploon cuspidatum*. G. *Ecclinusa ramiflora*. H. *Manilkara subsericea*.

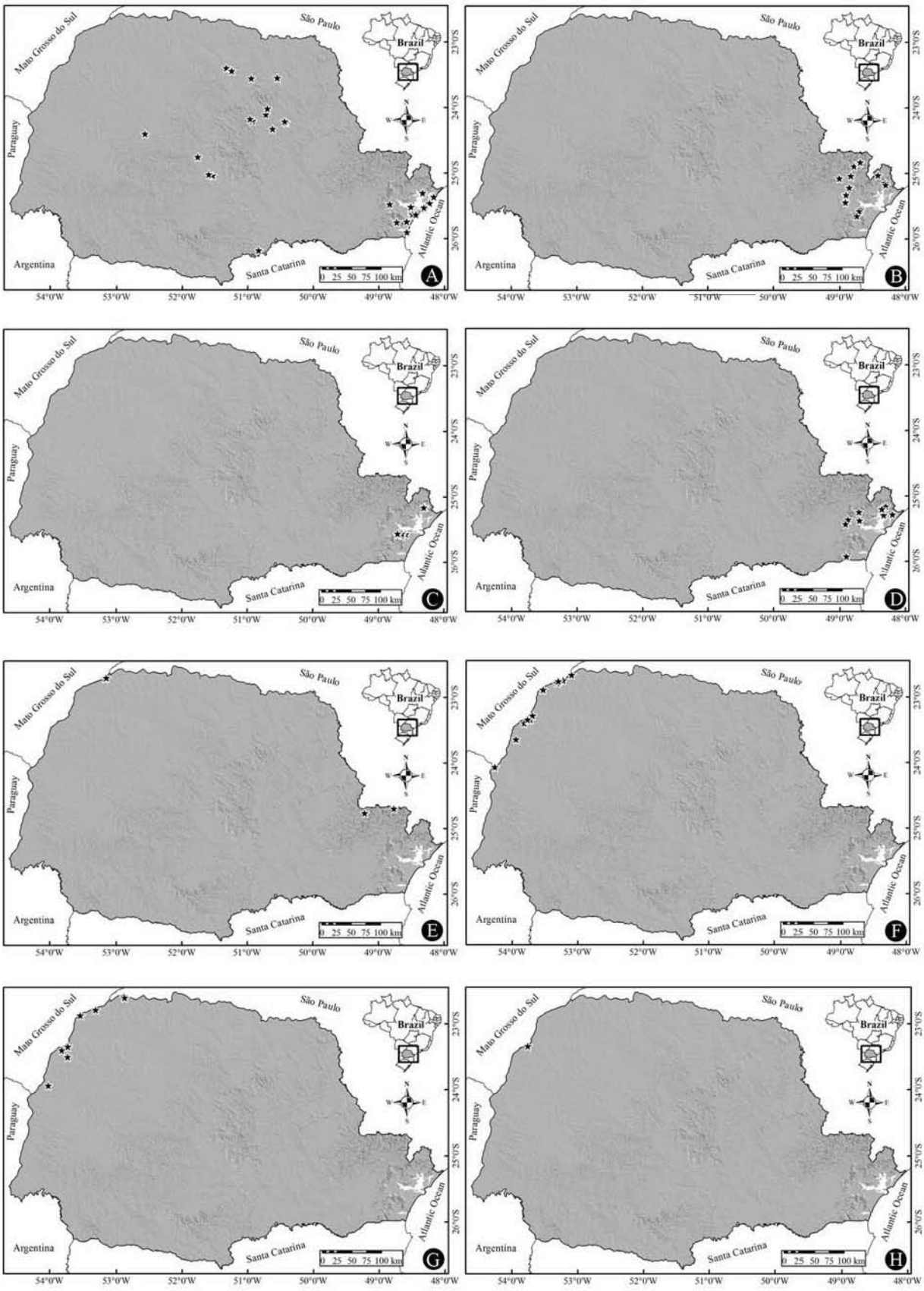

Figure 3: Species distributions. A. *Pouteria beaurepairei*. B. *P. bullata*. C. *P. caimito*. D. *P. durlandii*. E. *P. gardneri*. F. *P. glomerata*. G. *P. guianensis*. H. *P. ramiflora*.

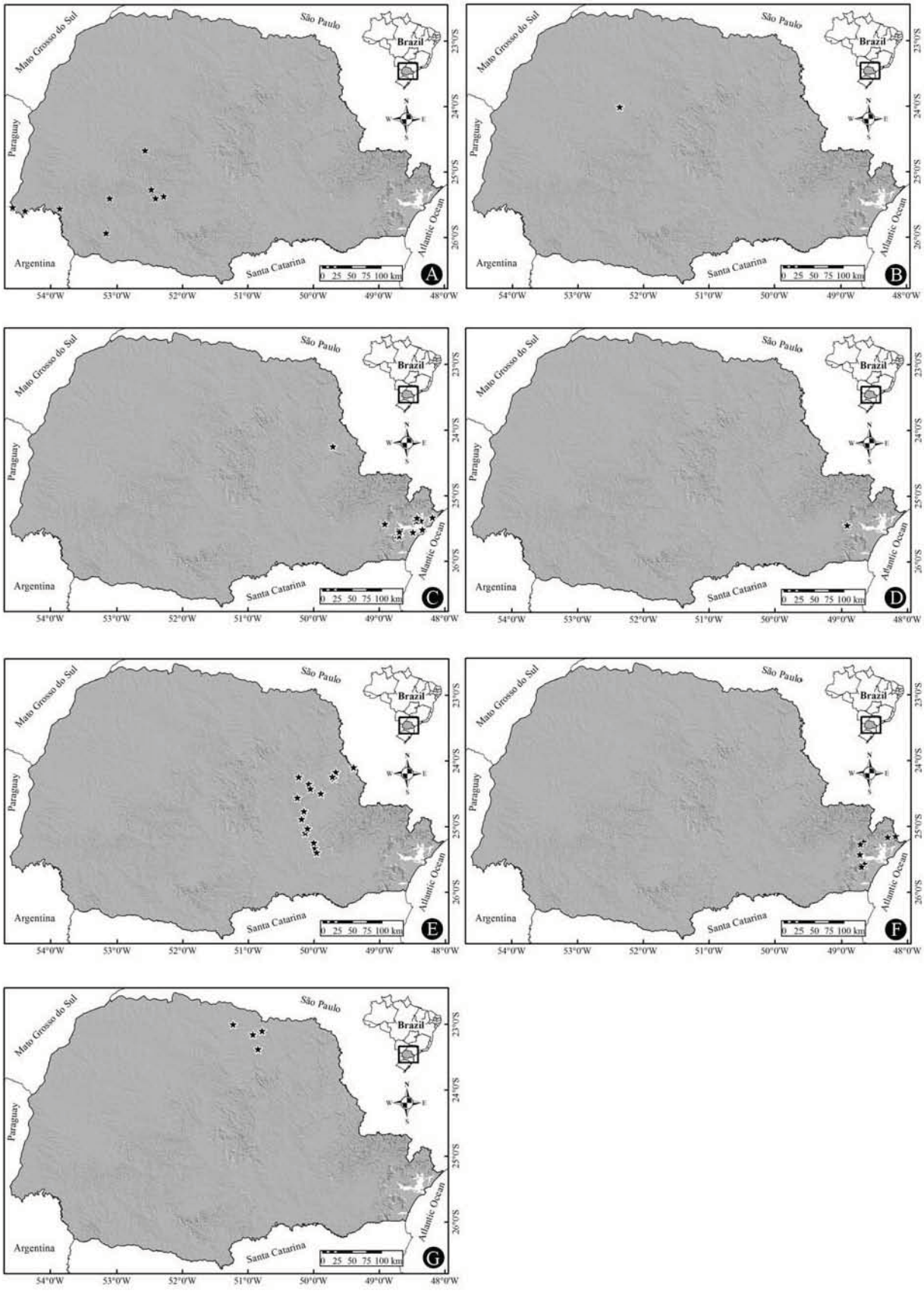

Figure 4: Species distributions. A. *Pouteria salicifolia*. B. *P. torta*. C. *P. venosa*. D. *Pouteria* sp.. E. *Pradosia brevipes*. F. *P. lactescens*. G. *Sideroxylon obtusifolium*.

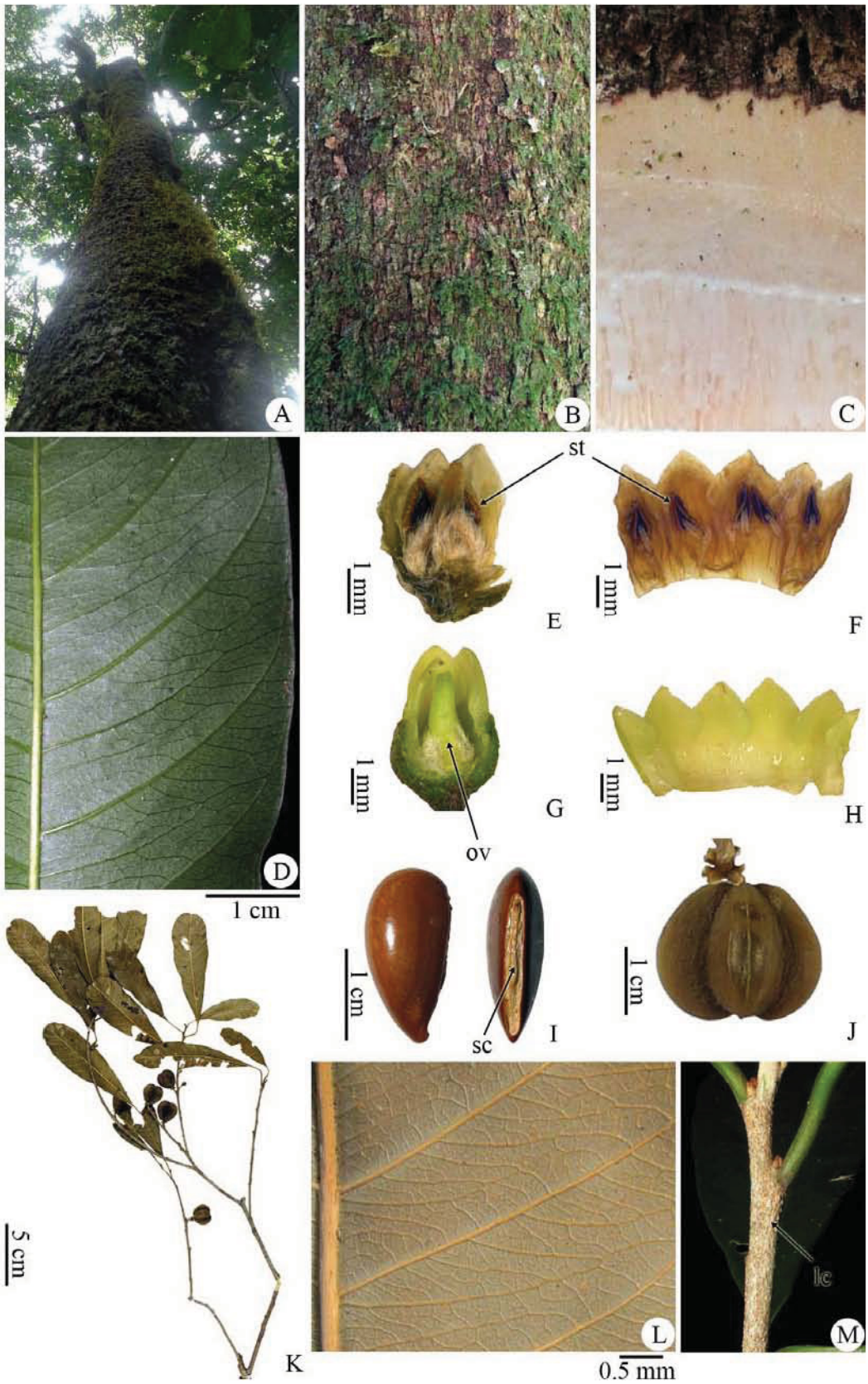

Figure 5: *Chrysophyllum gonocarpum*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Staminate flower, longitudinal section. F. Adaxial surface of the staminate corolla. G. Pistillate flower, longitudinal section. H. Adaxial surface of the pistillate corolla. I. Lateral and frontal view of the seed. J. Fruit. K. Stem with fruit. L. Detail of tertiary veins. M. Detail of the lenticellate stem. (A–D, M from *R.R. Völtz* 1512; E–F from *S.B. Mikich* UPCB 26374; G–H from *J.M. Silva* 763; I, L from *G. Felitto* 864; J–K from *E.D. Lozano* 998) (lc: lenticel; ov: ovary; sc: seed scar; st: stamen).

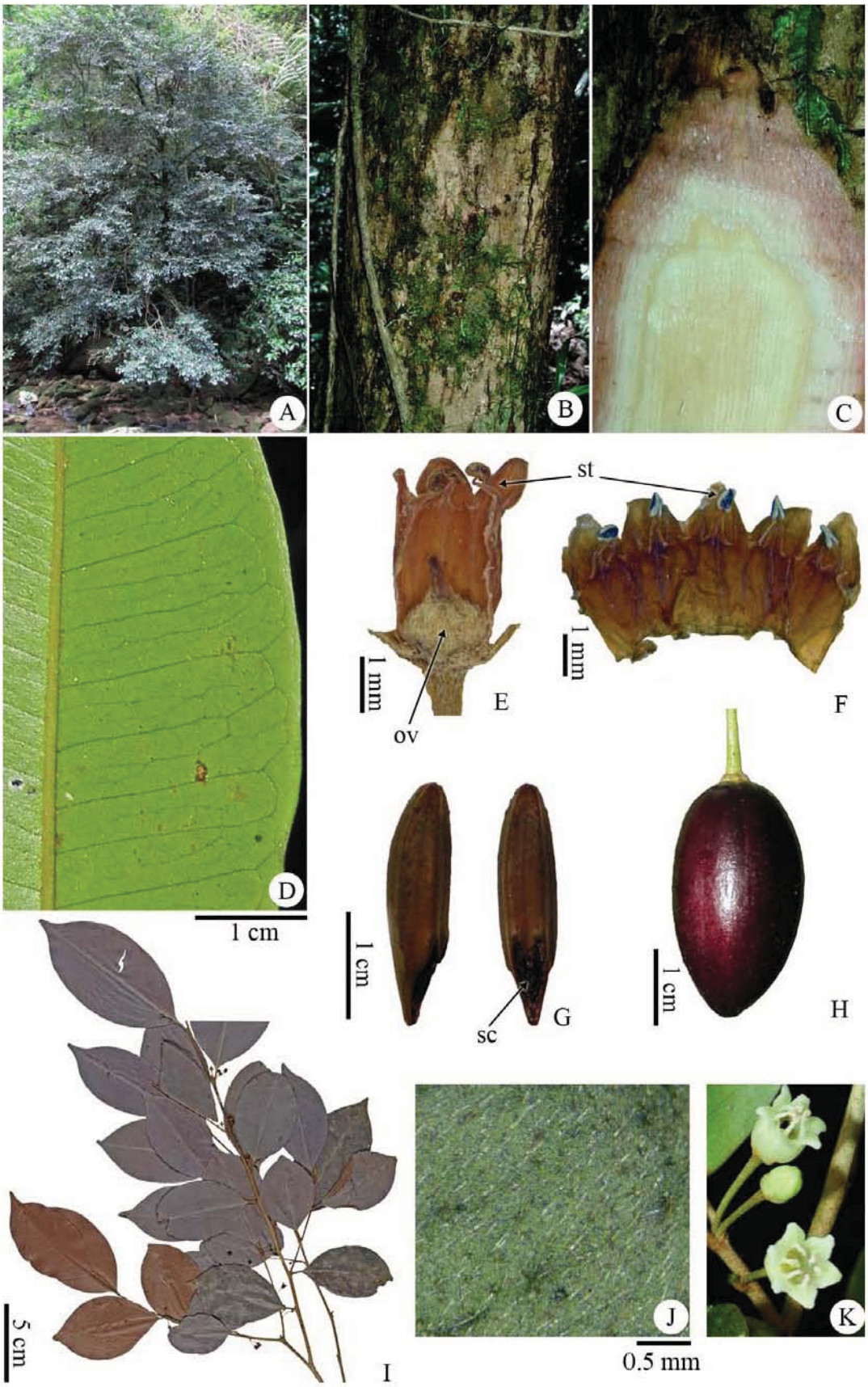

Figure 6: *Chrysophyllum inornatum*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla. G. Lateral and frontal view of the seed. H. Fruit. I. Stem with flower. J. Detail of the indumentum. K. Flower in vivo. (A–D, G–H from *R.R. Völtz* 1525; E–F, J–K from *R.R. Völtz* 1088; I from *R. Kummrow* 1670) (ov: ovary; sc: seed scar; st: stamen).

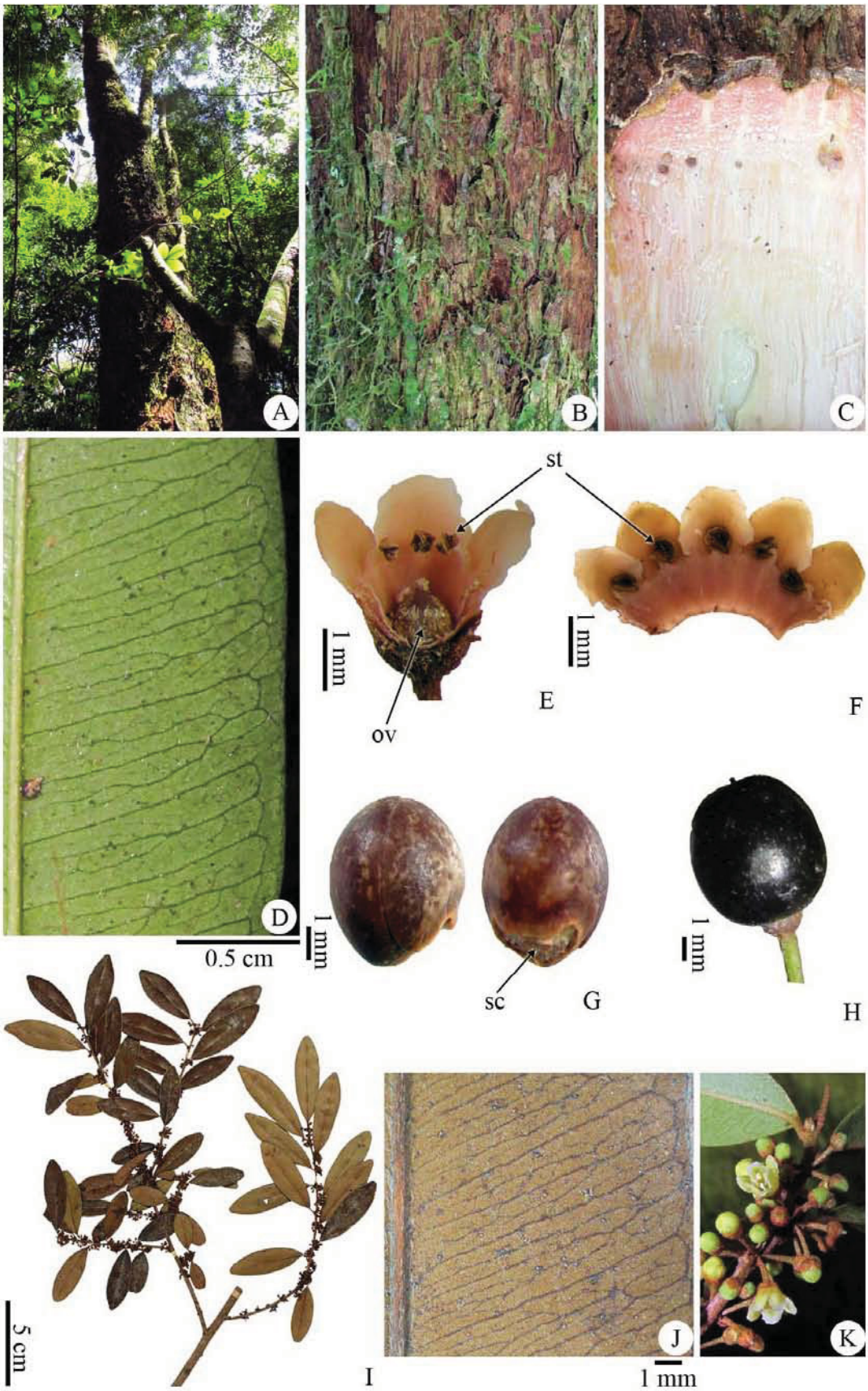

Figure 7: *Chrysophyllum marginatum*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla. G. Lateral and frontal view of the seed. H. Fruit. I. Stem with flower. J. Detail of the venation. K. Flower in vivo. (A–D without voucher; E–F, H, K from *R.R. Völtz* 1488; I, J from *E. M. Francisco* 320) (ov: ovary; sc: seed scar; st: stamen).

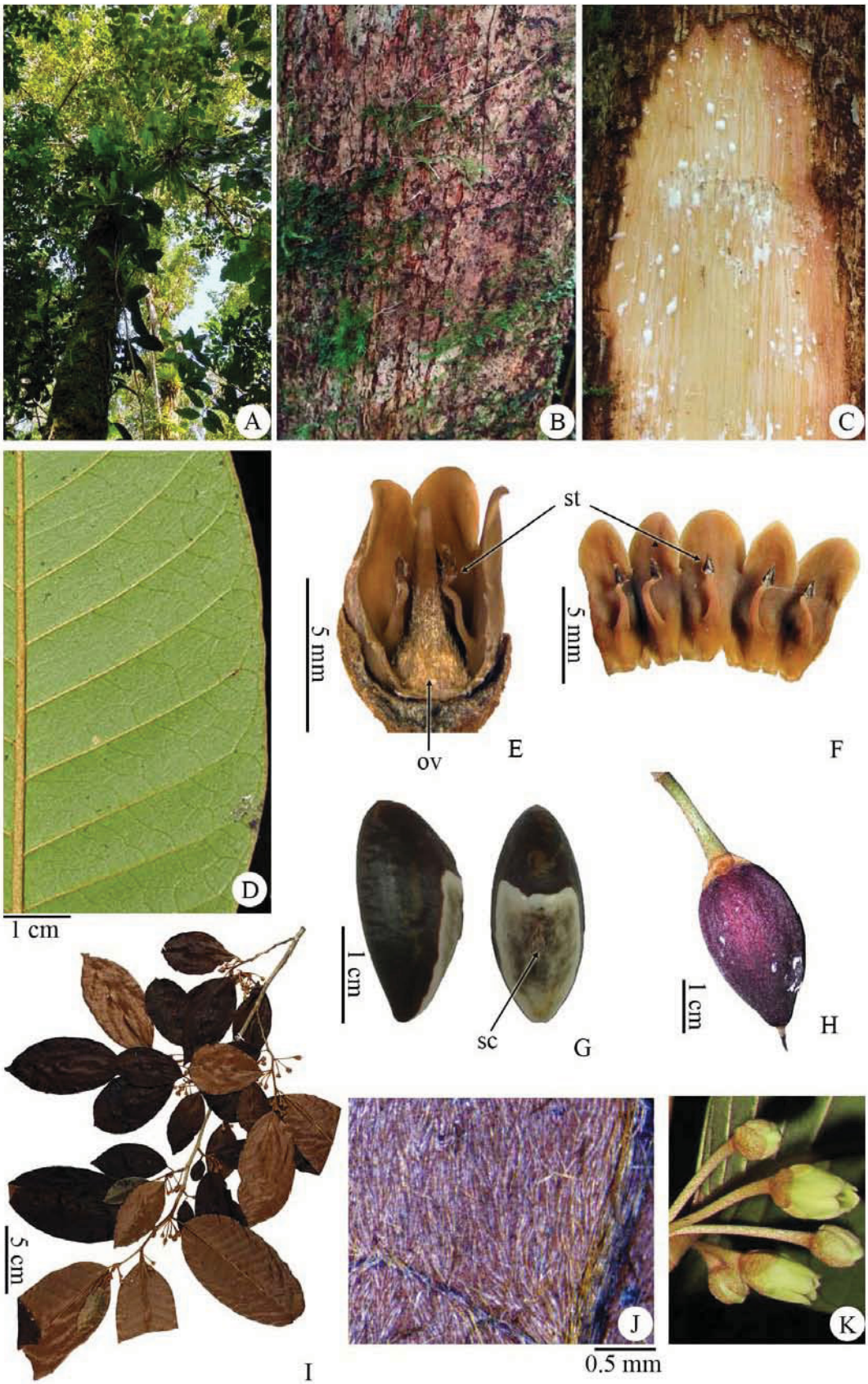

Figure 8: *Chrysophyllum paranaense*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla. G. Lateral and frontal view of the seed. H. Fruit. I. Stem with flower. J. Detail of the indumentum. K. Flower in vivo. (A–D from *R.R. Völtz* 1511; E–F, J, K from *R.R. Völtz* 1526; G from *R.R. Völtz* 1483; H from *R.R. Völtz* 1534; I from *A.C. Cervi* 6459) (ov: ovary; sc: seed scar; st: stamen).

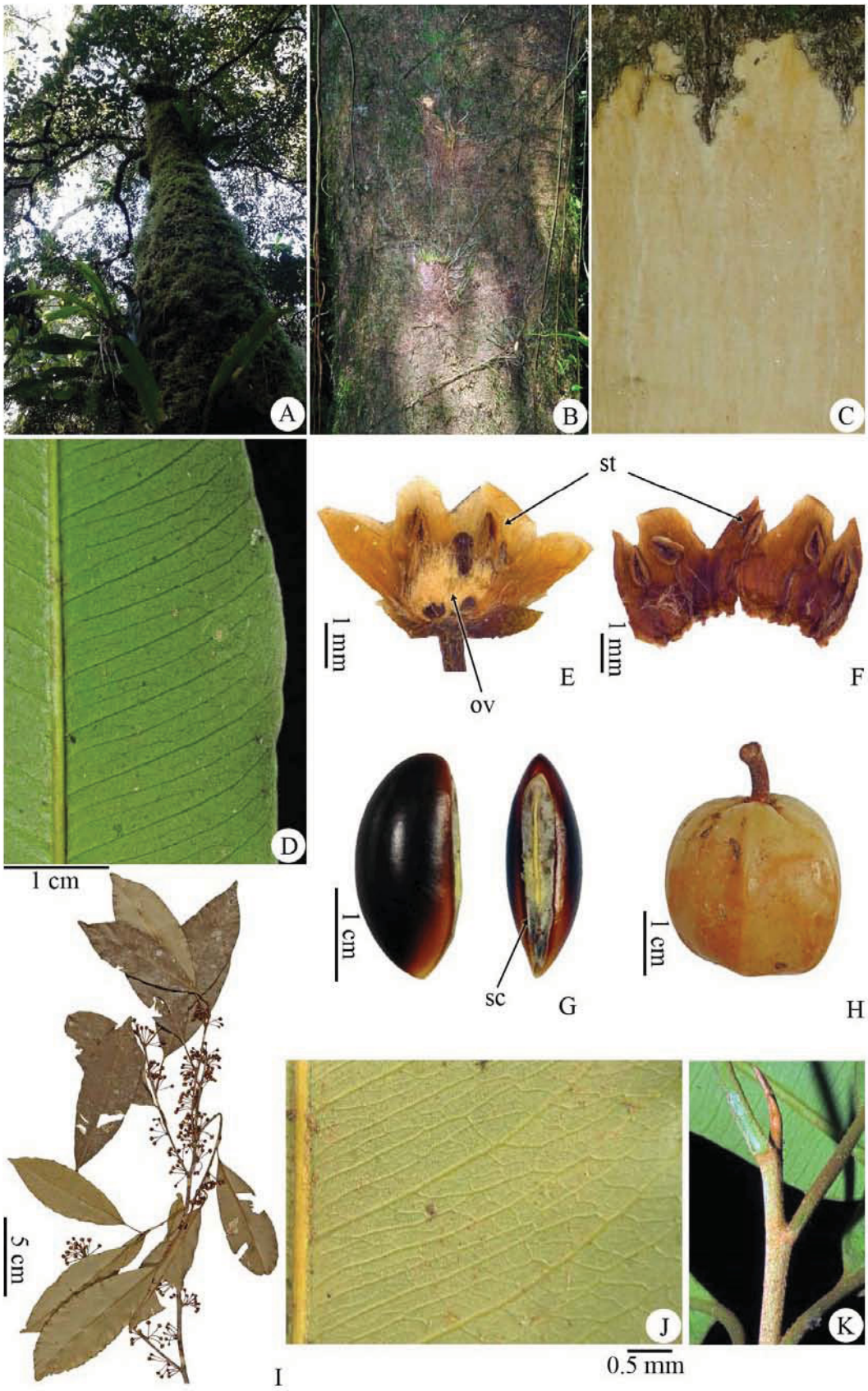

Figure 9: *Chrysophyllum viride*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla. G. Lateral and frontal view of the seed. H. Fruit. I. Stem with flower. J. Detail of the tertiary veins. K. Detail of the young stem. (A–D, G–H, K from *R.R. Völtz* 1218; E from *G.G. Hatschbach* 20357; F, I–J from *G.G. Hatschbach* 20181) (ov: ovary; sc: seed scar; st: stamen).

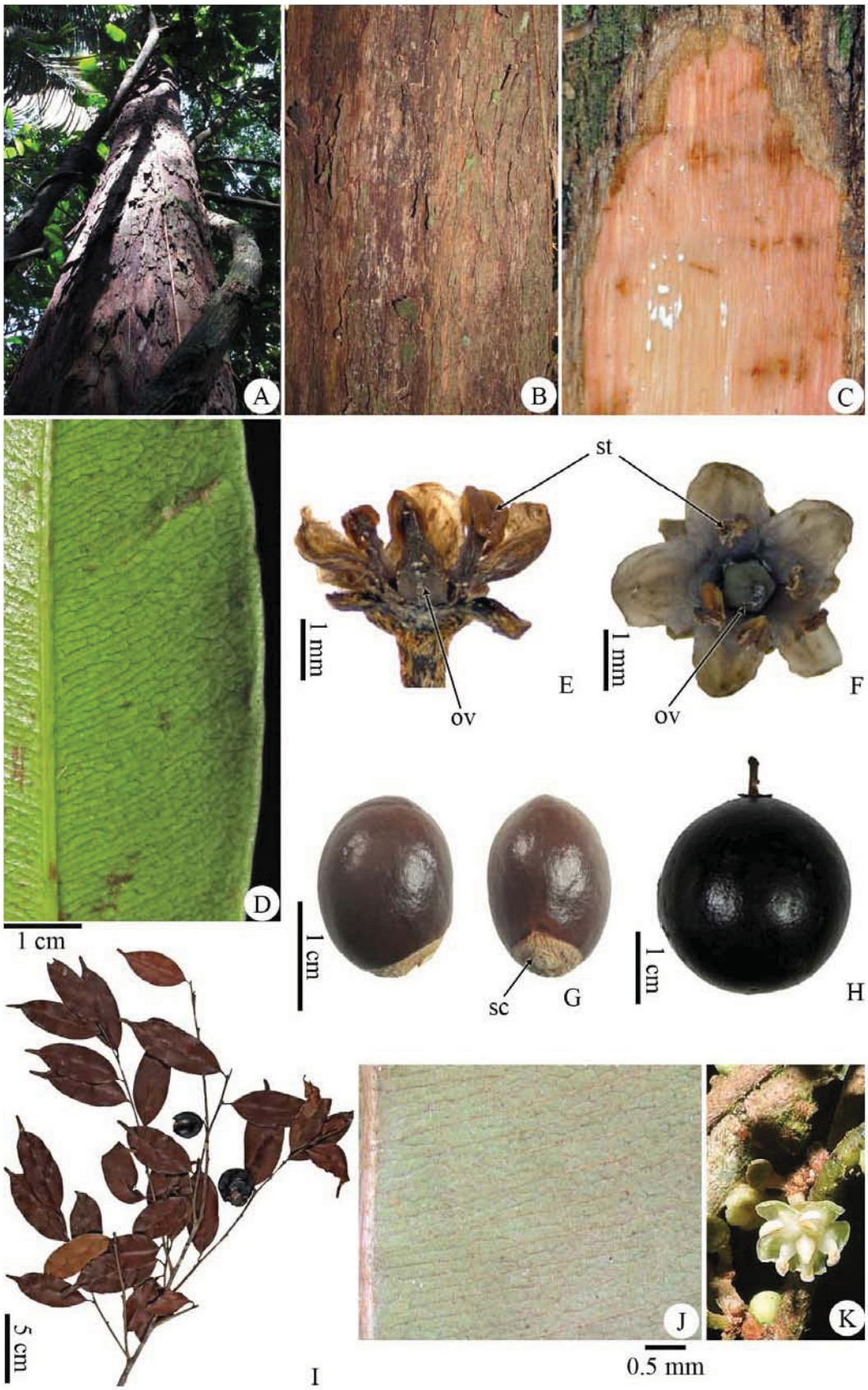

Figure 10: *Diploon cuspidatum*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Upper view of the flower. G. Lateral and frontal view of the seed. H. Fruit. I. Stem with fruit. J. Detail of the venation. K. Flower in vivo. (A–D from *R.R. Völtz* 1464; E–F, K from *R.R. Völtz* 1367; G–H, J from *R.R. Völtz* 1465; I from *G.G. Hatschbach* 20921) (ov: ovary; sc: seed scar; st: stamen).

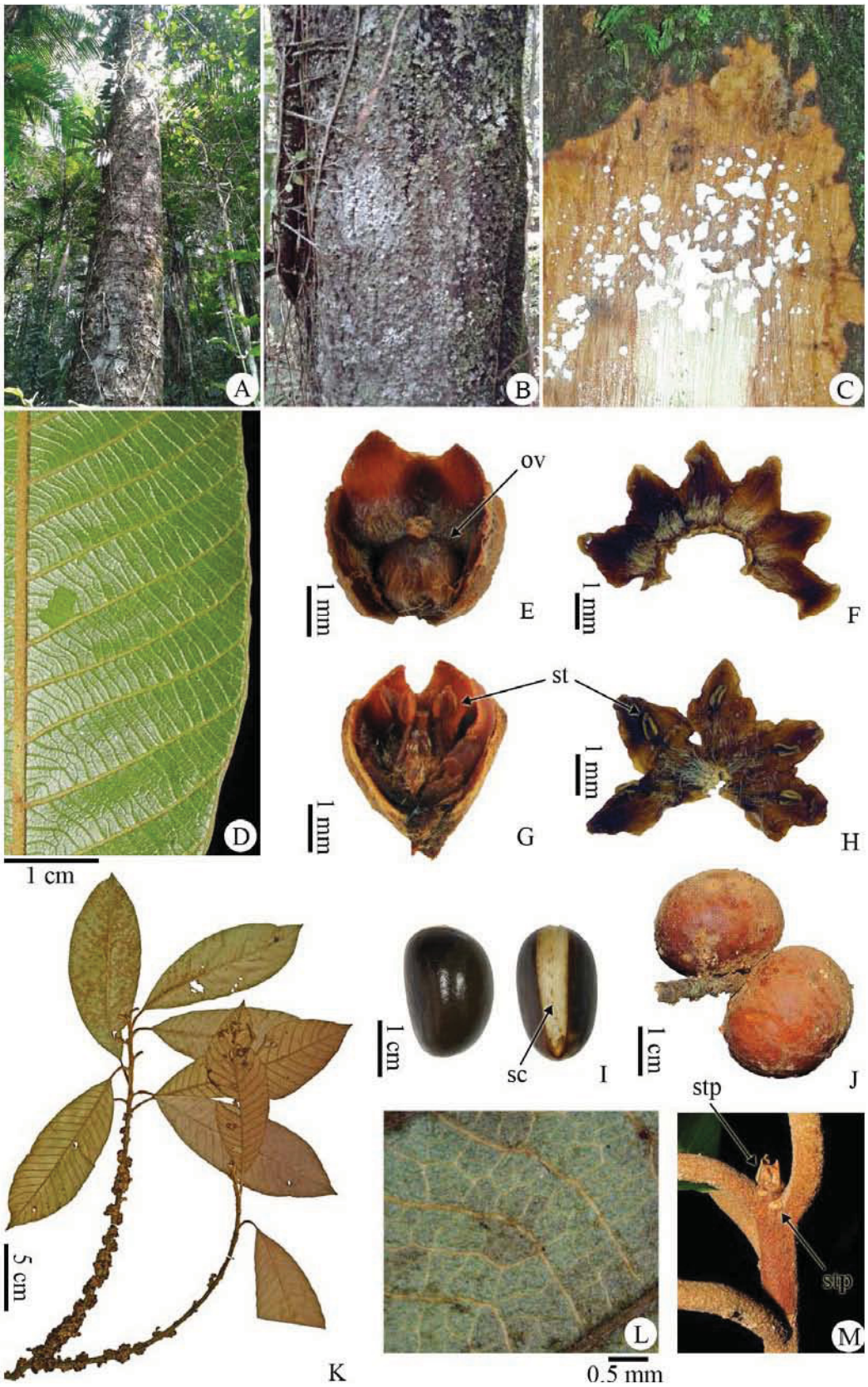

Figure 11: *Ecclinusa ramiflora*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Pistillate flower, longitudinal section. F. Adaxial surface of the pistillate corolla. G. Staminate flower, longitudinal section. H. Adaxial surface of the staminate corolla. I. Lateral and frontal view of the seed. J. Fruit. K. Stem with flower. L. Detail of the indumentum. M. Detail of the stem showing the stipules and stipules scar. (A–G, K from *R.R. Völtz* 1106; I–J, L–M from *R.R. Völtz* 1466) (ov: ovary; sc: seed scar; st: stamen; stp: stipules and stipules scar).

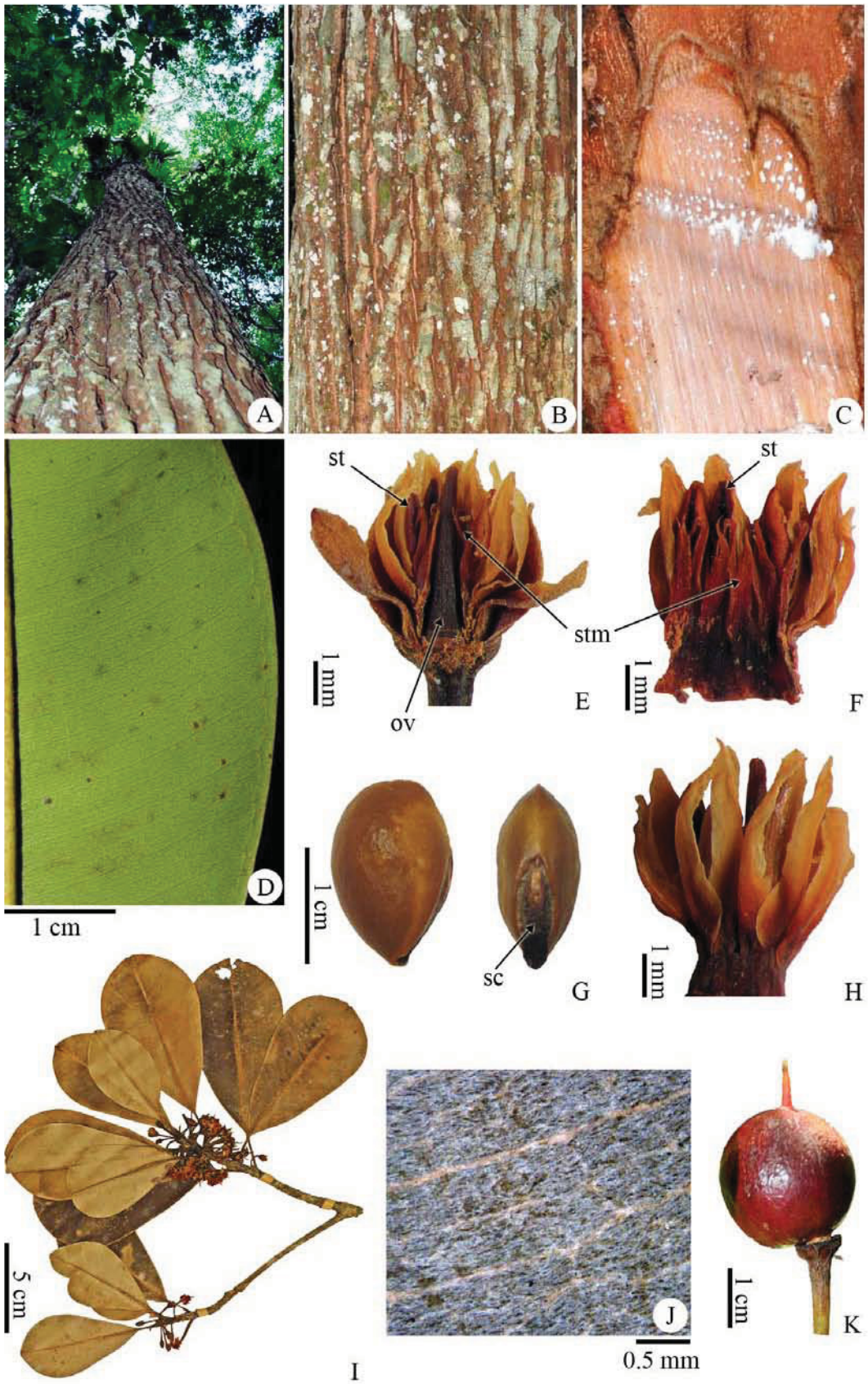

Figure 12: *Manilkara subsericea*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla. G. Lateral and frontal view of the seed. H. Abaxial surface of the corolla. I. Stem with flower. J. Detail of the indumentum. K. Fruit. (A–D, G, K from *R.R. Völtz* 1188; E–F, H from *G.G. Hatschbach* 53299; I from *G.G. Hatschbach* 51302; J from *J.M. Silva* 1680) (ov: ovary; sc: seed scar; st: stamen; stm: staminode).

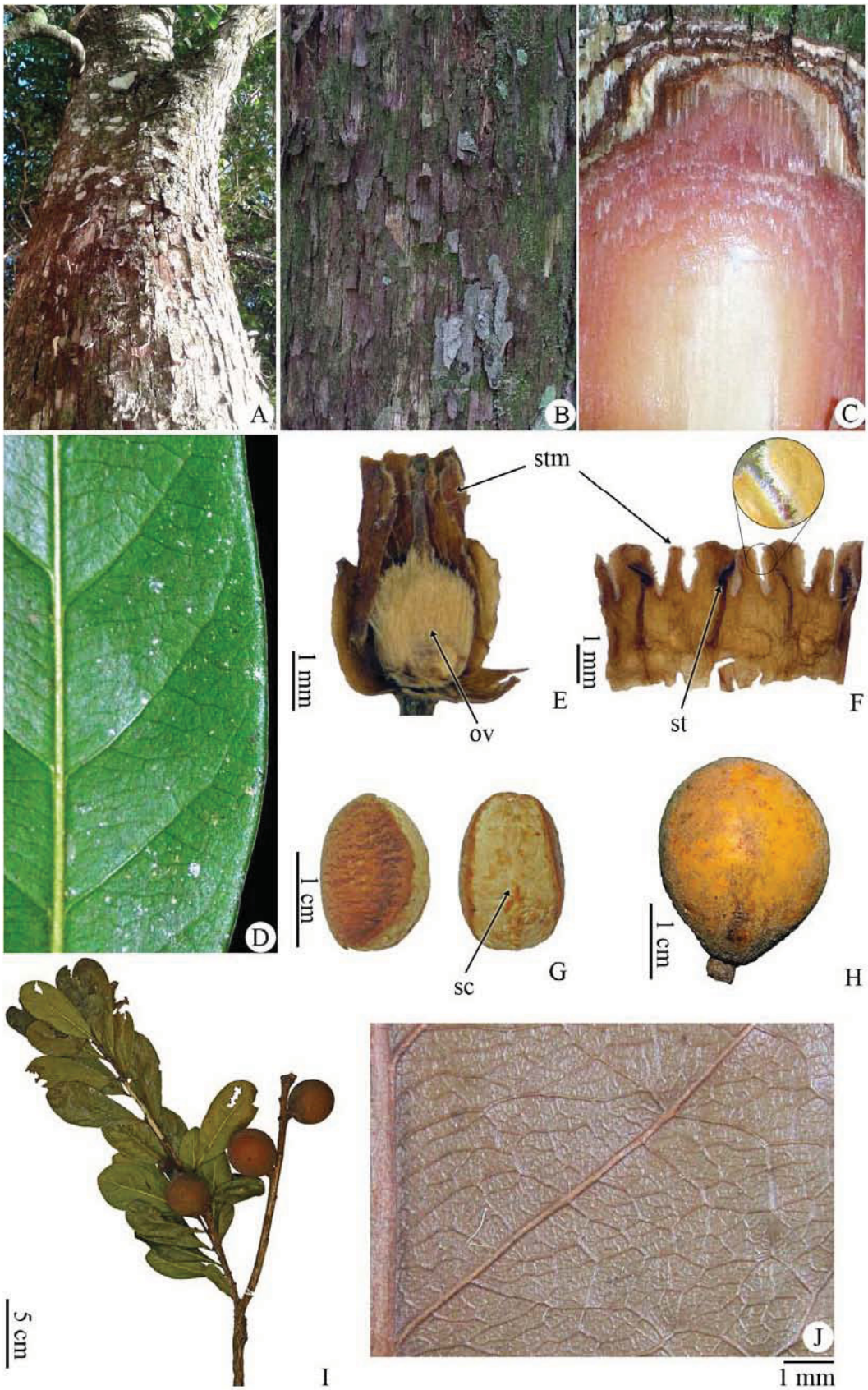

Figure 13: *Pouteria beaurepairei*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla and detail of the ciliate margin. G. Lateral and frontal view of the seed. H. Fruit. I. Stem with fruit. J. Detail of the venation. (A–C, from *R.R. Völtz* 1033; D, G–I from *R.R. Völtz* 23; E from *R. Kummrow* 1326; F from *M.S. Weiers* 22; J from *J.M. Silva* 1680) (ov: ovary; sc: seed scar; st: stamen; stm: staminode).

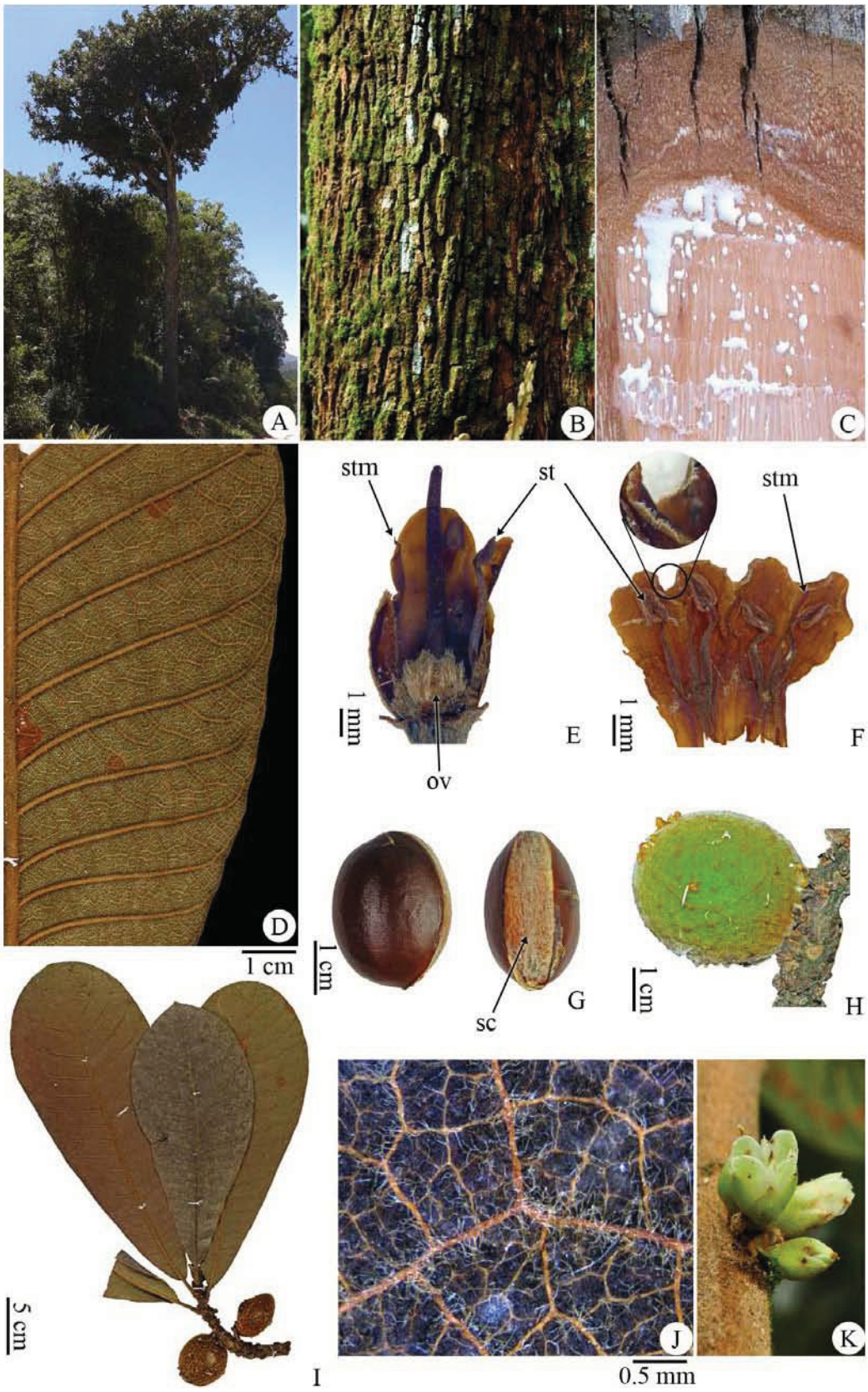

Figure 14: *Pouteria bullata*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla and detail of the ciliate margin. G. Lateral and frontal view of the seed. H. Fruit. I. Stem with fruit. J. Detail of the indumentum. K. Flower in vivo. (A–C, from *R.R. Völtz* 970; D, H–I from *R.R. Völtz* 1156; E, K from *R.R. Völtz* 1203; F, J from *G.G. Hatschbach* 1399; G from *G.G. Hatshcbach* 22242) (ov: ovary; sc: seed scar; st: stamen; stm: staminode).

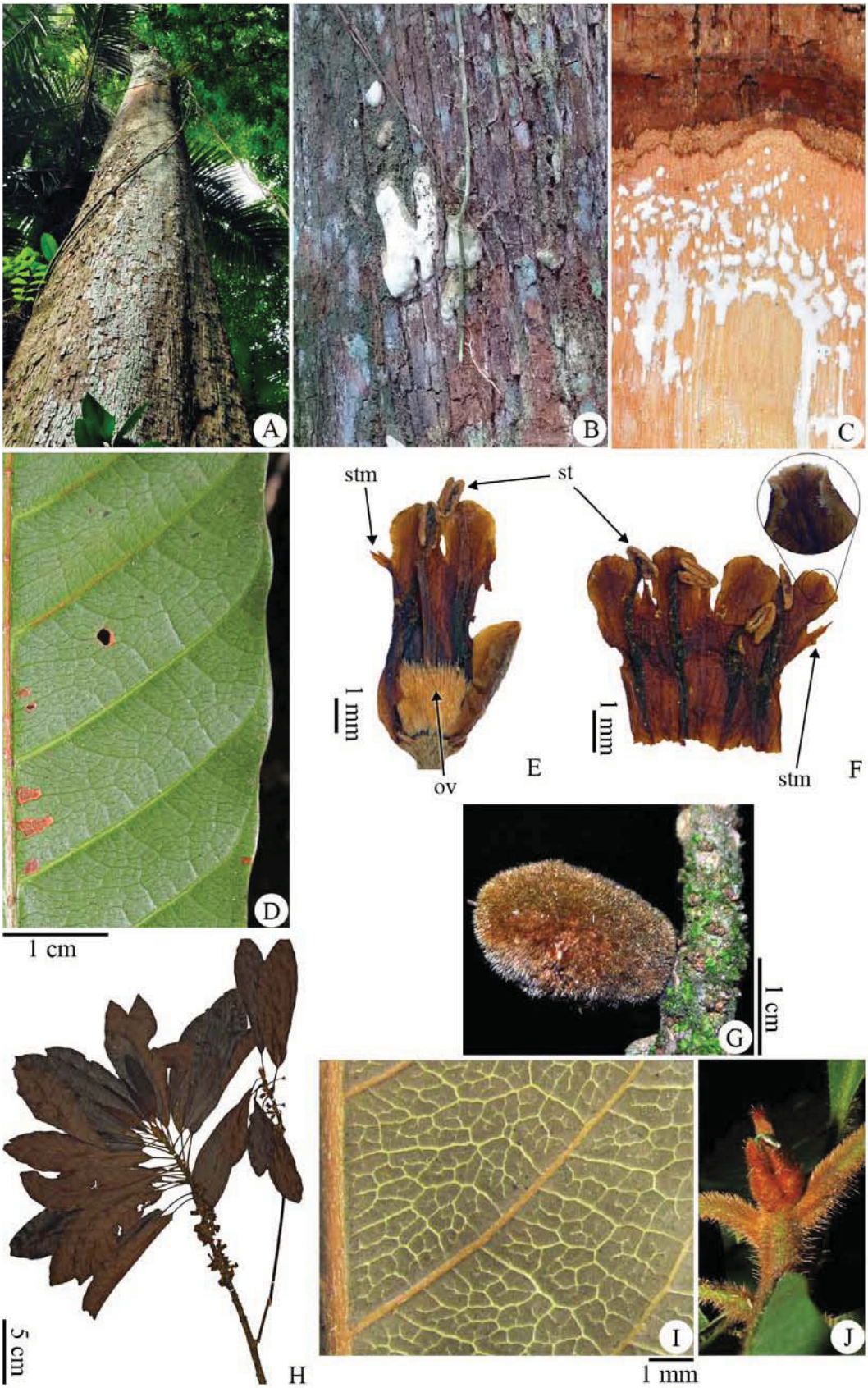

Figure 15: *Pouteria caimito*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla and detail of the ciliate margin. G. Fruit. H. Stem with flower. I. Detail of the venation. J. Detail of the young stem. (A without voucher; B–D, G, I–J from *R.R. Völtz* 976; E–F from *A.P. Savassi* 231; H from *N.M. Ivanauskas* 838) (ov: ovary; st: stamen; stm: staminode).

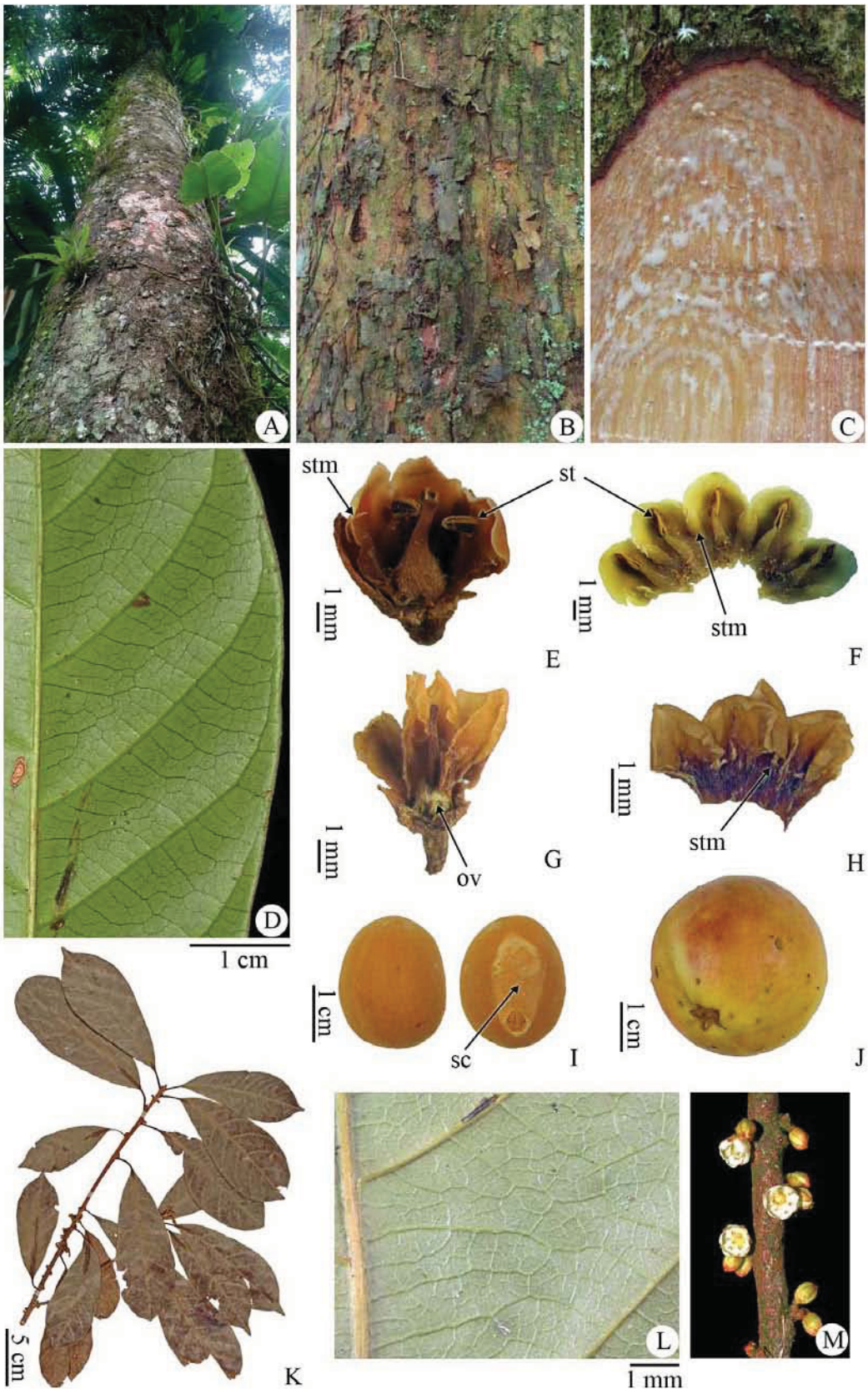

Figure 16: *Pouteria durlandii*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Staminate flower, longitudinal section. F. Adaxial surface of the staminate corolla. G. Pistillate flower, longitudinal section. H. Adaxial surface of the pistillate corolla. I. Lateral and frontal view of the seed. J. Fruit. K. Stem with flower. L. Detail of the venation. M. Flower in vivo. (A–F, L–M from *R.R. Völtz* 1467; G–H, K from *G.G. Hatschbach* 45419; I–J from *R.R. Völtz* 213) (ov: ovary; sc: seed scar; st: stamen; stm: staminode).

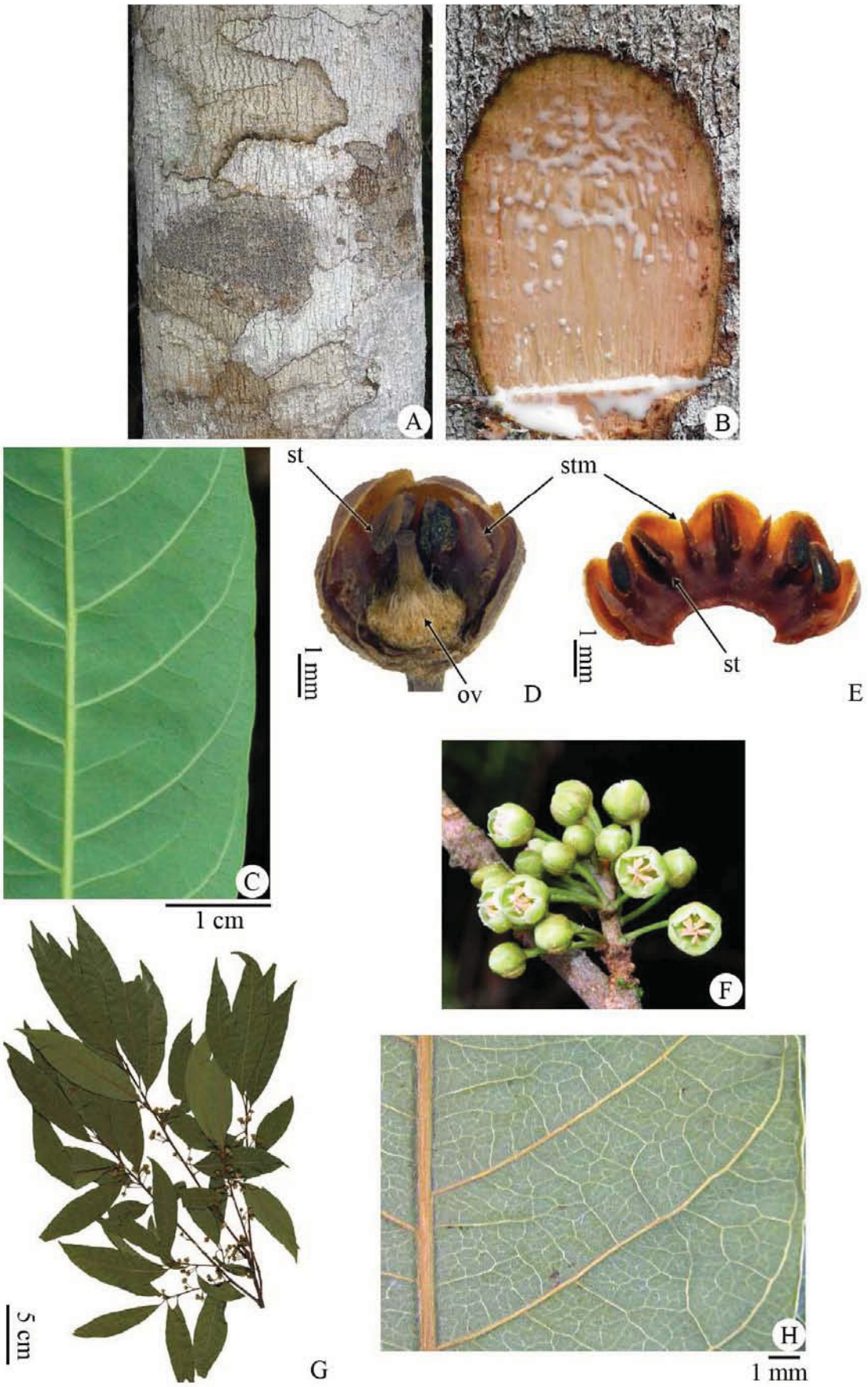

Figure 17: *Pouteria gardneri*. A. Bark. B. Slash. C. Abaxial surface of the leaf. D. Flower, longitudinal section. E. Adaxial surface of the corolla. F. Inflorescences. G. Stem with flower. H. Detail of the venation. (A–H from *R.R. Völtz* 1113) (ov: ovary; st: stamen; stm: staminode).

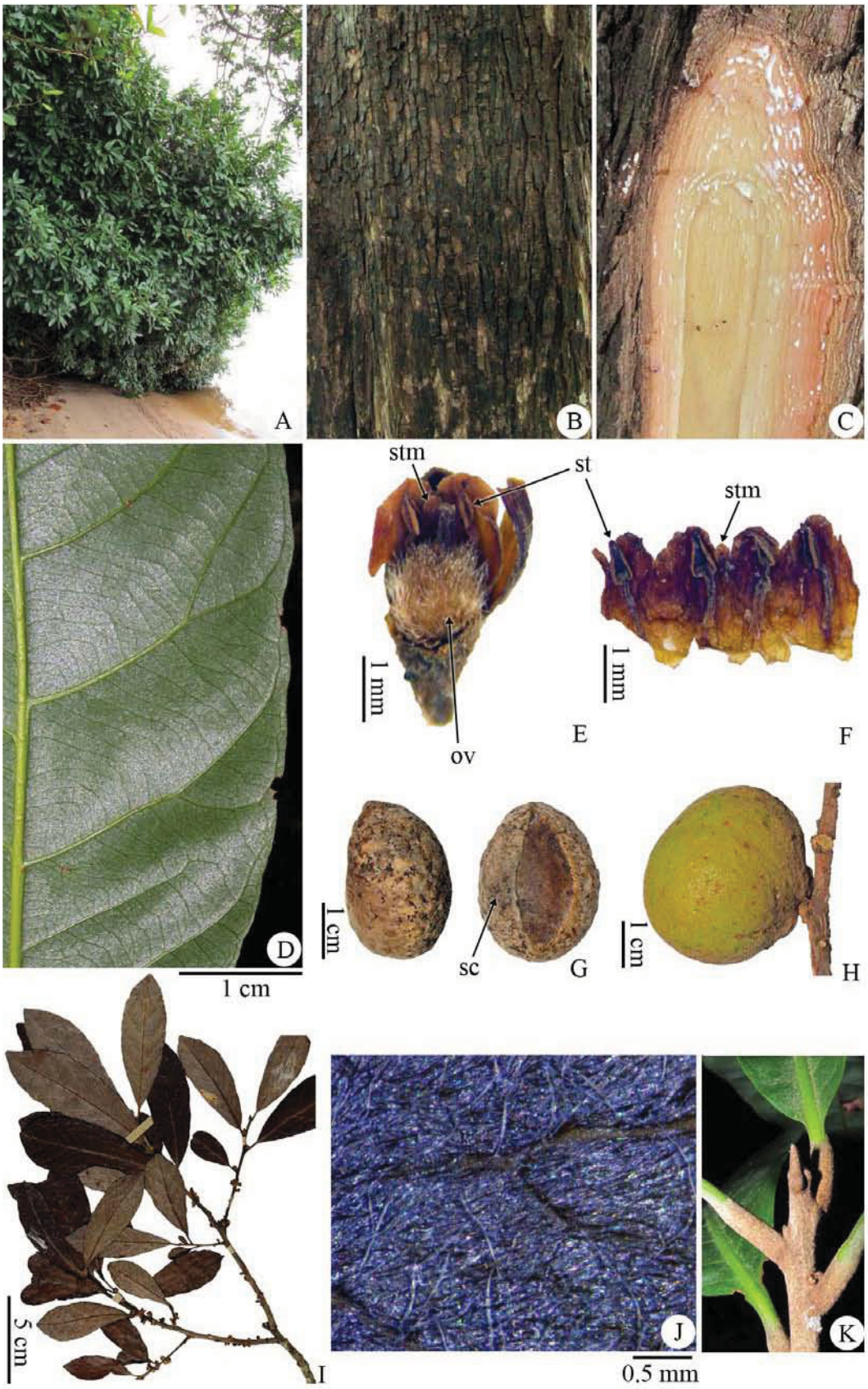

Figure 18: *Pouteria glomerata*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla. G. Lateral and frontal view of the seed. H. Fruit. I. Stem with flower. J. Detail of the indumentum; K. Detail of the stem indumentum. (A–D, G–H, K from *R.R. Völtz* 1524; E–F, J from *J.M. Margarido* 14; I from *G.G. Hatschbach* 15813) (ov: ovary; sc: seed scar; st: stamen; stm: staminode).

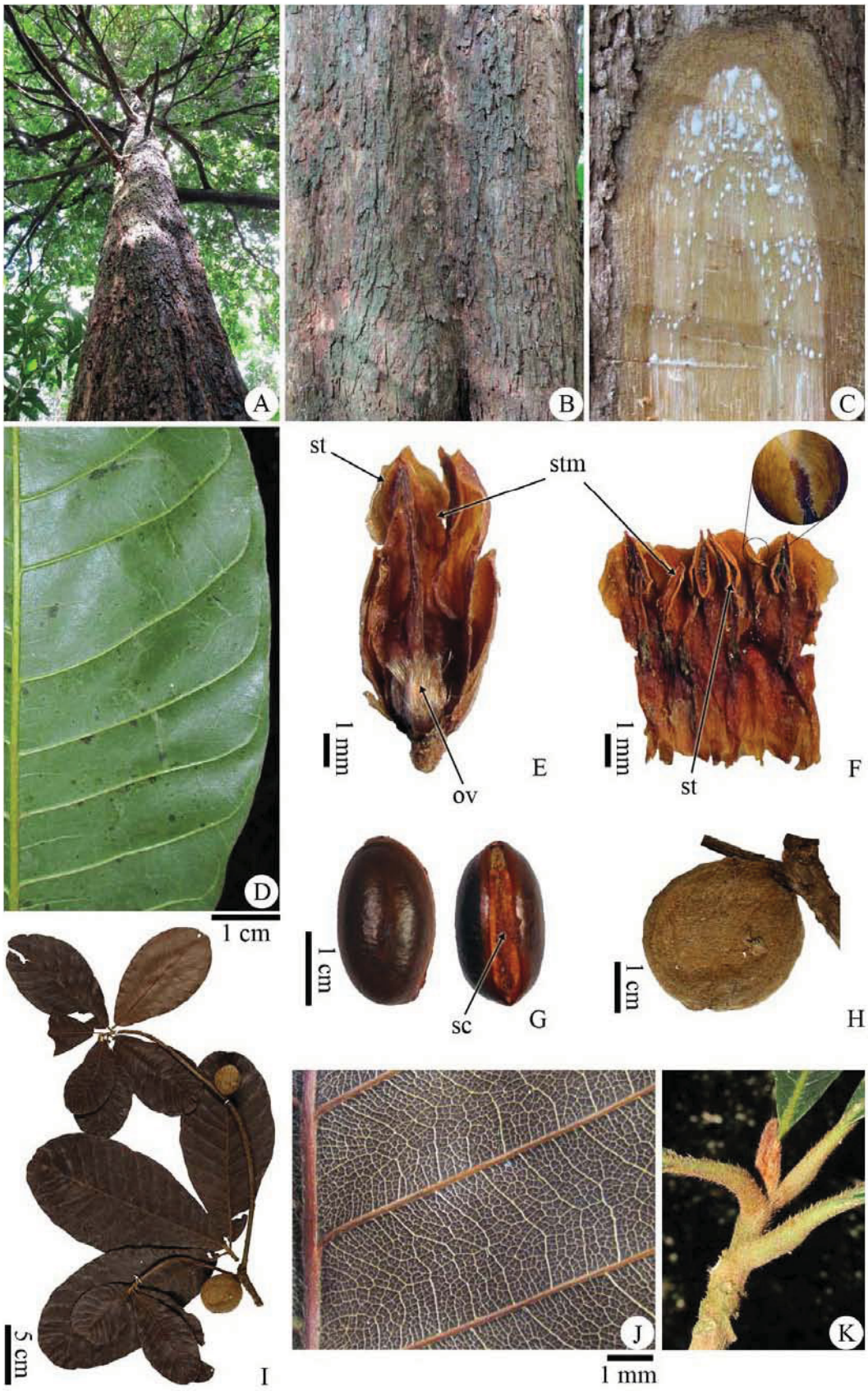

Figure 19: *Pouteria guianensis*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla and detail of the ciliate margin. G. Lateral and frontal view of the seed. H. Fruit. I. Stem with fruit. J. Detail of the venation; K. Detail of the stem indumentum. (A–D, K without voucher; E–F from *C.I.L.F. Rosa* 19; G from *G.G. Hatschbach* 15815; H–J from *J. Carneiro* 95) (ov: ovary; sc: seed scar; st: stamen; stm: staminode).

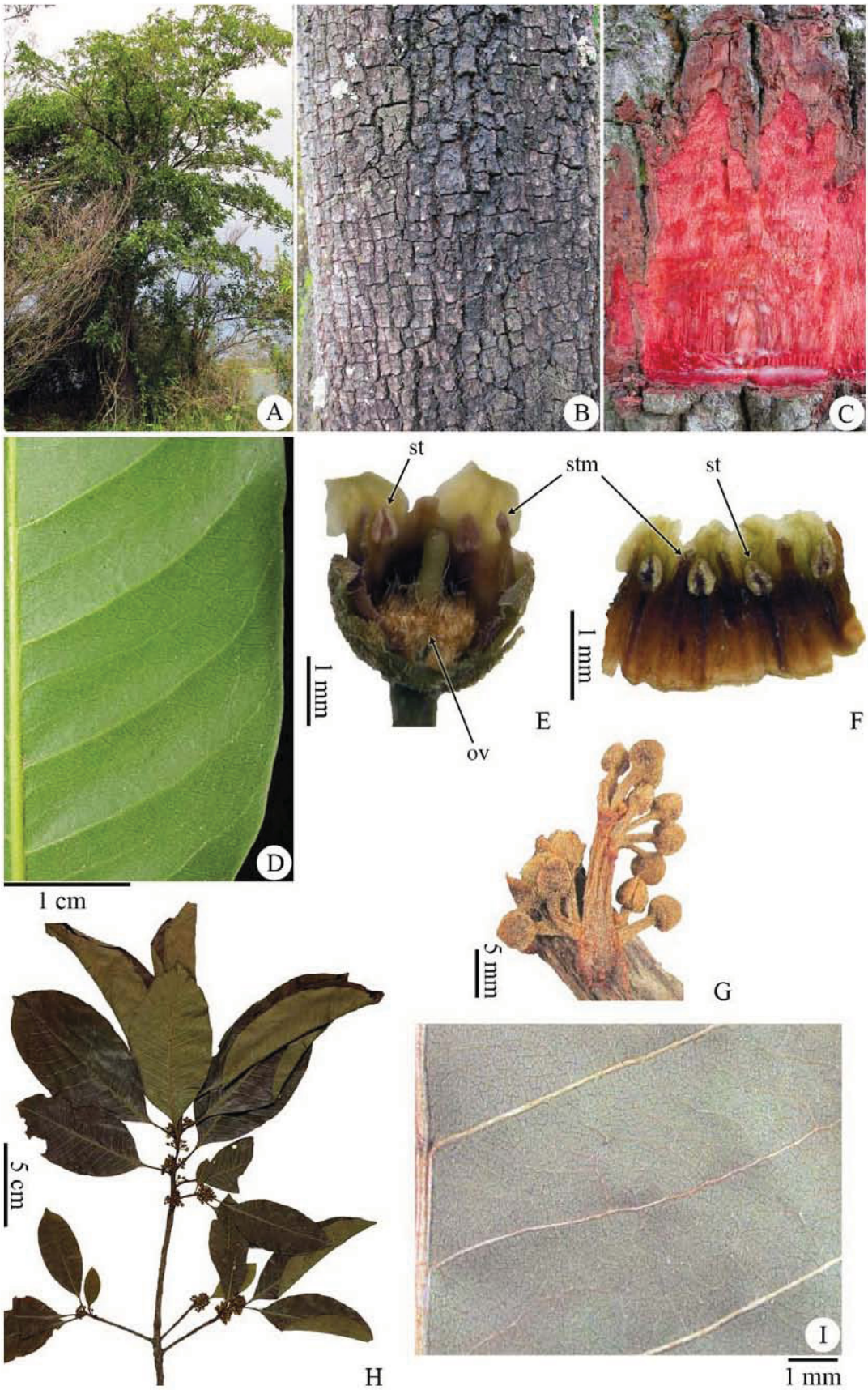

Figure 20: *Pouteria ramiflora*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla. G. Inflorescences set in a short aphyllous axillary shoot. H. Stem with flower. I. Detail of the venation. (A–D without voucher; E–I from *M.G. Caxambú* 5571) (ov: ovary; st: stamen; stm: staminode).

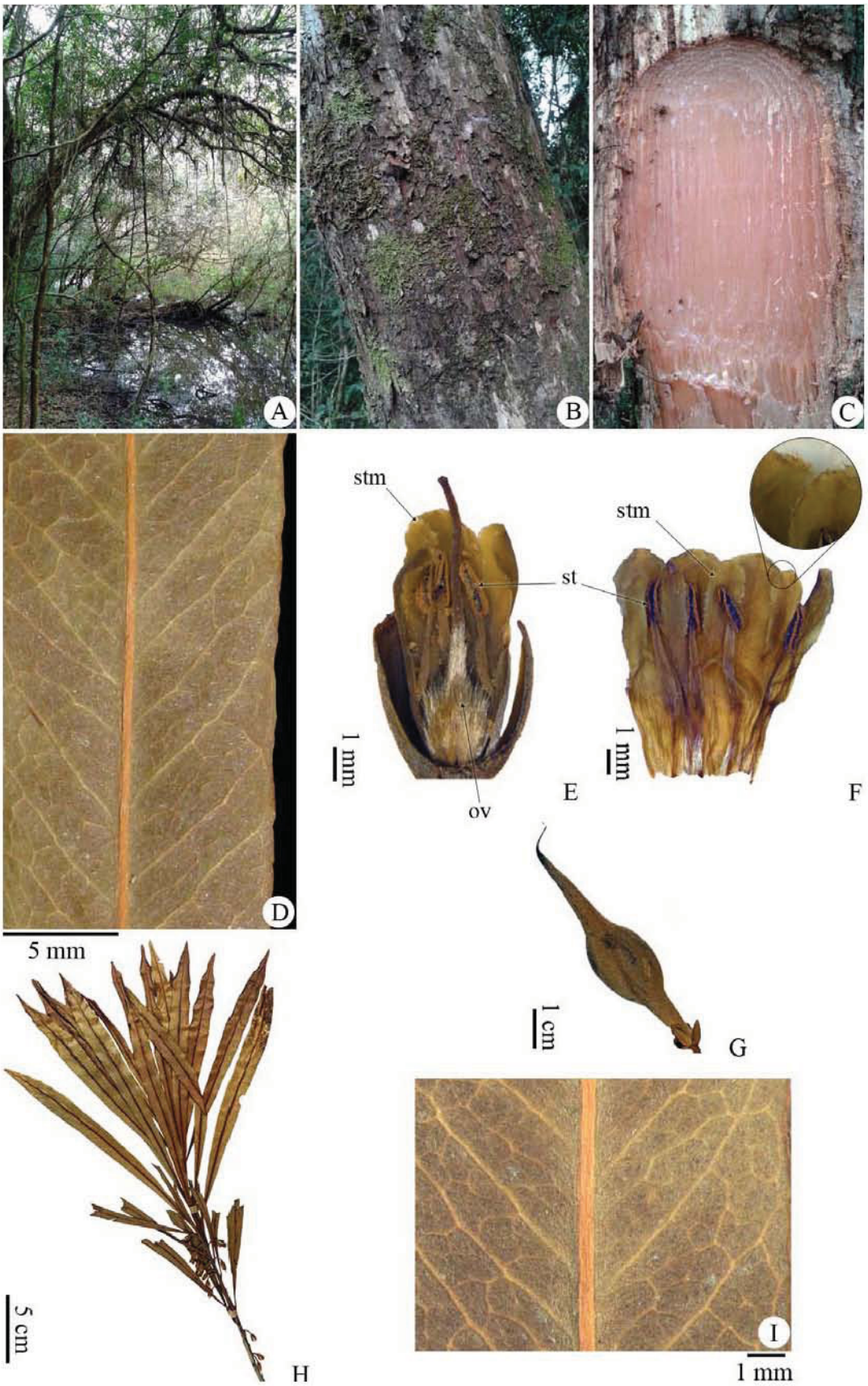

Figure 21: *Pouteria salicifolia*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla and detail of the ciliate margin. G. Immature fruit. H. Stem with flower. I. Detail of the venation. (A–D without voucher; E–F, H–I from *J.M. Silva* 2141; G from *G. Felitto* 898) (ov: ovary; st: stamen; stm: staminode).

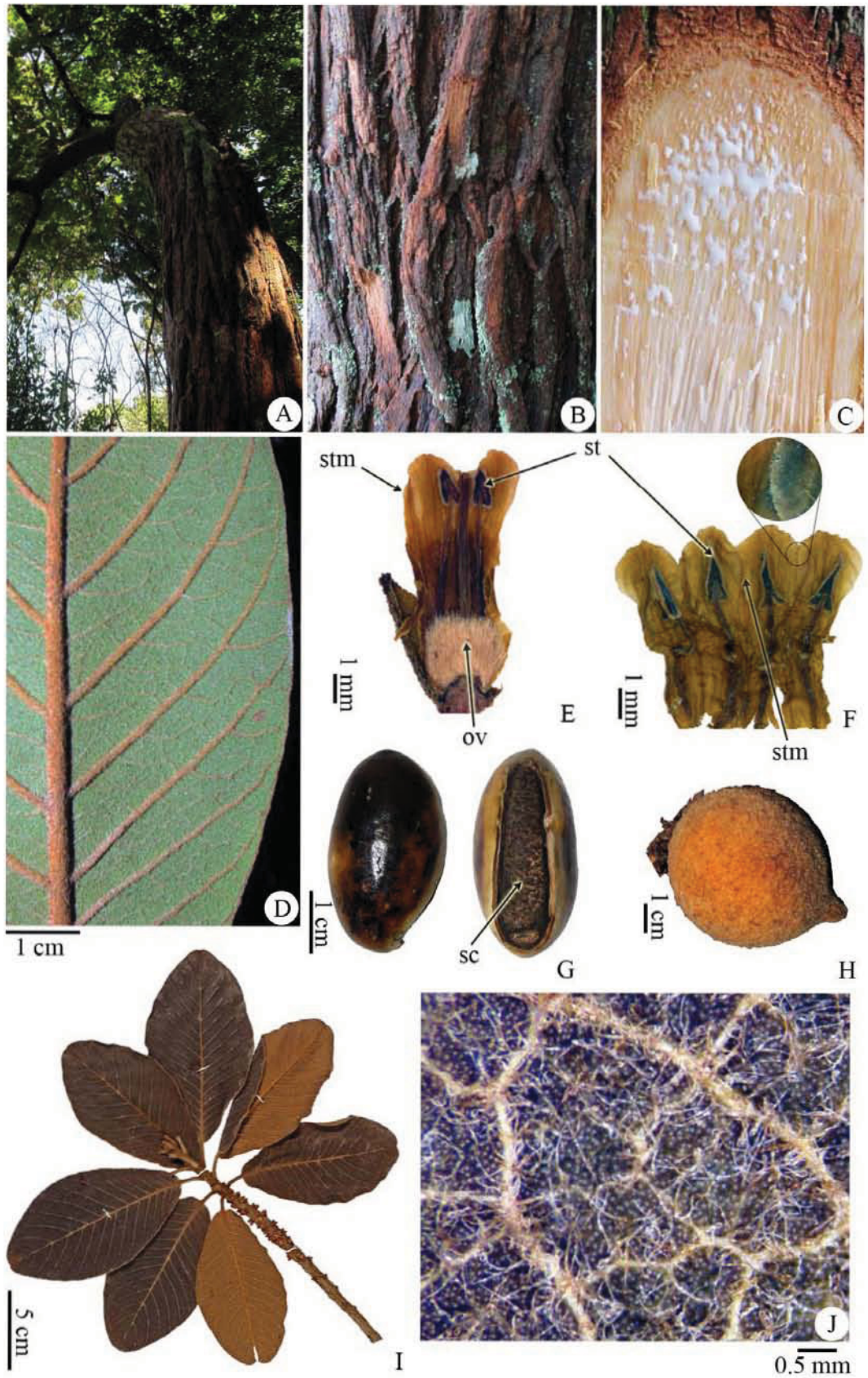

Figure 22: *Pouteria torta*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla and detail of the sparsely ciliate margin. G. Lateral and frontal view of the seed. H. Fruit. I. Stem with flower buds. J. Detail of the indumentum. (A–D, G–H from *R.R. Völtz* 1490; E from *M.G. Caxambú* 3211; F from *L.P. Queiroz* 2382; I–J from *M.G. Caxambú* 814) (ov: ovary; sc: seed scar; st: stamen; stm: staminode).

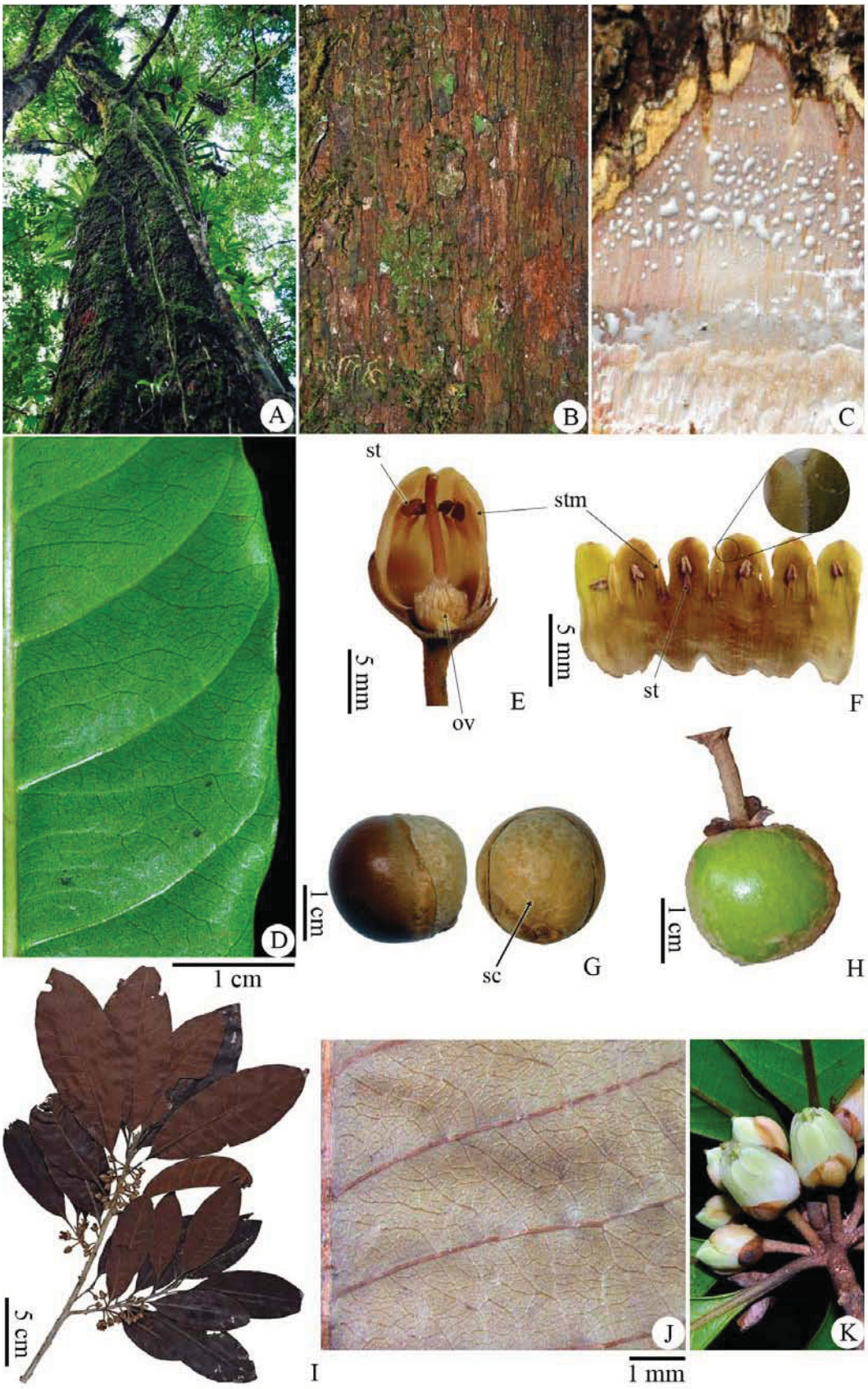

Figure 23: *Pouteria venosa*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla and detail of the papillose margin. G. Lateral and frontal view of the seed. H. Fruit. I. Stem with flower. J. Detail of the venation. K. Flower in vivo. (A–F, K from *R.R. Völtz* 1309; G–H from *R.R. Völtz* 1451; I from *G.G. Hatschbach* 19431; J from *G.G. Hatschbach* 19616) (ov: ovary; sc: seed scar; st: stamen; stm: staminode).

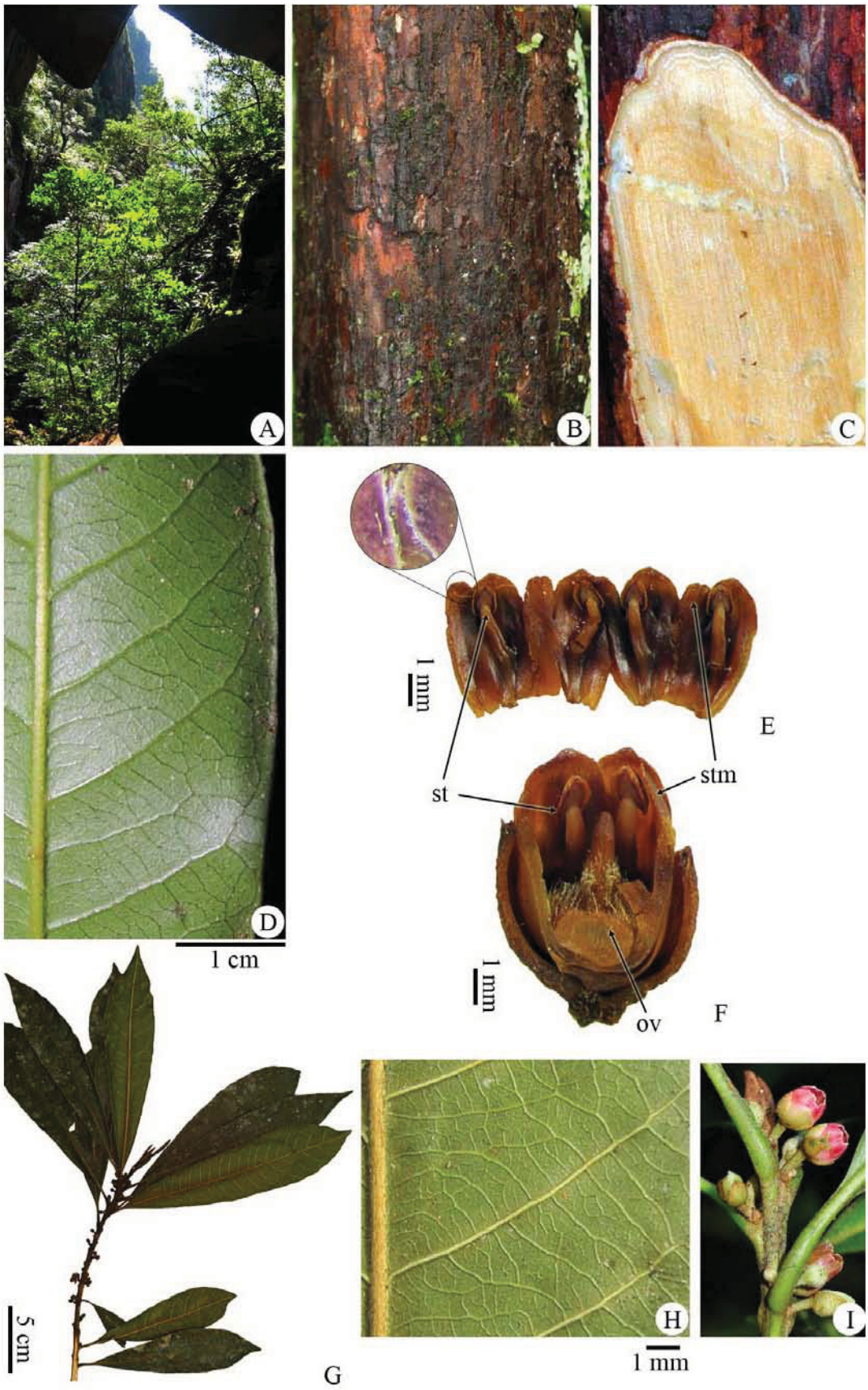

Figure 24: *Pouteria* sp. A. Habitat. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Adaxial surface of the corolla and detail of the ciliate margin. F. Flower, longitudinal section. G. Stem with flower. H. Detail of the venation. I. Flower in vivo. (B–I from *R.R. Völtz* 1562) (ov: ovary; st: stamen; stm: staminode).

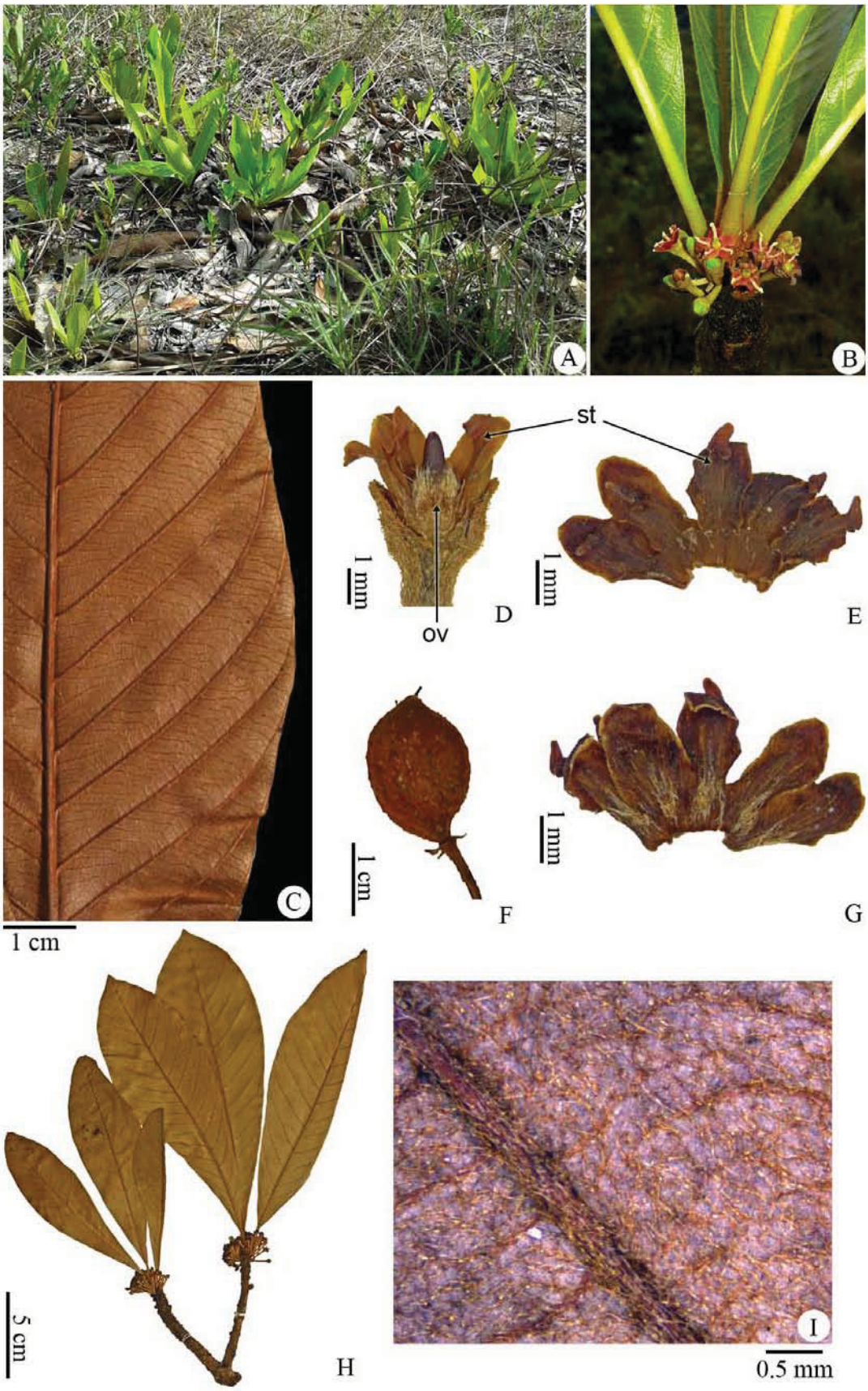

Figure 25: *Pradosia brevipes*. A. Habit. B. Flower in vivo. C. Abaxial surface of the leaf. D. Flower, longitudinal section. E. Adaxial surface of the corolla. F. Fruit. G. Abaxial surface of the corolla. H. Stem with flower. I. Detail of the indumentum. (A–E, G–I from *R.R. Völtz* 989; F from *G.G. Hatschbach* 52579) (ov: ovary; st: stamen).

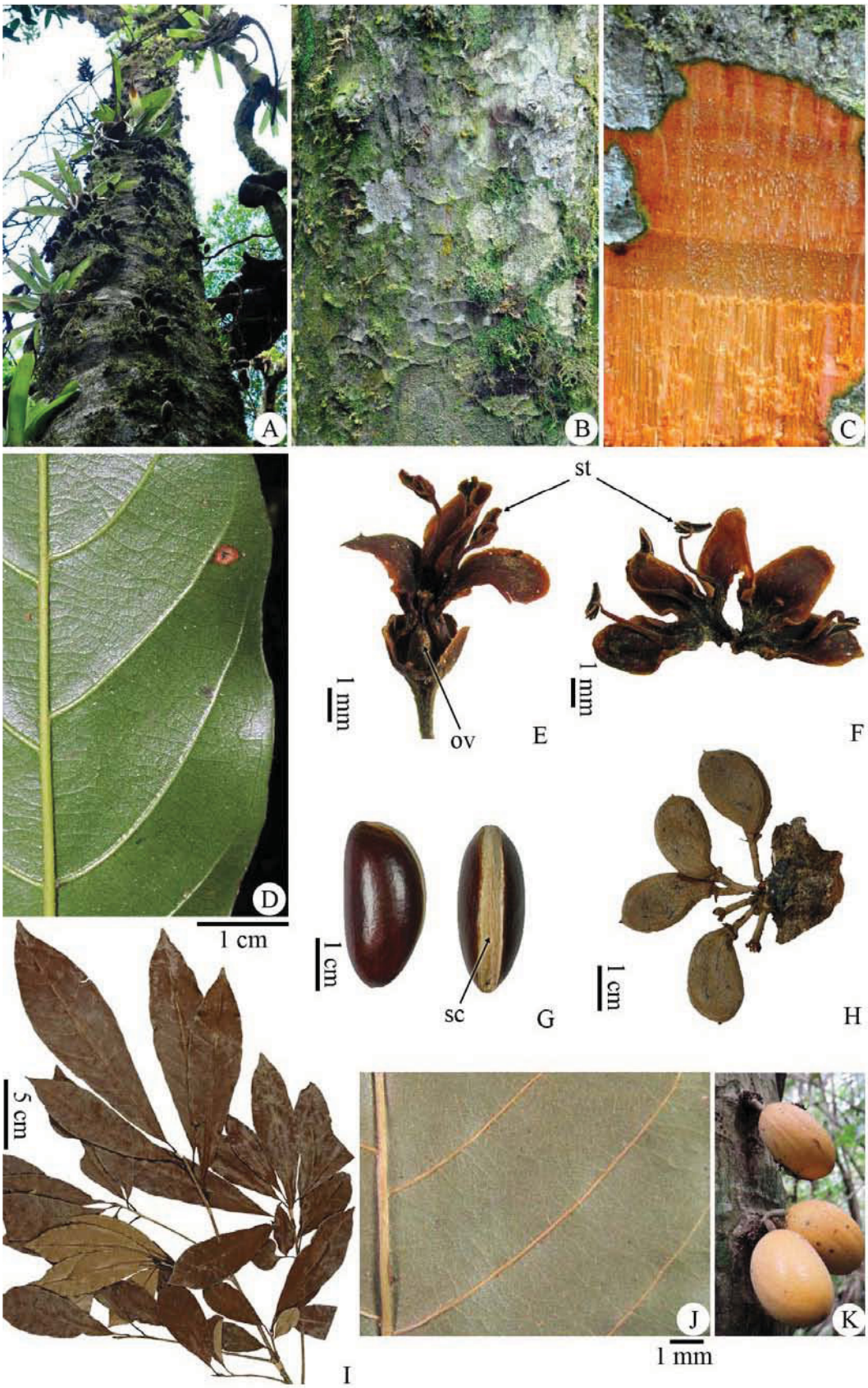

Figure 26: *Pradosia lactescens*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla. G. Lateral and frontal view of the seed. H. Fruit. I. Stem. J. Detail of the venation. K. Fruit attached on trunk. (A–C from *R.R. Völtz* 1310; D, G, J–K from *R.R. Völtz* 1301; E–F from *G.G. Hatschbach* 41775; H–I from *J.M. Silva* 2411) (ov: ovary; sc: seed scar; st: stamen).

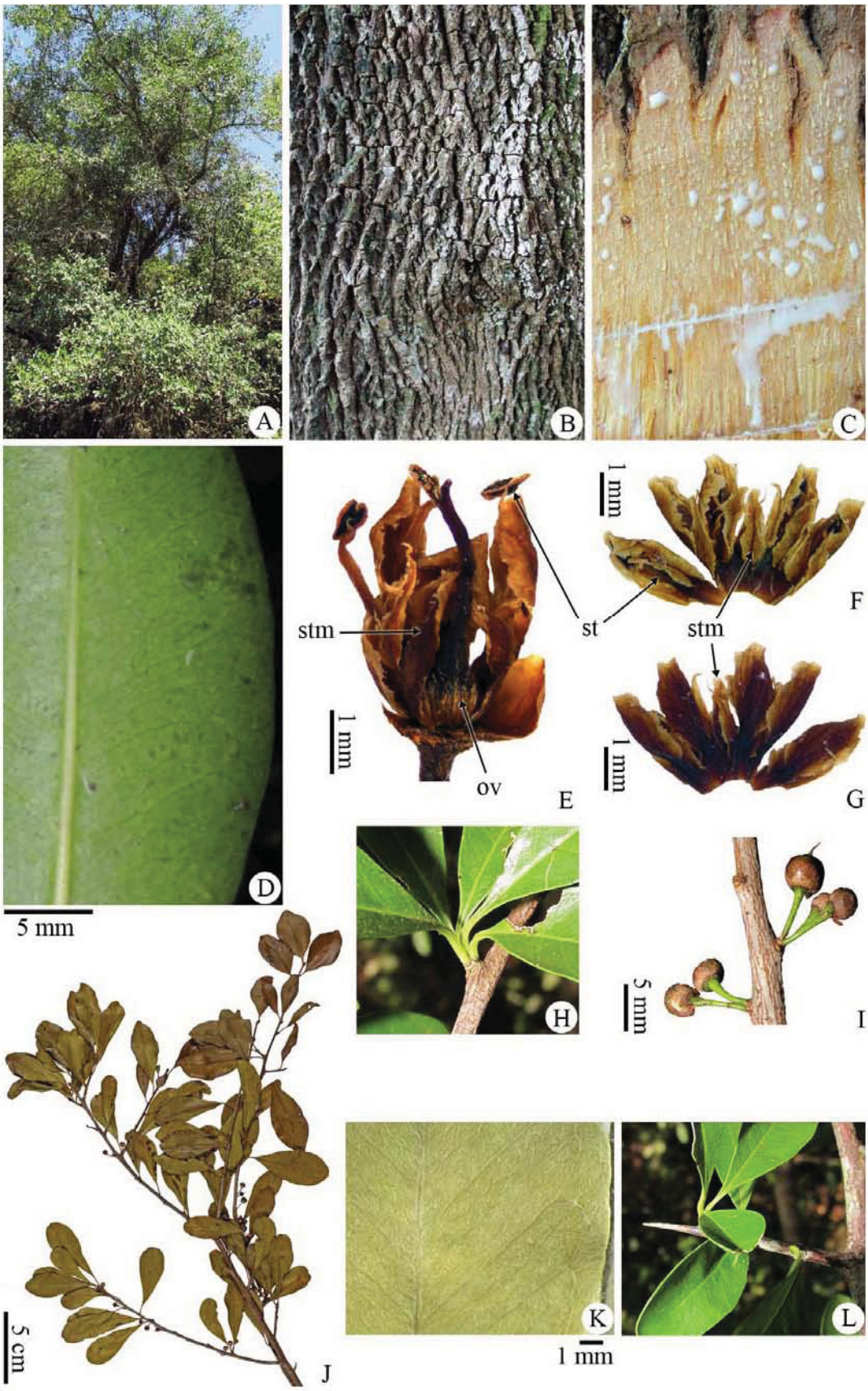

Figure 27: *Sideroxylon obtusifolium*. A. Habit. B. Bark. C. Slash. D. Abaxial surface of the leaf. E. Flower, longitudinal section. F. Adaxial surface of the corolla. G. Abaxial surface of the corolla. H. Leaves fascicled. I. Fruit. J. Stem with fruit. K. Detail of the venation. L. Spiny stem. (A–D, H–L from *R.R. Völtz* 1491; E–G from *J.A. Jarenkow* 522) (ov: ovary; st: stamen; stm: staminode).

4 CONSIDERAÇÕES FINAIS

Sapotaceae no Estado do Paraná é representada por 23 espécies subordinadas a sete gêneros. O gênero mais diverso é *Pouteria* com 12 espécies, seguido por *Chrysophyllum* (5 spp.) e *Pradosia* (2 spp.). *Diploon, Ecclinusa, Manilkara* e *Sideroxylon* apresentam uma espécie cada. Táxons anteriormente listados para o Paraná não foram incluídos nesse estudo porque se tratavam de erros de identificação, como no caso de *Chrysophyllum flexuosum*, *Manilkara salzmannii*, *Pouteria gardneriana* e *Pouteria grandiflora*. Além disso, espécies cultivadas como *Chrysophyllum cainito* e *Manilkara zapota* ou espécies exóticas como *Mimusops coriacea* também não foram incluídas.

Por outro lado foi registrado pela primeira vez *Pouteria guianensis*, anteriormente identificada como *Pouteria torta* subsp. *glabra,* e que hoje é sinônimo da primeira espécie. Outro primeiro registro para a flora paranaense foi *Pouteria ramiflora*, espécie coletada em 2014 nas ilhas do Parque Nacional de Ilha Grande e que até o presente estudo não tinha sua identidade determinada.

A maioria das espécies que ocorrem no Paraná apresentam ampla distribuição pela América do Sul, seja por representantes das florestas tropicais da bacia amazônica, seja por representantes da florestas estacionais. Algumas poucas são endêmicas, principalmente aquelas que ocorrem na Floresta Atlântica *stricto sensu*. Dentro do limite geopolítico estadual, a Floresta Ombrófila Densa é a fitofisionomia mais rica com 14 espécies. Em seguida vem a Floresta Estacional Semidecidual com nove espécies, Floresta Ombrófila Mista com três espécies e a Savana com duas espécies.

Dentre os caracteres morfológicos que permitem o reconhecimento das espécies, são destaques a presença ou ausência de estípulas e espinhos, o padrão de venação secundária e terciária, a presença ou ausência de nervuras intersecundárias, indumento, o número de verticilos do cálice, tipo de flor, tipo de margem dos lobos da corola e a presença ou ausência de estaminódio.

A caracterização de tronco e casca se mostrou muito útil para o reconhecimento das espécies em campo, apesar que em algumas situções o padrão não se mostra tão nítido, pois o tronco pode estar coberto por musgos e líquens. A casca interna é outra característica auxiliar importante na identificação. No entanto,

devem ser utilizados com cautela e sempre associados com outros elementos como folhas, flores e frutos.

Das espécies registradas no Paraná, *Pouteria bullata* apresenta-se “em perigo” (EN) segundo as listas oficiais. *Chrysophyllum paranaense* e *Chrysophyllum viride* são enquadradas como “vulnerável” (VU) e “quase ameaçada” (NT), respectivamente. As espécies restantes ou enquadram-se em “menos preocupante” (LC) ou não foram ainda avaliadas segundo os critérios da IUCN. Dentre as ameaças potenciais observadas, destaca-se a perda de habitat por agricultura, pecuária, urbanização e grande obras, perda da qualidade do habitat e a fragmentaçao dos remascentes.

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APÊNDICE A – RELACAO DE INDIVÍDUOS ANALISADOS PARA A CARACTERIZAÇÃO DE TRONCO E CASCA

(continua)

Espécie	Município	Coordenadas	Voucher
Chrysophyllum gonocarpum	Fênix	23°54'44" S / 51°57'20" W	Völtz 982
(Mart. & Eichler ex Miq.) Engl.	Fênix	23°54'52" S / 51°57'18" W	-
	Foz do Iguaçu	25°37'47" S / 54°27'44" W	Völtz 1512
	Londrina	23°26'46" S / 51°14'52" W	-
Chrysophyllum inornatum Mart.	Antonina	25°16'47" S / 48°39'22" W	Völtz 1171
	Antonina	25°17'01" S / 48°38'35" W	-
	Guaratuba	25°38'42" S / 48°47'59" W	Völtz 1089
	Guaratuba	25°37'55" S / 48°47'55" W	-
	Adrianópolis	24°42'00" S / 48°45'26" W	Völtz 1088
	Adrianópolis	24°42'00" S / 48°45'24" W	-
	Guaratuba	25°43'52" S / 48°56'41" W	-
Chrysophyllum marginatum (Hook. & Arn.)	Tibagi	24°25'03" S / 50°20'24" W	-
Radlk.	Londrina	23°26'50" S / 51°14'53" W	-
Chrysophyllum paranaense T.D.Penn.	Guaraqueçaba	25°11'01" S / 48°17'57" W	Völtz 1483
	Guaraqueçaba	25°10'29" S / 48°17'06" W	Völtz 1511
	Guaraqueçaba	25°10'29" S / 48°17'05" W	-
	Guaratuba	25°47'27" S / 48°37'39" W	Völtz 1536
Chrysophyllum viride Mart. & Eichler	Adrianópolis	24°51'36" S / 48°43'05" W	-
	Adrianópolis	24°51'36" S / 48°43'05" W	-
	Adrianópolis	24°53'21" S / 48°45'43" W	Völtz 972
	Guaraqueçaba	25°10'13" S / 48°18'50" W	-
	Guaraqueçaba	25°10'04" S / 48°18'55" W	-
	Adrianópolis	24°51'29" S / 48°42'11" W	-
	Morretes	25°21'38" S / 48°53'04" W	Völtz 1218
	Morretes	25°21'52" S / 48°52'39" W	Völtz 502
	Guaratuba	25°43'45" S / 48°56'44" W	Völtz 1262
Diploon cuspidatum (Hoehne) Cronquist	Paranaguá	25°35'01" S / 48°40'06" W	-
	Paranaguá	25°35'03" S / 48°40'01" W	-
	Guaraqueçaba	25°10'14" S / 48°18'02" W	Völtz 1465
	Guaraqueçaba	25°10'15" S / 48°18'07" W	-
	Guaraqueçaba	25°10'41" S / 48°18'12" W	-
	Guaraqueçaba	25°10'44" S / 48°18'14" W	Völtz 1302
	Morretes	25°35'47" S / 48°42'42" W	-
Ecclinusa ramiflora Mart.	Guaraqueçaba	25°09'38" S / 48°17'36" W	-
	Guaraqueçaba	25°09'50" S / 48°18'00" W	-
	Guaraqueçaba	25°10'38" S / 48°18'00" W	-
	Guaraqueçaba	25°09'33" S / 48°18'33" W	-
	Guaraqueçaba	25°09'50" S / 48°18'01" W	-
	Guaraqueçaba	25°10'16" S / 48°18'05" W	Völtz 1106
	Guaraqueçaba	25°09'26" S / 48°17'34" W	-
Manilkara subsericea (Mart.) Dubard	Paranaguá	25°35'05" S / 48°39'58" W	-
	Guaraqueçaba	25°09'38" S / 48°17'35" W	-
	Guaraqueçaba	25°09'38" S / 48°17'35" W	-
	Guaraqueçaba	25°10'38" S / 48°18'04" W	-
	Paranaguá	25°26'08" S / 48°31'35" W	-
	Morretes	25°35'47" S / 48°42'42" W	Völtz 1188

APÊNDICE A – RELACAO DE INDIVÍDUOS ANALISADOS PARA A CARACTERIZAÇÃO DE TRONCO E CASCA

(conclusão)

Espécie	Município	Coordenadas	Voucher
Pouteria beaurepairei (Glaz. & Raunk.)	Paranaguá	25°33'08" S / 48°18'26" W	-
Baehni	Paranaguá	25°33'05" S / 48°18'25" W	Völtz 1033
	Paranaguá	25°31'39" S / 48°18'40" W	Völtz 1031
	Paranaguá	25°26'18" S / 48°31'28" W	-
	Guaraqueçaba	25°27'44" S / 48°13'32" W	Völtz 23
Pouteria bullata (S.Moore) Baehni	Adrianópolis	24°51'12" S / 48°42'44" W	-
	Adrianópolis	24°51'09" S / 48°42'44" W	Völtz 1156
	Adrianópolis	24°53'58" S / 48°48'03" W	Völtz 970
	Adrianópolis	24°50'43" S / 48°40'09" W	-
	Adrianópolis	24°50'55" S / 48°40'00" W	-
	Guaraqueçaba	25°09'37" S / 48°18'35" W	-
	Morretes	25°36'02" S / 48°42'23" W	-
	Morretes	25°37'04" S / 48°41'44" W	-
	Morretes	25°26'47" S / 48°54'51" W	Völtz 1354
Pouteria caimito (Ruiz & Pav.) Radlk.	Guaraqueçaba	25°09'50" S / 48°18'01" W	-
	Guaraqueçaba	25°09'31" S / 48°17'34" W	Völtz 976
	Guaraqueçaba	25°09'33" S / 48°18'32" W	-
	Morretes	25°35'49" S / 48°42'39" W	-
	Guaraqueçaba	25°09'32" S / 48°17'34" W	Völtz 211
	Paranaguá	25°35'12" S / 48°32'46" W	-
Pouteria durlandii (Standl.) Baehni	Antonina	25°16'47" S / 48°39'22" W	-
	Antonina	25°16'47" S / 48°39'22" W	-
	Antonina	25°17'01" S / 48°38'35" W	-
	Guaratuba	25°38'11" S / 48°48'00" W	-
	Guaraqueçaba	25°10'14" S / 48°18'02" W	-
	Guaraqueçaba	25°09'50" S / 48°18'01" W	Völtz 1467
	Paranaguá	25°25'02" S / 48°31'49" W	-
	Paranaguá	25°25'22" S / 48°31'45" W	-
	Guaraqueçaba	25°10'05" S / 48°18'51" W	Völtz 1170
	Guaraqueçaba	25°10'43" S / 48°18'16" W	-
Pouteria gardneri (Mart. & Miq.)	Adrianópolis	24°41'09" S / 48°45'14" W	Völtz 1113
Baehni	Tunas do Paraná	24°59'39" S / 48°51'47" W	-
Pouteria glomerata (Miq.) Radlk.	Marilene	22°40'01" S / 53°05'34" W	Völtz 1524
	Porto Rico	22°45'49" S / 53°17'43" W	Völtz 1487
Pouteria guianensis Aubl.	Diamante do Norte	22°36'11" S / 52°53'31" W	-
	Diamante do Norte	22°37'10" S / 52°53'31" W	-
	Diamante do Norte	22°37'10" S / 52°53'31" W	-
	Porto Rico	22°45'49" S / 53°17'43" W	-
Pouteria ramiflora (Mart.) Radlk.	Icaraíma	23°20'55" S / 53°45'56" W	-
Pouteria salicifolia (Spreng.) Radlk.	Foz do Iguaçu	25°35'46" S / 54°23'37" W	-
Pouteria torta (Mart.) Radlk.	Campo Mourão	24°00'52" S / 52°21'48" W	Völtz 1490
Pouteria venosa (Mart.) Baehni	Morretes	25°37'09" S / 48°41'42" W	Völtz 1309
	Morretes	25°37'04" S / 48°41'44" W	-
	Morretes	25°26'43" S / 48°54'54" W	-
Pouteria sp.	Morretes	25°26'46" S / 48°54'52" W	Völtz 1562
Pradosia lactescens (Vell.) Radlk.	Paranaguá	25°25'01" S / 48°31'49" W	-
	Morretes	25°36'54" S / 48°41'57" W	Völtz 1310
	Guaraqueçaba	25°10'06" S / 48°18'02" W	Völtz 1301
	Antonina	25°14'22" S / 48°39'53" W	Völtz 1404
Sideroxylon obtusifolium	Leópolis	23°06'15" S / 50°47'13" W	Völtz 1491
(Roem. & Schult.) T.D.Penn.	Leópolis	23°06'11" S / 50°47'57" W	-

APÊNDICE B – CARACTERES MORFOLÓGICOS AVALIADOS PARA TODAS AS ESPÉCIES

Ramos
Cor
Secção transversal
Pilosidade
Lenticelas (ausência / presença)
Estípulas (ausência / presença)
Folha
Pecíolo
Secção transversal
Dimensão
Pilosidade
Filotaxia
Consitência
Lâmina
Forma
Dimensão (compr. x larg.)
Ápice
Base
Margem
Pilosidade (Ab. & ad.)
Perfil venação primária
Venação secundária
Tipo
Perfil
N° de pares
Desenvolvimento venação intersecundária
Venação terciária
Tipo
Perfil
Tipo de venação quaternária
Inflorescência
Local
N° de flores
Fruto
Cor
Forma
Dimesão (compr. x larg.)
Rugosidade
Pilosidade
N° sementes
Sementes
Dimesão (compr. x larg.)
Forma
Rugosidade
Cicatriz

Flor
Pedicelo
Dimensão
Pilosidade
Andrógina/unissexual
Cálice
N° verticilos
N° de sépalas
Dimensão
Forma
Ápice
Margem
Pilosidade (Ab. & Ad.)
Corola
Tipo
Dimensão
N° pétalas
Cor
Dimensão tubo
Dimensão lobos
Ápice
Margem
Pilosidade (Ab. & Ad.)
Androceu
N° estames
Excerto/Incluso
Local fusão
Dimesão filamentos
Pilosidade filamentos
Dimesão antera
Forma antera
Pilosidade antera
Estaminódios
Quantidade
Dimensão
Forma
Gineceu
Forma ovário
Dimensão ovário
N° lóculos
Pilosidade ovário
Dimesão estilete
Pilosidade estilete
Estigma (Inteiro / lobado)

ANEXO A – FICHA LEVANTAMENTO TRONCO E CASCA

UFPR

Laboratório de Dendrologia / Herbário EFC

FICHA DESCRITIVA PARA LEVANTAMENTO DENDROLÓGICO

DATA: ____/____/____ Local: _____ Alt.: _____ PAP: _____ Altura: _____ Fotos: _____

Código: _____ Família: _____ Nome científico: _____

1. TRONCO (Fuste):

1.1 Posição → ( ) ereto ( ) inclinado

1.2 Forma longitudinal → ( ) reto ( ) tortuoso ( ) torcido ( ) abaulado ou ventricoso

1.3 Forma transversal → ( ) cilíndrico / elíptico ( ) acanalado ( ) nodoso ( ) fenestrado ( ) arestado ou cristado

1.4 Base do fuste → ( ) reta ( ) dilatada ( ) digitada ( ) acanalada

( ) raízes superficiais ( ) raízes escora ( ) raízes adventícias

( ) raiz sapopema → simetria: ( ) simétrica ( ) assimétrica ( ) ramificada

→ forma da aresta: ( ) convexa ( ) reta ( ) côncava

OBS → _____

2. CASCA EXTERNA (Ritidoma):

2.1 Deiscência → ( ) deiscente ( ) indeiscente *2.2 Espessura* → _____ (mm) *2.3 Cor* → _____

2.4 Aspecto → ( ) liso ( ) áspero ( ) rugoso (dobras transversais) ( ) com depressões ( ) reticulado ( ) estriado

( ) laminado → consistência: ( ) papiráceas ( ) coriáceas

( ) escamoso → consistência: ( ) papiráceas ( ) lenhosas

→ formato: ( ) quadrado ( ) retangular ( ) irregular

→ aderência: ( ) lateral ( ) central ( ) apical ( ) indeterminada

( ) fissurado → largura → _____ (mm) profundidade → _____ (mm)

→ forma da crista: ( ) côncava ( ) convexa ( ) aguda ( ) plana

( ) verrucoso → disposição: ( ) dispersas ( ) agrupadas vertical ( ) agrupadas horizontal

( ) irregularmente agrupadas

→ forma da lenticela: ( ) circular ( ) elíptica vertical ( ) elíptica horizontal

( ) linear horizontal ( ) linear vertical

2.5 Desprendimento → ( ) lâminas ( ) placas ( ) ripas ( ) escamas ( ) pulverulento (microescamas)

2.6 Outros elementos → ( ) cicatrizes → disposição: ( ) anelar ( ) espiralada ( ) dispersa

( ) irregularmente agrupadas

( ) acúleos ou espinhos → aspecto: ( ) cônico ( ) mameliforme ( ) agudo ( ) ramificado

Descrição → _____

2.7 OBS → _____

3. CASCA INTERNA (Casca viva):

3.1 Cor → _____ *3.2 Odor* → (bom / ruim / descrição) _____

3.3 Resistência ao corte → ( ) macia ( ) média ( ) dura

3.4 Textura → ( ) fibrosa ( ) curto fibrosa ( ) arenosa ( ) pastosa

3.5 Aparência → ( ) anéis ( ) trançada (mesclada) ( ) compacta ( ) fibriada ( ) pontuações ( ) perfurações

3.6 Oxidação → ( ) sim ( ) não *3.7 Cor após oxidação* → _____

3.8 Exsudado → ( ) sem ( ) látex ( ) goma ( ) resina

3.9 Cor exsudado → _____ *3.10 Quantidade*: ( ) escassa ( ) abundante

3.11 Exsudado ramos e folhas → ( ) escassa ( ) abundante *3.12 Cor exsudado* → _____

3.13 OBS → _____

FONTE: LABORATÓRIO DE DENDROLOGIA/HERBÁRIO EFC (2010)