UNIVERSIDADE FEDERAL DE PERNAMBUCO
CENTRO DE BIOCIÊNCIAS
PROGRAMA DE PÓS-GRADUAÇÃO EM BIOLOGIA VEGETAL

ALINE FERNANDES PONTES PIRES

FILOGENIA E TAXONOMIA DE *XYLOPIA* L. (ANNONACEAE), COM FOCO NAS ESPÉCIES AMAZÔNICAS

Recife
2019

ALINE FERNANDES PONTES PIRES

FILOGENIA E TAXONOMIA DE *XYLOPIA* L. (ANNONACEAE), COM FOCO NAS ESPÉCIES AMAZÔNICAS

Tese apresentada ao Programa de Pós-Graduação em Biologia Vegetal da Universidade Federal de Pernambuco, como requisito parcial para a obtenção do título de Doutora em Biologia Vegetal.

Orientadora: Dra. Maria Regina de Vasconcellos Barbosa

Coorientador: Dr. David M. Johnson

Recife

2019

Catalogação na fonte
Elaine C Barroso
(CRB4 1728)

Pires, Aline Fernandes Pontes
Filogenia e taxonomia de *Xylopia* L. (Annonaceae), com foco nas espécies amazônicas/ Aline Fernandes Pontes Pires – 2019.

272 f.: il., fig., tab.

Orientadora: Maria Regina de Vasconcellos Barbosa
Coorientador: David M. Johnson

Tese (doutorado) – Universidade Federal de Pernambuco. Centro de Biociências. Programa de Pós-Graduação em Biologia Vegetal, 2019.
Inclui referências e anexo.

1. *Xylopia* 2. Filogenia 3. Amazônia I. Barbosa, Maria Regina de Vasconcellos (orient.) II. Johnson, David M. (coorient.) III. Título

583.11 CDD (22.ed.) UFPE/CB – 2020-135

ALINE FERNANDES PONTES PIRES

FILOGENIA E TAXONOMIA DE *XYLOPIA* L. (ANNONACEAE), COM FOCO NAS ESPÉCIES AMAZÔNICAS

Tese apresentada ao Programa de Pós-Graduação em Biologia Vegetal da Universidade Federal de Pernambuco, como requisito parcial para a obtenção do título de Doutora em Biologia Vegetal.

Aprovada em 23/08/2019.

BANCA EXAMINADORA

Prof^{a}. Dra. Maria Regina de Vasconcellos Barbosa (Orientadora)
Universidade Federal da Paraíba

Prof^{a}. Dra. Carmen Silvia Zickel (Examinadora Externa)
Universidade Federal Rural de Pernambuco

Prof^{a}. Dra. Sarah Maria Athiê de Souza (Examinadora Externa)
Universidade Federal da Paraíba

Prof. Dr. Luiz Gustavo Rodrigues Souza (Examinador Interno)
Universidade Federal de Pernambuco

Prof^{a}. Dra. Ana Maria Benko Iseppon (Examinadora Interna)
Universidade Federal de Pernambuco

Ao Dr. Paul Maas, pelo amor e dedicação ao estudo das Annonaceae, que me
serviram sempre de exemplo e incentivo,
Aos meus pais, Francisco Pontes da Silva (*in memorian*) e Maria do Amparo,
por todo amor e educação que me deram,
Ao meu esposo, Dariston, pelo amor e companheirismo, principalmente
durante o período do doutorado,
Ao meu filho, Lucas, pelo amor, companhia, força e paciência,
principalmente neste período do doutorado,

Dedico

AGRADECIMENTOS

Agradeço a Deus, por me conceder a vida e a oportunidade de realizar o doutorado, este grande desafio profissional e pessoal.

À Universidade Federal de Pernambuco (UFPE) e ao Programa de Pós-Graduação em Biologia Vegetal (PPGBV) pela oportunidade de cursar o doutorado e por todo o suporte e incentivo para a realização deste trabalho.

À Universidade Federal de Mato Grosso (UFMT), por ter me concedido o afastamento para a realização do doutorado, e por me permitir usar sua infraestrutura em algumas etapas deste trabalho.

Ao Departamento de Sistemática e Ecologia (DSE), da Universidade Federal da Paraíba (UFPB), por me permitir utilizar as dependências do Laboratório de Taxonomia de Angiospermas (TAXON) e do Herbário Lauro Pires Xavier (JPB), para a realização dos estudos taxonômicos e morfológicos.

À Ohio Wesleyan University (OWU), por ter me recebido no doutorado sanduíche e por me permitir utilizar suas dependências e infraestrutura neste período.

À Fundação de Amparo à Pesquisa do Estado de Mato Grosso (FAPEMAT), pela bolsa de doutorado e pelo financiamento parcial de projeto de pesquisa.

À Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), pela concessão da bolsa de doutorado sanduíche.

A minha orientadora, Profa. Regina, pelo grande exemplo como professora e pesquisadora, no qual sempre me espelhei; por ter me apresentado à Taxonomia Vegetal; por ter acreditado em mim para realizar esta tese; pela amizade; e pelas feijoadas...deliciosas e inesquecíveis.

À Profa. Dra Andrea Pedrosa-Harand, por aceitar me supervisionar no estudo de filogenia molecular de *Xylopia*; por me receber no Laboratório de Citogenética e Evolução Vegetal, da UFPE; por acreditar no meu trabalho; e por seu belo exemplo como mãe, professora e pesquisadora, o qual sempre tentarei seguir.

Ao meu co-orientador, Prof. Dr. David M. Johnson, por apoiar o meu projeto de doutorado desde o início, e acreditar que eu poderia desenvolvê-lo, mesmo sem me conhecer pessoalmente. Agradeço por me receber em seu laboratório e no Herbário na OWU; por compartilhar comigo seu conhecimento sobre taxonomia de *Xylopia*, e sobre história natural;

por sempre me ajudar com tudo o que precisei durante o período do doutorado sanduíche; e pelos almoços, jantares e conversas, sempre muito agradáveis.

À Profa. Dra. Nancy Murray, pelas conversas enriquecedoras sobre Annonaceae, *Xylopia* e Botânica; e por todo acolhimento, apoio e carinho, durante o período em que estive na OWU.

Ao Dr. Wayt Thomas, pelo exemplo de pesquisador que é, pela amizade, pelo apoio em minha visita ao New York Botanical Garden, e por sua preciosa contribuição na avaliação da primeira versão do artigo de *Xylopia maasiana*.

Ao Sr. Darrell James Albon, Diretor administrativo (International and Off-Campus Programs) da OWU, por seu auxílio na solicitação e obtenção dos documentos necessários para a realização do estágio de doutorado sanduíche.

Aos professores do PPGBV, por contribuírem para o aperfeiçoamento da minha formação profissional e, consequentemente, para o desenvolvimento deste trabalho.

Agradeço aos secretários do PPGBV, Hildebrando, Adriano, Soraya e Felipe, pela gentileza e atenção para comigo, e por todo o apoio acadêmico durante o período do doutorado.

À Banca de Qualificação, Dra. Ana Maria Benko Iseppon, Dra. Maria de Fátima Agra e Dra. Sarah Maria Athiê de Souza, pela disponibilidade em participar da banca, e pelas preciosas correções e sugestões para o aprimoramento deste trabalho.

À Banca de Defesa, Dr. Luiz Gustavo Rodrigues Souza, Dra. Ana Maria Benko Iseppon, Dra. Carmen Silvia Zickel e Dra. Sarah Maria Athiê de Souza, por aceitarem o convite para participar da banca, e pelos comentários e sugestões que tenho certeza só virão a enriquecer este trabalho. Aos membros suplentes, Dr. Leonardo Pessoa Felix e Dra. Alice de Moraes Calvente Versieux, obrigada por aceitarem o convite para participar da banca.

A todos os curadores e equipes dos herbários visitados e também daqueles que receberam solicitações via correio, pela acolhida e por enviar empréstimos dos espécimes, para que este estudo fosse possível. Agradeço de forma especial aos curadores que doaram fragmentos de folhas para a utilização nos estudos de filogenia molecular.

À Profa. Dra. Adriana Lobão, pela amizade, por compartilhar comigo seus conhecimentos em Annonaceae, por sua valorosa contribuição na leitura da primeira versão do artigo de *Xylopia maasiana*, e por me receber carinhosamente em sua casa durante as minhas visitas aos herbários do Rio de Janeiro.

Ao Prof. Dr. Fábio Borges, pela amizade, por compartilhar comigo a primeira viagem de campo do doutorado, pelos bons momentos de conversas científicas e de descontração.

Agradeço aos colegas professores, Dr. Ricardo Tortorella e ao Dr. Leandro Batirolla, pela amizade e pelo auxílio com os assuntos administrativos e acadêmicos do ICNHS e da UFMT.

Agradeço à Profa. Dra. Gracialda Ferreira, pela amizade, por me ajudar na execução do trabalho de campo no Pará, e por me receber tão gentilmente em sua casa.

Ao amigo Luciano, carinhosamente “Xuxu”, pela amizade, por compartilhar comigo o estudo, trabalho de laboratório, discussões taxonômicas, sonhos, anseios, medos e expectativas, e ainda por confeccionar os mapas de distribuição das espécies.

Gostaria de agradecer aos amigos do Laboratório de Taxonomia de Angiospermas (TAXON) da UFPB: Maria do Céo, Roberto, Ricardo Pontes, Géssica, Ana Raquel, Itamar, Luiz Henrique, Renato, César e Pietra, pela amizade, por compartilhar o trabalho no laboratório e pelas conversas agradáveis nos cafés da tarde. Céo e Roberto, obrigada pela amizade, carinho e força, e pela disponibilidade em ajudar sempre. Luiz, obrigada pela amizade, carinho e animação, por me pedir “abraços de mãe”, e por suas mensagens carinhosas via WhatsApp. À Ricardo Pontes, “primo”, pela amizade, pela companhia e parceria nas viagens de campo ao Amapá e Roraima, e pelas conversas agradáveis.

Aos amigos do Laboratório de Citogenética e Evolução Vegetal da UFPE: Tiago Esposito, Tiago Ribeiro, Sandra, Amália, Isabelle, Yhandra, Lucas, Amanda, Paulo, Ana Lúcia, Mariela, Pablo, Mariana, Lamonier, Brena, Maria Eduarda, Dani, Delgado, Rafaela, Yennifer, Erton e Amanda Santos, pela amizade, por compartilharem comigo os seus conhecimentos no laboratório, e pelos cafés revigorantes, regados a uma boa conversa. Tiago Ribeiro, obrigada pela amizade, por me socorrer sempre que precisava de ajuda, e pela companhia nos almoços. Amanda, muito obrigada por compartilhar comigo seus “passos” para rodar as análises Bayesianas no CIPRES, isso me ajudou muito.

Ao amigo Tiago Esposito, pela amizade, por todos os ensinamentos práticos compartilhados comigo no Laboratório de Citogenética e Evolução Vegetal, pela paciência, pelo auxílio nas análises filogenéticas e pelas discussões científicas sempre proveitosas.

Aos amigos do PPGBV, Thales, Edlley, Andréia, Rosália, Rafael e Carol, pela amizade, torcida e conversas científicas proveitosas.

À Dra. Carolina Nunes Liberal, técnica do DSE, da UFPB, pela gentileza e ajuda na captura de algumas imagens no estereomicroscópio com câmera acoplada.

À Regina Carvalho e a Madson Sousa pela confecção das belas ilustrações da revisão taxonômica.

Agradeço aos amigos, Karlla, Rebeca, Socorro Pereira, Letícia, Eli, José Hamilton (*in memorian*), Sueli, Rovena, Alexandre, Wagner e Cidinha, pela amizade e por me proporcionarem bons momentos de descontração.

Aos meus tios, Livramento, Nini, Socorro, Cila e Tito, Tereza e João; a minha sogra, Norma; as minhas enteadas, Amanda e Mariana; aos meus sobrinhos, Malu, Guigo, André, Betão e Gabriel; as minhas cunhadas e cunhados, e a todos os familiares e amigos, pelo amor, carinho, torcida e orações.

Aos meus pais, Francisco Pontes (*in memorian*) e Amparo, pelo amor, carinho, criação e educação que me deram. Mainha, obrigada por ser essa mulher de Deus e de fé que me guia e "ampara" em todos os momentos. Agradeço as minhas irmãs, Jaqueline e Angeline, pelo amor e carinho, por acreditarem em mim e no meu trabalho, e por me apoiarem sempre. Mainha, Angé e Jaque, obrigada por todo o apoio com Lucas no período do doutorado, sem a ajuda de vocês eu não teria conseguido realizar o que realizei.

Ao meu esposo, Dariston, e ao meu filho, Lucas, pelo amor e carinho, e por entrarem comigo nesse projeto, por enfrentarem bem as mudanças durante o período do doutorado, e por sempre acreditarem em mim e no meu trabalho; sem o apoio e a parceria de vocês nada disso teria sido possível.

“O saber se aprende com os mestres e com os livros. A sabedoria se aprende com a vida e com os humildes.”

Cora Coralina

RESUMO

Xylopia é o único gênero pantropical de Annonaceae, com aproximadamente 180 espécies de árvores, ou raramente arbustos, presentes, em sua maioria, em florestas pluviais de terras baixas. Nos Neotrópicos ocorrem cerca de 55 espécies, a maioria concentrada na Bacia Amazônica. São características marcantes do gênero a presença de estames numerosos com anteras loceladas, estaminódios, um cone estaminal circundando os ovários, pólen liberado em tétrades ou políades, carpelos livres, carpídios livres e deiscentes, e sementes, em sua maioria, ariladas. *Xylopia* é monofilético e, atualmente, está dividido em seis seções. Todas as espécies neotropicais, junto com algumas espécies africanas, estão reunidas na seção *Xylopia*. Um estudo filogenético foi realizado para testar o monofiletismo de *Xylopia* seção *Xylopia* e analisar as relações filogenéticas entre as espécies desta seção; para verificar se os Complexos *Xylopia brasiliensis* e *X. frutescens,* hipotetizados inicialmente, eram constituídos por uma única espécie variável ou espécies distintas proximamente relacionadas; e para estimar o tempo de divergência da origem do gênero *Xylopia* e de *Xylopia* seção *Xylopia*. Para tanto, utilizaram-se os loci plastidiais *mat*K, *ndh*F, *psb*A-*trn*H e *trn*L-F, e 82 acessos de 40 espécies de *Xylopia*, sendo 67 acessos de 25 espécies Neotropicais. Como resultados desse estudo, o monofiletismo de *Xylopia* seção *Xylopia* foi confirmado, e foi possível compreender as relações filogenéticas entre as espécies *Xylopia brasiliensis*, *X. frutescens*, *X. pittieri*, e espécies relacionadas. As estimativas de tempo de divergência sugeriram a origem de *Xylopia* há cerca de 40 milhões de anos atrás, durante o Eoceno, e a origem de *Xylopia* seção *Xylopia* há cerca de 28 milhões de anos atrás, durante o Oligoceno. Ambas estimativas são bem posteriores à fragmentação da Gondwana, e sugerem um ou mais eventos de dispersão a longa distância para a origem do gênero e o seu estabelecimento nos Neotrópicos. Além disso, realizou-se a revisão taxonômica das espécies de *Xylopia* presentes na Bacia Amazônica. Para a condução dessa revisão foram realizadas oito expedições de campo para a coleta de material botânico na Amazônia brasileira, e cinco expedições adicionais em estados brasileiros extra-amazônicos; e foram analisados cerca de 9400 espécimes, incluindo materiais-tipo, depositados nas coleções de 24 herbários brasileiros e estrangeiros. Como resultados, além da revisão taxonômica de *Xylopia* para Bacia Amazônica, com descrições, ilustrações e chave para identificação das espécies, foram descritas duas novas espécies. Ao final, foram reconhecidas 35 espécies para a Amazônia, designados 18 lectótipos, propostos uma nova combinação e um novo status para um nome, e estabelecidos dez novos sinônimos para as espécies presentes na região.

Palavras-chave: Amazônia. Tempo de divergência. Filogenia. Lectotipificação. Loci plastidiais. *Xylopia* seção *Xylopia*.

ABSTRACT

Xylopia is the only pantropical genus of Annonaceae, comprising around 180 species of trees, or rarely shrubs, present, mostly, in lowland rainforests. In the Neotropics around 55 species occur, most in the Amazon Basin. Distinctive characters of the genus are the presence of numerous stamens with locellate anthers, staminodes, a staminal cone surrounding the ovaries, pollen shed in tetrads or poliads, free carpels, free and dehiscent monocarps, and mostly arillate seeds. *Xylopia* is monophyletic and has six sections. All Neotropical species, together with some African species are nested in section *Xylopia*. A phylogenetic study was carried out to test the monophyly of *Xylopia* section *Xylopia*, and to analyze the phylogenetic relationships among the species of this section; to verify if the *X. brasiliensis* and *X. frutescens* complexes initially hypothesized as species complexes actually each consist of a single variable species or of closely related distinct species; and to estimate the mean divergence ages for the origins of both *Xylopia* and *X.* section *Xylopia*. Therefore, the plastid loci *mat*K, *ndh*F, *psb*A-*trn*H, and *trn*L-F were used and 82 accessions from 40 species of *Xylopia*, of which 67 accessions are from 25 Neotropical species. As results of this study, the monophyly of *Xylopia* section *Xylopia* was confirmed, and it was possible to disentangle the phylogenetic relationships among *X. brasiliensis*, *X. frutescens*, and *X. pittieri*, and their relatives. Divergence time estimation suggested the origin of *Xylopia* at around 40 MYA, during the Eocene, and the origin of *Xylopia* section *Xylopia* at around 28 MYA, during the Oligocene. Both estimates largely post-date the Gondwanan fragmentation and suggest one or more long-distance dispersal events for the genus origin and its establishment in the Neotropics. Furthermore, a taxonomic revision of the species of *Xylopia* from the Amazon Basin was performed. To conduct this revision eight field trips in the Brazilian Amazon, and five additional field trips were conducted in extra-Amazonian Brasilian states; and around 9400 specimens, including type material, in the collection of 24 Brazilian and foreign herbaria were examined. As results, beyond the taxonomic revision of *Xylopia* from the Amazon Basin, with descriptions, ilustrations and an identification key, two new species were described. Finally, 35 species were recognized as occurring in the Amazon Basin, 18 lectotypes were designated, one new combination and new status for a name were proposed, and ten new synonyms were established.

Keywords: Amazon. Divergence time. Phylogeny. Lectotypification. Plastid loci. *Xylopia* section *Xylopia*.

SUMÁRIO

1 INTRODUÇÃO ... 17

2 FUNDAMENTAÇÃO TEÓRICA ... 18

3 RESULTADOS ... 23

3.1 ARTIGO 1 – MOLECULAR PHYLOGENY OF NEOTROPICAL *XYLOPIA* L. (ANNONACEAE) AND CONSIDERATIONS ON THE TAXONOMY OF THE GENUS ... 23

3.1.1 Abstract ... 23

3.1.2 Introduction ... 24

3.1.3 Materials and Methods ... 27

3.1.4 Results ... 30

3.1.5 Discussion ... 33

3.1.6 Conclusions ... 38

3.1.7 Acknowledgments ... 39

3.1.8 Literature Cited ... 39

3.1.9 Appendix 1 ... 48

3.2 ARTIGO 2 – *XYLOPIA MAASIANA* (ANNONACEAE), A NEW SPECIES HIDDEN IN THE BRAZILIAN AMAZON, AND NOTES ON A SIMILAR SPECIES ... 56

3.2.1 Abstract ... 56

3.2.2 Introduction ... 57

3.2.3 Materials and Methods ... 58

3.2.4 Taxonomic Treatment ... 58

3.2.4.1 *Xylopia maasiana* Pontes-Pires, sp. nov. ined. ... 58

3.2.4.2 *Xylopia nitida* Dunal ... 64

3.2.5 Acknowledgments ... 66

3.2.6 Literature Cited ... 66

3.3 ARTIGO 3 – TAXONOMIC REVISION OF *XYLOPIA* L. (ANNONACEAE) FROM THE AMAZON BASIN ... 74

3.3.1 Abstract ... 74

3.3.2 Introduction ... 75

3.3.3 **Materials and Methods ..…………………………………………………..** **79**
3.3.4 **Results ..……………………………………………………………………...** **80**
3.3.5 **Taxonomic Treatment ………….……………………………………..…** **81**
3.3.5.1 Key to the species of *Xylopia* L. (Annonaceae) from the Amazon Basin ... 84
3.3.5.1.1 *Xylopia amazonica* R.E.Fr. ...……………………………………...… 90
3.3.5.1.2 *Xylopia annoniflora* Pombo & Zartman ……………….……………..… 95
3.3.5.1.3 *Xylopia aromatica* (Lam.) Mart. ……………………………………..... 97
3.3.5.1.4 *Xylopia barbata* Hoffmans. ex. Mart. ………………………………..…. 111
3.3.5.1.5 *Xylopia benthamii* R.E.Fr. ……….…………………………………...... 114
3.3.5.1.6 *Xylopia cayennensis* Maas ...………….…………………………………. 125
3.3.5.1.7 *Xylopia crinita* R.E.Fr. ...………………………………………………. 128
3.3.5.1.8 *Xylopia cuspidata* Diels ..……….………………………………..……... 132
3.3.5.1.9 *Xylopia discreta* (L.) Sprague & Hutch. …....……………………………. 135
3.3.5.1.10 *Xylopia egleriana* Aristeg. ex. Maas …..…………………………….... 139
3.3.5.1.11 *Xylopia emarginata* Mart. ………………………………………………. 141
3.3.5.1.12 *Xylopia excellens* R.E.Fr. ……………………………………………..…. 146
3.3.5.1.13 *Xylopia frutescens* Aubl. ..…………………………………………..……. 149
3.3.5.1.14 *Xylopia glomerulosa* D.M. Johnson, N.A. Murray & Pontes-Pires, sp. nov. ined. ……………………………………..…………………….. 155
3.3.5.1.15 *Xylopia ligustrifolia* Dunal ……………………………………….……… 158
3.3.5.1.16 *Xylopia longicuspis* R.E.Fr. …………………………………………..... 162
3.3.5.1.17 *Xylopia maasiana* Pontes-Pires ….……………………………………… 164
3.3.5.1.18 *Xylopia multiflora* R.E.Fr. ……………………………………………… 168
3.3.5.1.19 *Xylopia nervosa* (R.E.Fr.) Maas ………………………………………… 171
3.3.5.1.20 *Xylopia nitida* Dunal ……………………………………………….…. 174
3.3.5.1.21 *Xylopia ochrantha* Mart. ………………………………………….…... 179
3.3.5.1.22 *Xylopia orinocensis* Bagstad & D.M. Johnson ……………………….….. 182
3.3.5.1.23 *Xylopia parviflora* Spruce ………………………………………………. 184
3.3.5.1.24 *Xylopia peruviana* R.E.Fr. ………………………………………………. 187
3.3.5.1.25 *Xylopia pittieri* Diels ……………………………………………….….. 189
3.3.5.1.26 *Xylopia platypetala* R.E.Fr. ……………………………….……….….… 195
3.3.5.1.27 *Xylopia plowmanii* P.E. Berry & D.M. Johnson …………………….…... 197

3.3.5.1.28 *Xylopia polyantha* R.E.Fr. 200
3.3.5.1.29 *Xylopia rigidiflora* Bagstad & D.M. Johnson 206
3.3.5.1.30 *Xylopia sericea* A.St.-Hil. 208
3.3.5.1.31 *Xylopia spruceana* Benth. ex Spruce 212
3.3.5.1.32 *Xylopia surinamensis* R.E.Fr. 215
3.3.5.1.33 *Xylopia trichostemon* R.E.Fr. 217
3.3.5.1.34 *Xylopia uniflora* R.E.Fr. 220
3.3.5.1.35 *Xylopia xylantha* R.E.Fr. 223
3.3.6 Doubtful and Excluded Names 225
3.3.7 Acknowledgments 227
3.3.8 Literature Cited 228
3.3.9 Appendix 1 257
4 CONCLUSÕES 267
REFERÊNCIAS 268
ANEXO A – NORMAS PARA A PUBLICAÇÃO NO PERIÓDICO SYSTEMATIC BOTANY 272

1 INTRODUÇÃO

O presente trabalho compreende o estudo taxonômico e filogenético molecular das espécies amazônicas do gênero *Xylopi*a L. (Annonaceae). Este foi proposto em virtude da maioria das espécies Neotropicais do gênero serem amazônicas, e não existir, até então, um estudo revisional enfocando as espécies na área. Também não tinha sido realizado até então um estudo filogenético que incluísse um número significativo de espécies Neotropicais.

Uma dificuldade adicional no estudo de *Xylopia* nos Neotrópicos, é a existência de várias espécies que apresentam pequenas variações regionais na morfologia. Em 2015, no início do desenvolvimento desta tese, com base nas similaridades morfológicas entre algumas espécies, seguindo sugestões de alguns autores anteriores, reconhecemos a existência de dois complexos de espécies, o Complexo *Xylopia brasiliensis* e o Complexo *Xylopia frutescens*, ambos constituídos em sua maioria por espécies amazônicas. Estes dois complexos foram avaliados tanto no estudo filogenético quanto no estudo taxonômico.

Deste modo, em virtude da escassez de trabalhos taxonômicos com o gênero no Brasil, e da Amazônia brasileira deter uma grande riqueza de espécies de *Xylopia,* e da dificuldade na identificação e delimitação daquelas pertencentes aos complexos mencionados acima, desenvolveu-se o presente trabalho.

Os resultados estão divididos em três capítulos, conforme listado a seguir:

Artigo 1 – Filogenia Molecular das espécies Neotropicais de *Xylopia* L. (Annonaceae) e Considerações sobre a Taxonomia do Gênero

(Manusscript 1 – Molecular Phylogeny of Neotropical *Xylopia* L. (Annonaceae) and Considerations on the Taxonomy of the Genus);

Artigo 2 – *Xylopia maasiana* (Annonaceae), uma Espécie Nova Escondida na Amazônia Brasileira, e Notas sobre uma Espécie Parecida

(Manuscript 2 – *Xylopia maasiana* (Annonaceae): a New Species Hidden in the Brazilian Amazon, and Notes on a Similar Species).

Artigo 3 – Revisão Taxonômica de *Xylopia* L. (Annonaceae) da Bacia Amazônica

(Manuscript 3 – Taxonomic Revision of *Xylopia* L. (Annonaceae) from the Amazon Basin).

Todos os artigos aqui apresentados serão submetidos à Systematic Botany.

2 FUNDAMENTAÇÃO TEÓRICA

Annonaceae é uma família pantropical de árvores, arbustos e lianas, com aproximadamente 2400 espécies e 108 gêneros (CHATROU ET AL., 2012). É uma família importante na composição das florestas pluviais Neotropicais (BURNHAM & JOHNSON, 2004), com uma alta diversidade na Floresta Amazônica (BFG 2015; TER STEEGE ET AL., 2016; CARDOSO ET AL., 2017)

A família é bem delimitada e tem sido confirmada como monofilética em vários estudos filogenéticos (DOYLE & LE THOMAS, 1994, 1996; DOYLE ET AL., 1998; CHATROU ET AL., 2012; THOMAS ET AL., 2015). Porém, discussões sobre a delimitação e reconhecimento de subfamílias, tribos e gêneros ainda estão acontecendo (KOEK-NOORMAN ET AL., 1990; CHATROU ET AL., 2012). Recentemente, Chatrou et al. (2012) atribuíram status de subfamília para os quatro clados obtidos em sua filogenia molecular, Ambavioideae, Anaxagoreoideae, Annonoideae e Malmeoideae, e circunscreveram tribos dentro das mesmas.

Xylopia, compreendendo 160-180 espécies (JOHNSON & MURRAY, 2018), está incluído na subfamília Annonoideae (CHATROU ET AL., 2012), e é o único gênero pantropical da família (DIAS, 1988; STULL ET AL., 2017; JOHNSON & MURRAY, 2018). Suas espécies ocorrem principalmente em florestas pluviais tropicais nas Américas, África e Ásia.

Os representantes de *Xylopia* são árvores, raramente arbustos, caracterizados por suas folhas simples, dísticas e sem estípulas; flores com sépalas desde levemente conadas na base até conadas na metade ou mais do seu comprimento, formando neste caso um cálice cupuliforme; seis pétalas organizadas em dois verticilos de três, sendo as pétalas externas um pouco mais largas e longas do que as internas; estames férteis numerosos, com anteras loceladas e pólen liberado em tétrades ou políades, estaminódios presentes, e cone estaminal presente na maioria das espécies; carpelos livres; carpídios livres e deiscentes; e sementes em sua maioria ariladas.

Algumas espécies de *Xylopia* são utilizadas na alimentação humana, como: *Xylopia aethiopica* (Dunal) A.Rich. (DIAS, 1988; JOHNSON & MURRAY, 2018), *X. aromatica* (Lam.) Mart. (DIAS, 1988), *X. frutescens* Aubl. (LORENZI, 2002b) e *X. sericea* A.St.-Hil. (LORENZI, 2002a), por possuírem frutos e sementes picantes usados em substituição à pimenta-do-reino (*Piper nigrum* L.). Algumas têm uso medicinal, como *X. aethiopica,* cujos frutos são utilizados no tratamento de tosse, bronquite e desinteria (DIAS, 1988).

Xylopia foi descrito por Linnaeus (1759) no seu "*Systema Naturae*", e é um nome conservado ("*nomen conservandum*") sobre *Xylopicrum* P. Browne (1756). Linnaeus (1759) descreveu o gênero com apenas duas espécies da Jamaica: *Xylopia muricata* L., que ele associou a uma espécie de *Xylopicrum*, de P. Browne (1756); e *X. glabra* L., referindo-se a uma ilustração de *Xylopicron* apresentada por Plukenet em 1691, e mencionada também por P. Browne (1756). Posteriormente, Kuntze (1891) propôs novas combinações sob o nome *Xylopicrum* (BROWNE, 1756), porém, mais tarde, o nome *Xylopia* foi conservado sobre este. *Xylopia muricata* L., a espécie tipo do gênero, foi lectotipificada por van Setten e Maas (JARVIS ET AL., 1993), que escolheram como lectótipo o espécime LINN 1077.1.

Estabelecer e entender a lista de sinônimos de *Xylopia* não é uma tarefa fácil, devido ao fato de diversos gêneros de Annonaceae terem sido, no passado, de alguma forma relacionados a *Xylopia*, e também ao fato do gênero apresentar um grande número de espécies e distribuição pantropical.

Durante o Século XVIII, os gêneros *Krockeria* e *Bulliarda*, descritos por Necker em 1790, e *Unona* L.f. (LINNAEUS FILIUS, 1782) foram de alguma forma relacionados a *Xylopia*. *Krockeria* foi descrito com uma citação de "*Waria* Aublet". Aublet (1775) citou *Waria zeylanica* L., um erro de impressão para *Uvaria zeylanica* L., uma espécie do Sri Lanka, e ele também incluiu nesta espécie um material da Guiana Francesa. Este último material, da Guiana Francesa, foi posteriormente incorporado por Lamarck (1785) em *Uvaria aromatica* Lam. (basiônimo de *Xylopia aromatica* (Lam.) Mart.). Mais tarde, *Uvaria zeylanica* foi excluída da circunscrição de *Uvaria aromatica* por Willdenow (1799), que descreveu uma nova espécie, *Unona concolor* Willd., com base no material da Guiana Francesa descrito por Aublet (1775). De acordo com Johnson & Murray (2018), *Bulliarda* parece ser um nome supérfluo para *Unona* L.f. (LINNAEUS FILIUS, 1782), o que é corroborado pela descrição de *Bulliarda* (NECKER, 1790) que cita "*baccae, umbelliformes, gibosae, 2-spermae, divergentes*" (nossa tradução: "frutos umbelados, divergentes e gibosos, com 2 sementes"), caracteres também presentes na descrição original de *Unona*. Hoje, *Unona* L.f. (LINNAEUS FILIUS, 1782) e *Krockeria* (NECKER, 1790) são considerados sinônimos de *Xylopia*.

No início do Século XIX, Dunal (1817), na primeira monografia da família Annonaceae, utilizando o nome genérico proposto por Linnaeus, reconheceu oito espécies de

Xylopia na América tropical, sendo três novas. O gênero foi caracterizado principalmente pelo cálice frequentemente campanulado, pétalas externas maiores do que as internas, e carpídios compressos, curto-estipitados, com 1-2 sementes.

Mais tarde, Alphonse de Candolle (1832) ampliou a circunscrição de *Xylopia*, reconhecendo 10 espécies na América tropical. De Candolle também descreveu, no mesmo trabalho, os gêneros *Habzelia* e *Coelocline*, e observou semelhanças entre *Coelocline*, *Habzelia*, *Unona* e *Xylopia*, mas distinguiu cada um deles. Nos comentários sobre *Habzelia*, ele distingue o novo gênero de *Unona* por suas sementes ariladas, estriadas e glabras, e “carpelos” nunca regularmente moniliformes; e de *Xylopia* por seus “carpelos” mais alongados e quase não ventricosos (o termo “carpelos” provavelmente refere-se aos carpídios).

Em subsequentes tratamentos importantes com *Xylopia*, o gênero englobou apenas espécies americanas (JOHNSON & MURRAY, 2018). Lamarck (1785), porém, descreveu *Uvaria aromatica* reunindo uma miscelânia de materiais de diferentes regiões geográficas, incluindo materiais do Peru, Guiana Francesa, e possivelmente Ilhas Maurício, e também um material da África, que foi posteriormente excluído da circunscrição de *U. aromatica* por Willdenow (1799), e que atualmente está circunscrito em *Xylopia aethiopica* (Dunal) A.Rich. (Richard 1841, consideramos a data de publicação segundo o estabelecido por Brizicky (1962)).Portanto, Richard (1841) foi o primeiro autor a incluir dentro de *Xylopia* espécies africanas, mudando o conceito do gênero para o que se tornaria próximo do seu senso atual (JOHNSON & MURRAY, 2018). Porém, Richard (1841) não reconheceu os gêneros *Habzelia* e *Coelocline*, e transferiu as espécies destes para *Xylopia*. Bentham (1862), Baillon (1864, 1868) e Oliver (1868) aceitaram o conceito de Richard (1841), e incluíram no gênero outras espécies africanas. Hooker & Thomson (1855, 1872) ampliaram a circunscrição de *Xylopia* para incluir espécies da Ásia. Deste modo, atualmente aceita-se a circunscrição pantropical do gênero (JOHNSON & MURRAY, 2018).

Não existe uma revisão abrangente de *Xylopia*. Porém, vários estudos taxonômicos com o gênero foram realizados no Século XX, principalmente por Fries (1900, 1930, 1931, 1934, 1937, 1939, 1959), que reconheceu um total de 48 espécies neotropicais. Os estudos taxonômicos de Fries de 1900, 1930 e 1959 são os mais importantes para o entendimento da taxonomia e diversidade do gênero nos Neotrópicos. Atualmente, *Xylopia* está representado nos Neotrópicos por cerca de 55 espécies, que ocorrem principalmente na Amazônia (DIAS, 1988; MELLO-SILVA ET AL., 2012). As espécies Neotropicais apresentam muitas características morfológicas marcantes, tais como: pétalas externas e internas lineares a ovadas, pétalas externas um pouco mais compridas e largas do que as internas; cone estaminal circundando completamente os ovários; e sementes com arilo bilobado (STULL ET AL., 2017).

Considerando que a maior diversidade de espécies de *Xylopia* ocorre na Amazônia, sobre a história das espécies amazônicas, Aublet (1775) foi o primeiro a descrever uma espécie de *Xylopia* para a Bacia Amazônica, *X. frutescens*, da Guiana Francesa. Dunal (1817) descreveu três outras espécies da região, *X. ligustrifolia* e *X. salicifolia* Humb. & Bonpl. ex Dunal, da Colômbia; e *X. nitida*, da Guiana Francesa.

Martius (1841), na "*Flora Brasiliensis*", reconheceu oito espécies brasileiras de *Xylopia*, e duas delas, *X. barbata* Hoffmanns. ex Mart. e *X. ligustrifolia* Dunal, foram citadas para a Amazônia brasileira. Spruce (1861) descreveu *Xylopia parviflora*, de San Carlos de Río Negro, e *X. spruceana*, do Casiquiare, ambas da Venezuela. Sagot (1881) descreveu originalmente *Xylopia nitida* Dunal var. *longifolia*, hoje *X. cayennensis* Maas, da Guiana Francesa. Mais recentemente, Dias (1988) citou as espécies *Xylopia aromatica*, *X. emarginata* Mart., *X. frutescens* Aubl., *X. langsdorffiana* A. St.-Hil. & Tul., *X. ochrantha* Mart. e *X. sericea* A. St.-Hil., como ocorrendo na Amazônia brasileira.

Maas et al. (2015) referiram 33 espécies de *Xylopia* na "*Lista de Espécies da Flora do Brasil*", e destas, 27 com ocorrência na Amazônia brasileira, sendo 15 endêmicas do país. Atualmente, o gênero está sendo monografado por Pontes-Pires e Johnson para o projeto "*Flora do Brasil online 2020*", e conta com 32 espécies no país.

No Brasil, a Amazônia abriga a maioria das espécies do gênero, e estas ocorrem principalmente em florestas de terra firme, florestas ripárias, florestas de várzea e nas áreas de transição entre a floresta Amazônica e o cerrado. Mas, espécies muito conhecidas do gênero, como: *Xylopia aromatica*, *X. emarginata* e *X. sericea* são muito frequentes na vegetação do cerrado. E ainda, *Xylopia frutescens*, *X. sericea* e *X. brasiliensis* Spreng., entre outras, são distribuídas na Mata Atlântica, ocorrendo em florestas e matas de restinga.

Análises filogenéticas baseadas em caracteres morfológicos e/ou moleculares, incluindo espécies de *Xylopia* (DOYLE ET AL., 1998; RICHARDSON ET AL., 2004; CHATROU ET AL., 2012; THOMAS ET AL., 2015; STULL ET AL., 2017), têm demonstrado que o gênero é monofilético, e que o gênero *Artabotrys* R.Br. é seu grupo irmão. Juntos, estes gêneros compõem a tribo Xylopieae, incluída na subfamília Annonoideae (CHATROU ET AL., 2012). Entretanto, mais recentemente, Couvreur et al. (2019) no primeiro estudo filogenético baseado no Sequenciamento de Próxima Geração (em inglês: Next Generation Sequencing, sigla: NGS) de centenas de loci nucleares em Annonaceae, não recuperaram *Artabotrys* como grupo irmão de *Xylopia*. Portanto, as relações filogenéticas entre *Xylopia* e *Artabotrys* ainda não estão muito claras. Contudo, Couvreur et al. (2019) ressaltam que o posicionamento de *Artabotrys* necessita de uma investigação mais cuidadosa, e também discutem o fato da tribo Xylopieae ter sido proposta com base na filogenia molecular, sem, contudo, apresentar sinapomorfias morfológicas para corroborar sua circunscrição, o que também já havia sido ressaltado por Chatrou et al. (2012).

Stull et al. (2017) realizaram o primeiro estudo filogenético molecular especificamente com *Xylopia*, baseando-se nos dados dos loci plastidiais *mat*K, *ndh*F, *psb*A-*trn*H e *trn*L-F. Neste trabalho, os autores adaptaram a classificação do gênero *Xylopia* proposta por Engler e Diels (1901) e reconheceram cinco seções, que correspondem a grupos presentes na árvore de consenso: *Ancistropetala, Neoxylopia, Rugosperma, Stenoxylopia* e *Xylopia*. Das cinco seções, *Xylopia* seção *Rugosperma* é uma seção nova. Mas, além de utilizar a filogenia com base nos loci plastidiais para embasar a classificação das suas seções, Stull et al. (2017) também utilizaram o tipo de arilo e outras características da semente, confirmadas como taxonomicamente importantes no gênero, para caracterizar cada uma das seções.

As espécies Neotropicais estão incluídas em *Xylopia* seção *Xylopia* (*sensu* STULL ET AL., 2017) (oito espécies foram incluídas no estudo), juntamente com mais quatro espécies da África e Madagascar. *Xylopia* seção *Verdcourtia*, foi subsequentemente proposta por Johnson e Murray (2018), que a distinguiram da seção *Stenoxylopia* pelo arilo cupular e caracteres florais. Portanto, atualmente, seis seções são reconhecidas em *Xylopia* (JOHNSON & MURRAY, 2018).

A existência de várias espécies que apresentam pequenas variações regionais na morfologia é uma dificuldade no estudo de *Xylopia* nos Neotrópicos. A existência desses complexos de espécies relacionadas nos Neotrópicos foi percebida por Dias (1988), que menciona um complexo incluindo *X. frutescens* e *X. sericea*; e outro, que inclui *X. laevigata* (Mart.) R.E.Fr., *X. lanceolata* R.E.Fr., *X. langsdorfiana* e *X. ochrantha*. Berry e Johnson (1993), citam um grupo formado por *X. emarginata*, *X, plowmanii* P.E.Berry & D.M.Johnson, *X. spruceana* Benth. ex Spruce e *X. venezuelana* R.E.Fr. Bagstad e Johnson (1999), descreveram e relacionaram *X. orinocensis* e *X. rigidiflora* a um grupo incluindo *X. barbata*.

3 RESULTADOS

3.1 ARTIGO 1 – MOLECULAR PHYLOGENY OF NEOTROPICAL *XYLOPIA* L. (ANNONACEAE) AND CONSIDERATIONS ON THE TAXONOMY OF THE GENUS[*]

Aline Fernandes Pontes-Pires,[1, 2, 6] Tiago Esposito,[2, 3] David M. Johnson,[4] Maria Regina de V. Barbosa,[5] and Andrea Pedrosa-Harand[3]

[1] Instituto de Ciências Naturais, Humanas e Sociais, Campus Universitário de Sinop, Universidade Federal de Mato Grosso, Av. Alexandre Ferronato, 1200, Reserva 35, Setor Industrial, 78557-267, Sinop, Mato Grosso, Brazil; afpont@hotmail.com

[2] Programa de Pós-Graduação em Biologia Vegetal, Universidade Federal de Pernambuco, Av. Prof°. Moraes Rego s/n, Cidade Universitária, 50670-901, Recife, Pernambuco, Brazil.

[3] Laboratório de Citogenética e Evolução Vegetal, Departamento de Botânica, Universidade Federal de Pernambuco, 50670-420, Recife, Pernambuco, Brazil

[4] Department of Botany and Microbiology, Ohio Wesleyan University, Delaware, Ohio 43015, USA.

[5] Departamento de Sistemática e Ecologia, Universidade Federal da Paraíba, Caixa Postal 5065, Cidade Universitária, 58051-970, João Pessoa, Paraíba, Brazil.

[6] Author for correspondence

3.1.1 Abstract— *Xylopia* is the only pantropical genus within Annonaceae and the second largest in the family. *Xylopia* is monophyletic and six sections are currently recognized, with ca. 55 Neotropical species nested in *Xylopia* section *Xylopia*. Although the genus is well circumscribed and monophyletic, some phylogenetic relationships within the genus and Neotropical species delimitations are unclear, with some species being hypothesized as

---

[*] This manuscript will be submitted to Systematic Botany.

complexes of species. Two such problematic complexes were one focus of this study, one involving *X. frutescens* and its allies, and the other consisting of *X. brasiliensis* and allies. We present here a phylogenetic reconstruction of Neotropical *Xylopia* species using four plastid loci: *mat*K, *ndh*F, *psb*A-*trn*H and *trn*L-F. We analyzed 25 Neotropical species of *Xylopia* and generated 206 new sequences from 55 accessions of 22 species, 16 of which sequenced here for the first time, and 3 species included from databases. The single locus matrices and the four locus combined matrix were analyzed using Bayesian Inference (BI) and Maximum Likelihood (ML). The combined Bayesian majority rule consensus tree showed a well resolved, strongly supported topology for most of the major clades, also confirming *Xylopia* sect. *Xylopia* as monophyletic. Our results also supported the disentangling of the relationshiops among *X. brasiliensis*, *X. frutescens*, *X. pittieri*, and their allies, and corroborated our decision to not recognize any species complex in the genus. Divergence time estimation suggested at around 40 MYA for the crown node of the genus *Xylopia*, during the Eocene, and the mean divergence date for *Xylopia* section *Xylopia* was estimated at around 28 MYA, during the Oligocene. Both estimations largely post-date the Gondwanan fragmentation and suggest one or more long-distance dispersal events for the genus origin.

Keywords — Divergence time estimation, plastid loci, *Xylopia brasiliensis*, *Xylopia frutescens*, *Xylopia pittieri*, *Xylopia* section *Xylopia*.

3.1.2 Introduction

Annonaceae is a pantropical family of trees, shrubs and lianas with about 2,400 species and 108 genera (Chatrou et al. 2012). It is an important family in the neotropical rainforests (Burnham and Johnson 2004), with a high diversity in the Amazon rainforest (ter Steege et al. 2016, Cardoso et al. 2017).

The family is well delimited and has been confirmed as monophyletic in several previous studies (Doyle and Le Thomas 1994, 1996, Doyle et al. 1998, Chatrou et al. 2012, Thomas et al. 2015). Chatrou et al. (2012), on the basis of their molecular phylogeny, recognized the four major clades as the subfamilies: Ambavioideae, Anaxagoreoideae, Annonoideae and Malmeoideae, and circumscribed multiple tribes within the latter two. Complete delimitation and recognition of subfamilies, tribes, and genera, however, are still ongoing (Koek-Noorman et al. 1990, Chatrou et al. 2012, Guo et al. 2017).

Xylopia is the only pantropical genus within Annonaceae and the second largest in the family, comprising 160–180 species (Johnson and Murray 2018). The genus is monophyletic, and *Artabotrys* R.Br. has been shown as its sister group in several studies based on morphological and molecular phylogenetic analyses using plastid genome (Doyle et al. 1998, Richardson et al. 2004, Chatrou et al. 2012, Thomas et al. 2015, Stull et al. 2017). Chatrou et al. (2012) classified *Xylopia* and *Artabotrys* in the tribe Xylopieae of the subfamily Annonoideae, but recently, the first phylogenetic study based on Next Generation Sequencing (NGS) of a hundred nuclear loci in Annonaceae showed *Artabotrys* grouped in a clade with *Letestudoxa* Pellegr., *Fusaea* Saff., and *Duguetia* A.St.-Hil. (all from tribe Duguetieae), and *Xylopia* alone as sister to this group (Couvreur et al. 2019). So, the relationship between *Artabotrys* and *Xylopia* is still unclear. Although, Couvreur et al. (2019) concluded that the placement of *Artabotrys* needs a more carefully analysis, and they also mentioned the tribe Xylopieae was proposed only based on molecular phylogeny, without, however, presenting morphological synapomorphies to support the circumscription of the tribe, as was already discussed by Chatrou et al. (2012).

In the first molecular phylogenetic study carried out specifically with *Xylopia*, including data from four plastid loci and also from seed morphology, Stull et al. (2017) recognized five sections within *Xylopia*, corresponding to groups recovered in their consensus tree: *Ancistropetala, Neoxylopia, Rugosperma*, *Stenoxylopia* and *Xylopia*. However, the group *Xylopia* sect. *Xylopia* (Posterior probability, PP = 0.87, and Bootstrap, BS = 67) recovered by Stull et al. (2017) was weakly supported. But, aril types and other seed characters were confirmed as taxonomically important in the genus and were also used by Stull et al. (2017) to characterize each section, beyond being based in the results from the molecular phylogeny of the plastid loci.

Xylopia section *Xylopia* included all Neotropical species, represented by eight species sampled in their study, and four species from the Old World (*Xylopia aethiopica* (Dunal) A.Rich., *X. humblotiana* Baill., *X. lamarckii* Baill., and *X. madagascariensis* Cavaco & Keraudren). Another section, *Xylopia* sect. *Verdcourtia,* was subsequently proposed by Johnson and Murray (2018), who distinguished it from *Xylopia* sect. *Stenoxylopia* by its cupular aril and floral characters. Therefore, currently, six sections are recognized within *Xylopia* (Johnson and Murray 2018).

The species of *Xylopia* occur mainly in lowland tropical forests in the Neotropics, sub-Saharan Africa, Madagascar, tropical Asia, and Australasia east to Fiji (Stull et al. 2017).

About 55 species of the genus occur in the Neotropics, mostly in the Amazonian rainforest (Dias 1988, Fries 1930), where Pontes-Pires et al. (in preparation, Manuscript 3) recognized 35 species. The Neotropical species show morphological characteristics typical of the genus, such as locellate anthers, inner and outer staminodes, a staminal cone surrounding the ovaries, and dehiscent apocarpous fruits, as well as traits unique to section *Xylopia*, such as the bilobed aril (Pontes-Pires et al. in preparation, Manuscript 3).

Altough the family Annonaceae had been suggested by previous authors to be a group that had diversified before the Gondwanan fragmentation (Raven and Axelrod 1974, Doyle et al. 2004, Stull et all. 2017), the phylogenetic analysis by Stull et al. (2017) supported a post-Gondwanan origin and dispersal for *Xylopia*, as had been previously suggested by other analyses (Richardson et al. 2004, Couvreur et al. 2011, Thomas et al. 2015).

The Neotropical species of *Xylopia* were last revised by Fries (1930, 1959), who distinguished several natural groups of species based on pericarp thickness, shape of the buds and outer petals, connation of the sepals, number of carpels, and leaf shape. More recently, Dias (1988) drew attention to the taxonomic problems surrounding two South American probable species complexes, one including *X. frutescens* Aubl. and *X. sericea* A. St.-Hil., and another including *X. laevigata* (Mart.) R.E.Fr., *X. lanceolata* R.E.Fr., *X. langsdorffiana* A. St.-Hil. & Tul., and *X. ochrantha* Mart. Berry and Johnson (1993) commented on another group including *X. emarginata* Mart., *X, plowmanii* P.E.Berry & D.M.Johnson, *X. spruceana* Benth. ex Spruce and *X. venezuelana* R.E.Fr. Bagstad and Johnson (1999) when describing *X. orinocensis* and *X. rigidiflora*, mentioned that they formed a group together with *X. barbata* Hoffmanns. ex Mart.

At the beginning of this study, in 2015, based on morphological similarities, we recognized that the Amazonian region encompassed two particularly diverse species complexes, constituted mostly by Amazonian species, that were poorly understood taxonomically (Table 1). The *Xylopia brasiliensis* Complex was proposed to include *X. amoena* R.E.Fr., *X. brasiliensis* Spreng., *X. calophylla* R.E.Fr., *X. micans* R.E.Fr., *X. pittieri* Diels, and *X. pulcherrima* Sandwith. A second complex, the *Xylopia frutescens* Complex, was proposed to include *X. amazonica* R.E.Fr., *X. densiflora* R.E.Fr., *X. discreta* (L.) Sprague & Hutch., *X. frutescens* Aubl., *X. ligustrifolia* Dunal, *X. polyantha* R.E.Fr., *X. sericea* A.St.-Hil., and *X. trichostemon* R.E.Fr. A complex including *X. frutescens* and *X. sericea* had already been mentioned by Dias (1988), as we cited above, but here we added more species morphologically related to this complex (Table 1). These hypothesized complexes (Table 1) were selected for a particular emphasis in our phylogenetic analysis in this study, as well as in taxonomic revision of *Xylopia* from the Amazon River Basin (Pontes-Pires et al. in preparation, Manuscript 3).

Considering the unique pantropical distribution of *Xylopia*, within the Annonaceae, the large number of species concentrated in the Amazon, and the difficulties in delimiting many of these Amazonian species, we conducted an expanded phylogenetic study of Neotropical *Xylopia*. The same plastid loci (*mat*K, *ndh*F, *psb*A-*trn*H and *trn*L-F), previously confirmed as phylogenetically informative in the genus (Stull et al. 2017) were used. Our major goals in this analysis were: 1) to increase the Neotropical species sampling to test the monophyly of *Xylopia* section *Xylopia*; 2) to analyze the phylogenetic relationships among the species of *Xylopia* section *Xylopia* included here; 3) to test if the proposed *X. brasiliensis* and *X. frutescens* complexes actually consist of closely related distinct species or a single variable species each; and 4) to estimate the mean divergence ages for both *Xylopia* and *X.* section *Xylopia* based on our molecular phylogenetic hypothesis, and analyze possible dispersal events for the genus.

3.1.3 Materials and Methods

Taxon Sampling — Our analysis included 82 accessions from 40 species of *Xylopia*, including 67 accessions from 25 species from the Neotropics. This represents 22–25% of the species of the genus and 45% of those from the Neotropics. Species sampled, voucher information, and GenBank accession numbers for the four molecular loci are listed in Appendix 1. The Neotropical *Xylopia* species names adopted follow current species concepts used by Pontes-Pires et al. (in preparation, Manuscript 3). We included more than one accession of several species, particularly within the *Xylopia frutescens* and *X. brasiliensis* complexes, to sample across their morphological and geographic diversity. Nine species of *Xylopia* from the Neotropics had been previously sequenced (Thomas et al. 2015, Stull et al. 2017, Pombo et al. 2017); for six of those we added new accessions, while 16 additional species were sequenced for the first time. Three species, *X. annoniflora* Pombo & C.E. Zartman (Pombo et al. 2017), *X. parviflora* Spruce, and *X. peruviana* R.E.Fr. (Stull et al. 2017), not sequenced in our study, were included from GenBank or the Dryad Digital Repository.

We also included 15 other species of *Xylopia* available in GenBank or the Dryad Digital Repository (Stull et al. 2017), in order to represent the five other sections from the Paleotropics. We included only specimens with DNA sequences from two or more loci. Furthermore, we included the same outgroups used by Stull et al. (2017), two species of *Artabotrys,* and other representatives of the subfamily Annonoideae (Chatrou et al. 2012) from the tribes Bocageeae, Duguetieae and Annoneae (Appendix 1).

DNA Extraction, Amplification, Sequencing, and Alignment — Total genomic DNA was extracted from silica gel-dried leaves or from herbarium materials using a modified cetyl trimethyl ammonium bromide (CTAB) method (Ferreira and Grattapaglia 1995). This method was adapted from Doyle and Doyle (1987), with small modifications. We used 30 mg of dried leaf to proceed with the DNA extraction. Four plastid loci, obtained using the primers indicated, were chosen for the analysis: *mat*K (primers 3F_Kim and 1R_Kim, Costion et al. 2011), *ndh*F (primers 1318F and 2110R, Olmstead and Sweere 1994), *psb*A-*trn*H (primers psbA and trnH, Hamilton 1999), and *trn*L-F (primer C and F, Taberlet et al. 1991). These loci were chosen because they were informative in previous studies in Annonaceae (Erkens et al. 2007, Chatrou et al. 2012, Thomas et al. 2015, Stull et al. 2017).

The PCR reactions were performed using modified protocols from Stull et al. (2017), in a final volume of 50 µl containing: 40–120 ng of genomic DNA, 0.5–1× Taq polymerase buffer (1× contains 20 mM Tris-HCl pH 8.4, 50 mM KCl), 0.2-0.25 mM dNTPs; 2.5–5 mM MgCl2; 1× TBT (5× TBT contains 750 mM trehalose, 1 mg/mL BSA, 1% Tween-20, 8.5 mM Tris-HCl pH 8.0; described in Samarakoon et al. 2013); 0.1–0.4 µmol of each F and R primers; 0.625–0.75 U of Taq DNA polymerase (Invitrogen) or 0.2 µl of a labmade Taq polymerase (reactions for each locus described in Table S1).

The PCR programs were run with these specifications: an initial step of denaturation at 95°C for 5 min, 30 or 35 cycles of denaturation for 45 or 60 sec at 95°C, annealing at 48–60°C for 45 or 60 sec, 1–3 min at 72°C for extension, and an additional final extension step of 7 or 10 min at 72°C. The amplification products were checked on 1% agarose gels using GelRed^{TM} (Biotium) dye and the bands observed were compared with the 1 kb DNA size standard ladder. The PCR products of interest were purified using the QIAquick®PCR Purification kit (Qiagen, Germantown, Maryland, USA), following the manufacturer's instructions, or using isopropanol precipitation. The purified PCR products were Sanger sequenced in both directions using a Genetic Analyzer 3500 ABI sequencer (Applied

Biosystems) at the Plataforma de Sequenciamento, Centro de Biociências/UFPE. The sequences obtained were assembled into contigs, aligned and first automatically edited using Geneious alignment in Geneious v. 9.1 (Kearse et al. 2012, Biomatters Ltd.), or ClustalW in *MEGA* v. 6 (Tamura et al. 2013), and manually edited. Regions with ambiguous indels or regions of repetitive DNA were deleted from the final alignment. We concatenated the single matrices of the four loci into a combined plastid matrix.

Phylogenetic Analysis — Phylogenetic reconstruction was performed using Bayesian Inference (BI) and Maximum Likelihood (ML) from the resulting matrices (four single locus and the four loci combined). The selection of the substitution models for each locus and the combined region was performed in jModelTest v. 2.1.7 (Darriba et al. 2012), using the Akaike Information Criterion (AIC). The number of polymorphic sites for each matrix were calculated using DnaSP V. 6 (Rozas et al. 2017).

The Bayesian Inference (BI) analysis was carried out using MrBayes v. 3.2.6 (Huelsenbeck and Ronquist 2001, Ronquist et al. 2012), through the Cyberinfrastructure for Phylogenetic Research (CIPRES Science Gateway, Miller et al. 2010). For the BI analysis of the four single locus matrices we used the best model for each region according to the analysis of jModelTest v. 2.1.7 (Darriba et al. 2012) (Table 2) and for the concatenated four-locus matrix we used the GTR + G model (the best model for this matrix, Table 2). We ran 30 million generations, with four chains, four runs, with trees sampled every 1,000 generations and burn-in of 0.25 trees. The resulting majority rule *consensus* trees with posterior probability (PP) were partially edited in FigTree v. 1.4.3 (Rambaut 2018).

We also performed maximum likelihood (ML) analysis for the four single locus matrices and for the combined four-locus matrix using RAxML v. 8.2.10 (Stamatakis 2014) available in the Cyberinfrastructure for Phylogenetic Research (CIPRES Science Gateway, Miller et al. 2010). We conducted a rapid Bootstrap analysis and search for the best-scoring ML tree in one single program run (-f a), with 1,000 Bootstrap iterations. In the analyses we used the best models described above. The best-scoring ML tree obtained with Bootstrap support (BS) was edited in FigTree v. 1.4.3 (Rambaut 2018), and a final editing was performed in Adobe Photoshop CC.

Divergence Time Estimation — The divergence dates used to calibrate our phylogeny were based on the chronogram shown by Thomas et al. (2015) in their Fig. 4. They used the root constraint fixed to 112 MYA, based on the age of *Endressinia brasiliana* Mohr and Bernardes-de-Oliveira (considered sister to Eupomatiaceae, a monogenic family from Magnoliales, near Annonaceae). They also used the fossil *Futabanthus asamigawaensis* Takahashi, Friis, Uesugi, Suzuki et Crane (Annonaceae), dated from ca. 89 MYA. The two secondary calibration points we included in the present analysis (both shown in Fig. 4 from Thomas et al 2015) are: 1) ca. 64 MYA, as the split between the Xylopieae Endl. tribe (which includes *Xylopia,* and its sister group, *Artabotrys*, sensu Chatrou et al. 2012) and the lineage that later gave rise to the genera *Asimina* Adans.*, Duguetia, Fusaea, Goniothalamus* (Blume) Hook.f. & Thomson, and *Guatteria* Ruiz & Pav.; and 2) ca. 54 MYA, as the split between *Xylopia* and *Artabotrys*. These divergence ages are almost the same shown in Table 4 from Pirie and Doyle (2012), who considered a divergence age at 64 MYA to the first point described above, and at 55 MYA to the node of the tribe Xylopieae. Pirie and Doyle (2012) also used *Endressinia* and *Futabanthus* as age constraints.

The Bayesian divergence time estimation was carried out using BEAST v.1.8.3 (Drummond and Rambaut 2007). The analysis was performed for the same concatenated four-loci matrix we used to perform the BI and ML analysis, and the GTR + G model was also used here. The analysis was carried out using an uncorrelated relaxed molecular clock model assuming a lognormal distribution of rates, selecting the Yule Process as tree prior and the random starting tree option. We ran the MCMC analysis with 100 million generations, with trees sampled every 10,000 generations. We used Tracer v.1.6 (Rambaut and Drummond 2019) to analyze time-series plots of all parameters to check for adequate effective sample sizes (ESS > 200). The trees were summarized using the maximum clade credibility tree (MCC) option in TreeAnnotator v.1.8.3 (Drummond and Rambaut 2007), and a burn-in of 7.5% of the trees was set, based on the stability of the analysis checked by Tracer. The MCC resulting tree was edited in FigTree v. 1.4.3 (Rambaut 2018), and a final editing was performed in Adobe Photoshop CC and CorelDRAW.

3.1.4 Results

Phylogenetic Analysis — We generated 206 new sequences from 55 accessions, representing 22 species of *Xylopia* from the Neotropics. Sequences from three further species were obtained from GenBank or the Dryad Digital Repository for a total of 25 Neotropical species included in this analysis. Sixteen species were included for the first time in a molecular phylogenetic analysis. The concatenated matrix has 1,917 bp and the best substitution model for the combined matrix was GTR + G (Table 2). The alignment length, number of polymorphic sites and the best substitution model to each molecular matrix analyzed in this study are shown in Table 2.

The BI majority rule consensus trees resulting from the analysis of single locus matrices demonstrated poorly resolved topologies, showing several polytomies and weak support for many clades. The BI majority rule consensus tree for the combined matrix, showed most major clades strongly supported, and few polytomies (Fig. 1), therefore this was chosen to be discussed here. The fully resolved best-scoring ML tree (Fig. 2), resulting from the concatenated matrix, presented lower values of Bootstrap support for many clades. The weakly supported clades in the ML tree corresponded to the polytomies in the BI tree. In general, the topologies of both methods are congruent. Clades weakly supported ($PP \leqq 0.95$) will not be detailed and discussed, unless they include species important to the phylogenetic or taxonomic discussion.

Based on the BI majority rule consensus tree, *Xylopia* is monophyletic (PP = 1, BS = 100) with *Artabotrys* as its sister group (Fig 1). The current sections of *Xylopia*: *Ancistropetala*, *Stenoxylopia*, and *Verdcourtia* (Stull et al. 2017, Johnson & Murray 2018), highlighted in Fig. 1, were monophyletic. The *Xylopia* section *Neoxylopia* and *Xylopia* section *Rugosperma* (also highlighted in Fig. 1), of which we included only one species, emerged in a polytomy with a clade that includes all the other *Xylopia* species. A strongly supported clade (PP = 1, BS = 99), Clade A, nested all the Neotropical species of the genus we included, corresponding to *Xylopia* section *Xylopia* (Johnson and Murray 2018, Stull et al. 2017).

Within Clade A, *Xylopia decorticans* D.M.Johnson & Lobão, *X. laevigata* (Mart.) R.E.Fr., *X. langsdorffiana* A. St.-Hil. & Tul., *X. ochrantha* Mart. and *X. peruviana* R.E.Fr. emerged as the most basal subclade B (PP = 0.98). The relationships among these species, however, are not clear yet. *Xylopia laevigata* forms a subclade within Clade B (Clade C, PP = 0.99), with two subclades strongly supported (both PP = 1), with distinct geographic distribution: one including accessions from Northeastern Brazil, sister to another including accessions from the Southeastern Brazil.

The next divergence within the Clade A (*Xylopia* sect. *Xylopia* clade), is between Clade E (PP = 1), which includes the only two Old World species of the section included in the analysis, *X. aethiopica* (Dunal) A.Rich., from Africa, and *X. humblotiana* Baill., from

Madagascar, and the Clade F (Core Neotropical clade), but with weak support (PP = 0.87, BS = 48). The Core Neotropical Clade (Clade F, highlighted by a green bar in Fig. 1) is a strongly supported clade (PP = 0.98), important to include only Neotropical species (formed by 20 species, from the total of 25 Neotropical ones included in this analysis).

Clade H (PP =1) includes *Xylopia involucrata* M. C. Dias & Kin.-Gouv., as sister to all the remaining Neotropical species of our analysis that are nested in Clade I. Clade K (nested in Clade I, together with Clade J), although a group weakly supported (PP = 0.83), includes Clade L, a well-supported clade (PP = 1, BS = 96), with two accessions of *Xylopia brasiliensis*, sister to a strongly supported clade (PP = 0.98), Clade M, consisting of the remaining Neotropical species analyzed. Clade M includes the French Guiana accession of *X. benthamii* R.E.Fr.; Clade N, with one accession of *X. amazonica* (1) and the only accession of *X. discreta*; Clade O, including the second accession of *X. amazonica* (2), and a group of four accessions of *X. pittieri* (Clade P, PP = 0.87, BS = 68), and the unique accession of *X. ligustrifolia*; and Clade Q, a strongly supported clade (PP = 0.99), consisting of the remaining Neotropical species analyzed.

Clade Q includes *Xylopia maasiana* Pontes-Pires, a new species described recently (Pontes-Pires et al. in preparation, Manuscript 2); a small subclade strongly supported (Clade R, PP = 1), grouping *X. multiflora* R.E.Fr., as the sister group of all accessions of *X. nitida* Dunal; and a larger subclade (Clade S), strongly supported (PP = 1), including two strongly supported (PP = 1) subclades: Clade T, constituted of *X. aromatica* (Lam.) Mart. (Clade V) and *X. cayennensis* Maas (Clade U), both monophyletic species; and Clade W (PP = 0.98). Clade W is divided into two other subclades: Clade X (PP = 0.97), including all *X. sericea* accessions; and Clade Z (PP = 0.98), including one accession of *X. polyantha*. (Brazil, AM), as sister to all *X. frutescens* accessions together with a second accession of *X. polyantha* (Bolivia).

Divergence Time Estimation —The mean divergence date estimated in our analysis for the crown node of the genus *Xylopia* (PP = 0.98) was at 40.03 MYA (95% HPD: 28.64–50.4 MYA), and for the crown node of *Xylopia* section *Xylopia* (PP = 1) was estimated at 28.69 MYA (95% HPD: 19.56–38.33 MYA) (Fig. 3). This last clade includes all the Neotropical species included in this analysis, and also two Old World species, *Xylopia aethiopica* (from Africa) and *X. humblotiana* (from Madagascar).

3.1.5 Discussion

Phylogenetic Analysis — The BI consensus tree obtained here represents the broadest phylogenetic reconstruction of *Xylopia* section *Xylopia* and of the Neotropical species of the genus to date (Fig. 1). It confirmed that *Xylopia* sect. *Xylopia* is monophyletic, but monophyly of all the Neotropical species of the genus within this section was not supported here, since the two Old World species, *X. aethiopica* and *X. humblotiana*, diverged after the earliest diverging Neotropical clade (Clade B). Nevertheless, the CN Clade is strongly supported and include 20 (from 25) Neotropical species of the section analized here.

The species in Clade B, *Xylopia decorticans, X. laevigata*, *X. langsdorffiana, X. ochrantha,* and *X. peruviana*, are morphologically related, although distinct, giving support for this molecular phylogenetic relationship. All are distributed in the Atlantic Rainforest, except for *X. ochrantha*, which also occurs in the Amazon Forest (Dias 1988, Pontes-Pires et al. in preparation), and *X. peruviana*, occurring only in the Peruvian Amazon (Pontes-Pires et al. in preparation). They share similar morphological characters such as elliptic and wider (2.5–5 cm) leaves, solitary flowers or 2–3-flowered inflorescences, triangular or triangular-ovate floral buds, outer petals wider at midpoint, and 2–6 seeded, long-stipitate monocarps. These similarities have already been noticed by Dias (1988) who mentioned a species complex including *X. laevigata*, *X. lanceolata*, *X. langsdorffiana*, and *X. ochrantha.* Here we considered the species of Clade B as distinct species, although morphologically related, because they have morphological differences which could separate them apart of each other. However, there are other Neotropical *Xylopia* species (*X. cuspidata* Diels, *X. longicuspis* R.E.Fr., and *X. platypetala* R.E.Fr.) with similar morphological characters, as the triangular or triangular-ovate buds and the large outer petals, and they should be include in a phylogenetic reconstruction to allow a better understanding of these characters in the phylogeny of the group.

Xylopia aethiopica, from Africa, and *X. humblotiana* (Clade E), from Madagascar, also nested within *X.* sect. *Xylopia* clade (Clade A), share some of the remarkable morphological characters with the Neotropical species studied here, as the inner petals without fleshy basal margins, staminal cone completely concealing the ovaries, seeds with bilobed aril and a smooth seed coat (Stull et al. 2017).

The relationships among the species of Clade G (*Xylopia* cf. *barbata*, *X. benthamii* (accessions 2 and 3), and *X. annoniflora*), the subclade within the Core Neotropical Clade

(Clade F), could not be completely clarified in our BI analysis because of the polytomy. We also did not find any non-molecular synapomorphies for this clade. A future attempt to elucidate this group must include more accessions of these species, and also of other species morphologically related.

Xylopia involucrata, sister to Clade I, which includes the remaining Neotropical species within the Clade F, is particularly remarkable because of *"the presence of three imbricate involucral bracts which almost entirely surround the flower buds"*, as stated by Dias and Kinoshita (1998), which distinguishes it from any other Neotropical *Xylopia* species described so far.

The clade consisting of *Xylopia emarginata, X. parviflora*, and *X. spruceana*, Clade J, is interesting because these species have an emarginate or retuse leaf apex, or an attenuate to acuminate apex mostly with a retuse tip. A species group including *X. emarginata* and its closest relatives was previously mentioned by Berry and Johnson (1993). However, more studies within this group are needed to solve this question, including more accessions of the species analyzed here and including other related species, as *X. plowmanii* (Berry and Johnson 1993).

Xylopia benthamii emerged as non monophyletic in the BI consensus tree. The three accessions included appears in two different places on the tree (in Clades G and M), and related to two different groups of species. Morphologically, *Xylopia benthamii* is related to *X. aromatica* and *X. cayennensis* (included in this analysis), in the shape of the buds, and these latter are in the Clade T. But *Xylopia benthamii* is also slightly morphologically related to *X. crinita* R.E.Fr.*, X. excellens* R.E.Fr.*,* and *X. xylantha* R.E.Fr., for sharing the cup-shaped calyx with these species, but these species were not included in our study. To try to improve the phylogenetic analysis of this species we suggest to increase its sampling, and also include accessions of those latter related species.

The phylogenetic relationships between *Xylopia maasiana* and other species in Clade Q are not clear. Although only one accession of *X. maasiana* was included, it appeared as a different lineage from *X. nitida*, giving support for two different species. Nevertheless, relationships within this clade are still unclear. In Clade R, our results showed *X. multiflora* as the sister group of *X. nitida*, and more closely related to this species than to *X. maasiana*. *Xylopia multiflora* and *X. nitida* shares the (elongate) narrow triangular or narrow oblong flower buds, the cup-shaped calyx, the great number of carpels (20–30(–35)), and monocarps (10–27(–35)), generally with more than 3 seeds.

The clade including *Xylopia aromatica* and *X. cayennensis* (Clade T) demonstrates the proximity of both species, but also that they constitute different lineages. They share some morphological characters, such as the indument of the twigs, the leaf base and the indument of the abaxial surface of the leaves and the consistency of the monocarps.

The *Xylopia brasiliensis* and *X. frutescens* complexes, proposed at the beginning of this study (Table 1), did not represent monophyletic groups in either the BI or the ML analysis. Indeed, these results from our molecular analysis corroborate the changes in the circumscription of these and related species, based on morphological analysis, which are being proposed elsewhere (Pontes-Pires et al. in preparation, Manuscript 3).

Also according to the flower morphology, *Xylopia brasiliensis* is not so related to the other species of the complex with its name (Table 1). In both analysis, the two accessions of *X. brasiliensis* (Clade L) appear in a basal position in the CN clade (Clade F), not closely related to the other species of the group.

Another fact we noticed was the close morphological relationship between *Xylopia ligustrifolia* and *X. pittieri*. Our BI tree showed *X. ligustrifolia* in a polytomy together with all the accessions of *X. pittieri* (Clade P) (Fig. 1A), corroborating our previous perception of the morphological proximity of these species (Pontes-Pires et al. in preparation, Manuscript 3). Despite the uncertain phylogenetic relationships between them, we have enough morphological characteristics (i.e., leaf base, number of flowers per inflorescence, indument of the stigmas) to distinguish *X. ligustrifolia* and *X. pittieri.* Therefore, they are being considered as distinct close species (Pontes-Pires et al. in preparation, Manuscript 3).

Xylopia amazonica, also hypothesized by us to be part of the *X. frutescens* complex, emerged in our BI and ML analysis in two different places on the tree, and distantly related to the other species of the *X. frutescens* complex. More accessions of *X. amazonica* would be necessary to improve the resolution of its phylogenetic placement within the genus. *Xylopia discreta*, also hypothesized by us to be in the *X. frutescens* complex, was here showed phylogenetically related to one of the accessions of *X. amazonica* (accession 1, from Amazonas, Brazil).

The *Xylopia frutescens* clade (Clade W) emerged in our BI consensus tree as a strongly supported group, and within it were included two subclades representing three phylogenetically and morphologically close species, *X. sericea* A.St.-Hil., *X. polyantha* and *X. frutescens*. These three species, nevertheless, can be distinguished by morphological characters and were accepted as distinct species. The current circumscription is shown in the Table 1.

Xylopia frutescens and *X. sericea* can be distinguished by the density and color of the indument on the abaxial surface of the leaves, the indument of the carpels, the shape of the monocarps and the length of the monocarps stipe. Although the relationship of *X. frutescens* and *X. polyantha* is still uncertain, morphological characters already support them as different species (the sepals length, monocarps shape and constriction, and stipe length; Pontes-Pires et al. in preparation, Manuscript 3). As they are nested in the most derived clade, probably, this divergence between them can be very recent.

Divergence Time Estimation — The mean divergence age estimated for the crown node of the genus *Xylopia* in the present work, at 40.03 MYA (95% HPD: 28.33–50.4 MYA) (Fig. 3), is slightly older than the age estimated by Thomas et al. (2015), at 31.4 MYA (using lognormal analysis, 95% HPD: 23.5–40.3 MYA), and by Pirie and Doyle (2012), at 32 MYA (95% HPD: 20–43 MYA). The difference between our results and those from Thomas et al. (2015) may be because we adopted secondary calibration points based on their chronogram and they used the age of two fossils as calibration, *Endressinia brasiliana* (ca. 112 MYA), and *Futabanthus asamigawaensis* (ca. 89 MYA), and fixed the root constraint to 112 MYA, based on the age of *Endressinia*.

The use of secondary calibration dates has its limitations, because we can have a reduced precision (Pirie and Doyle 2012). However, as our interest was to date the relationships within *Xylopia*, specifically the placement and relationships of the Neotropical species within the genus, and we did not have any realiable fossil closer to the divergence time of *Xylopia*, we chose to use these secondary points of calibration.

The mean divergence ages estimated for the genus mentioned above (ca. 31.4, 32 or 40.03 MYA) postdate the Gondwanan fragmentation, as indicated in previous studies (Richardson et al. 2004, Couvreur et al. 2011, Stull et al. 2017). According to our results the origin of the genus *Xylopia*, and the first and second splittings within the genus, occurred during the Eocene, and not in the Oligocene, as suggested by Thomas et al. (2015). These splittings were estimated to occur at 40.03 MYA, 36.53 MYA, and 33.51 MYA, respectively, and could be related to a period soon after the Early Eocene Climatic Optimum (EECO), between 45 to 32 MYA, when the global temperature was decreasing (Couvreur et al. 2011, Zachos et al. 2001). Numerous speciation events within subfamily Annonoideae (*sensu*

Chatrou et al. 2012, "Long Branch Clade" *sensu* Richardson et al. 2004) are also correlated to EECO (Richardson et al. 2004, Couvreur et al. 2011).

The mean divergence age for the crown node of *Xylopia* section *Xylopia* (*sensu* Stull et al. 2017) estimated here at 28.69 MYA, during the Oligocene, was older than that shown by Thomas et al. (2015) at ca. 18 MYA, during the Miocene. This difference can be due to the fact that we included 25 Neotropical species of *Xylopia*, while Thomas et al. (2015) used only five.

The mean divergence ages estimated here for the crown node of *Xylopia* section *Xylopia* (at 28.69 MYA) and for the divergence of the clade composed by *X. humblotiana* and *X. aethiopica,* and the clade constituted by *X. decorticans, X. laevigata, X. langsdorffiana, X. ochrantha*, and *X. peruviana* (at 24 MYA) happened during the Late Oligocene. These events could had been influenced by the warm climate, in the Late Oligocene Warming (Zachos et al. 2001), as suggested, among other geological events, for Caricaceae (Carvalho and Renner (2012). Altought the phylogenetic relationships between these Old World species and the remaining Neotropical species remain unclear (not presented in the MCC tree because PP supports less than 0.85 were not shown), this age also postdated the Godwanan fragmentation and may be due to long-distance dispersal, as previously suggested by Stull et al. (2017).

Thus, which could possibly be the vectors for this long-distance dispersal across the Atlantic? Floating islands have been proposed as a good hypothesis of transport of monkeys and rodents across the Atlantic during the Oligocene and Miocene (Houle 1998, 1999). Perhaps these floating islands also carried together some plants to provide shade to the animals, and to give them the chance of survival from sun exposure and dehydration to reach the other side of the Atlantic Ocean (Houle 1998, 1999; Renner 2004). Renner (2004) concluded that floating islands are constantly transported into the tropical Atlantic from the deltas of the Congo, Senegal, and Amazon rivers in both directions across the Atlantic. Some *Xylopia* species currently occur in riverine habitats in the Neotropics (Pontes-Pires et al. in preparation, Manuscript 3) and Africa (Johnson and Murray 2018), so, it could be possible that a species from these habitas had been carried out in a floating island.

According to feeding reports, *Xylopia* seeds are dispersed in forests or savannas by birds and monkeys (Gonzaga 1983, Ayres 1989, Whitney et al. 1998, Poulsen et al. 2001, Christianini and Oliveira 2010). However, according to Renner (2004) there are no frugivorous bird migratory routes crossing over the Atlantic, and as guts of frugivorous land birds are usually empty in some minutes (White and Stiles 1990), it is unlikely that the seeds of *Xylopia* would remain in the birds guts in a migration across the Atlantic Ocean (Renner 2004).

The center of origin of the genus *Xylopia* was probably in Africa (Stull et al. 2017). Nevertheless, the ancestral area of the *Xylopia* section *Xylopia* clade is still uncertain. Stull et al. (2017) presented different ancestral areas to this clade depending on the analysis performed. The American Continent is the most probable area recovered by their ML analysis, but Africa was recovered (with a PP support of 0.84, according to Table 3 in Stull et al. 2017) by their Bayesian analysis.

Tectonic events, climate and hydrological changes which occurred mostly during the Miocene in the New World tropics are suggested as important factors that contributed to the diversification of plants in the Neotropics, including the Amazon region (Hoorn et al. 2010, Antonelli and Sanmartín 2011). Studies in Rapateaceae and Bromeliaceae (Givnish et al. 2004), Caricaceae (Carvalho and Renner 2012), and *Dolichandra* (Bignoniaceae) (Fonseca and Lohmann 2015) have confirmed this. As the cladogenesis in *Xylopia* section *Xylopia* (from the Clade H to Clade Z; Fig. 3) occurred during the Miocene to Pleistocene, and the highest diversity of *Xylopia* in the Neotropics occurs in the Amazon, we believe that the emergence of these lineages had also been influenced by Miocene events in this region, such as the Andean uplift, the closure of the Panama Isthmus, the Pebas System, and the Paleo-Orinoco pattern (Hoorn et al. 2010, Antonelli and Sanmartín 2011).

For further phylogenetic and divergence time estimation studies it would be necessary to increase the number of accessions and species included in the analysis, and to add nuclear loci, in an attempt to elucidate few still unclear relationships within *Xylopia*, and with its possible sister groups.

3.1.6 Conclusions

Our phylogenetic analysis contains the largest sampling of Neotropical *Xylopia* species to date, confirming the monophyly of *Xylopia* section *Xylopia* (Clade A). Nevertheless, the monophyly of the Neotropical species group was not confirmed, since two African species were nested among them within the Clade *Xylopia* section *Xylopia*. We obtained high support for different clades within this section, such as Clade B, a basal clade including *Xylopia decorticans, X. laevigata, X. langsdorffiana, X. ochrantha*, and *X. peruviana*, and the Core Neotropical Clade (Clade F), including 20 from the 25 Neotropical species included in the present analyses. The phylogenetic analyses also gave support to disentangling the relationships among *X. brasiliensis*, *X. frutescens*, *X. pittieri*, and their relatives.

The mean divergence time estimates for the origin of the genus *Xylopia* (40.03 MYA) post-dates Gondwanan fragmentation, supporting one or more long-distance dispersal events between Africa and the Neotropics. The origin of *Xylopia* occurred during the Eocene and could have been influenced by the decrease in global temperature after the Early Eocene Climatic Optimum (EECO) (Couvreur et al. 2011, Zachos et al. 2001). The main diversifications within *Xylopia* section *Xylopia* (within the Core Neotropical Clade, from the Clade H up to Z) happened during the Miocene to Pleistocene, and could be related to the tectonic, hydrological and climate changes of the Miocene (Hoorn et al. 2010, Antonelli and Sanmartín 2011).

3.1.7 Acknowledgments

The authors thank the Fundação de Amparo à Pesquisa do Estado de Mato Grosso (FAPEMAT) for the doctoral grant awarded to AFPP and for partially financing field work and visits to the herbaria (Process no. 161293/2014); the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for the Doutorado Sanduíche no Exterior (PDSE) grant (Process no. 88881.135436/2016-01) awarded to AFPP; and Ohio Wesleyan University (OWU) for kindly hosting AFPP during this period. This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001. We also thank all the herbaria curators that made specimens available for our study; the curators of JPB, RB, MO, NY, OWU and UFRR for permission to sample leaf material for DNA extraction; Dra. Adriana Quintella Lobão and Luiz Henrique Liberato Moreira for kindly providing leaf samples for DNA extraction; and Guilherme Pontes Leitão for assistance with preparation of the figures.

3.1.8 Literature Cited

Antonelli, A. and I. Sanmartín. 2011. Why are there so many plant species in the Neotropics? *Taxon* 60: 403–414.

Ayres, J. M. 1989. Comparative feeding ecology of the Uakari and Bearded Saki, Cacajao and Chiropotes. *Journal of Human Evolution* 18: 697–716.

Bagstad, K. J. and D. M. Johnson. 1999. Taxonomy of *Xylopia barbata* (Annonaceae) and related species from the Amazon/Orinoco Region. *Contributions from the University of Michigan Herbarium* 22: 21–28.

Berry, P. E. and D. M. Johnson. 1993. A new species of *Xylopia* (Annonaceae) from Southern Venezuela. *Novon* 3: 99–101.

Burnham, R. J. and K. R. Johnson. 2004. South American palaeobotany and the origins of neotropical rainforests. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences* 359: 1595–1610.

Cardoso, D., T. Särkinen, S. Alexander, A. M. Amorim, V. Bittrich, M. Celis, D. C. Daly, P. Fiaschi, V. A. Funk, L. L. Giacomin, R. Goldenberg, G. Heiden, J. Iganci, C. L. Kelloff, S. Knapp, H. C. de Lima, A. F. P. Machado, R. M. dos Santos, R. Mello-Silva, F. A. Michelangeli, J. Mitchell, P. Moonlight, P. R. L. de Moraes, S. A. Mori, T. S. Nunes, T. P. Pennington, J. R. Pirani, G. T. Prance, L. P. de Queiroz, A. Rapini, R. Riina, C. A. V. Rincon, N. Roque, G. Shimizu, M. Sobral, J. R. Stehmann, W. D. Stevens, C. M. Taylor, M. Trovó, C. van den Berg, H. van der Werff, P. L. Viana, C. E. Zartman, and R. C. Forzza. 2017. Amazon plant diversity revealed by a taxonomically verified species list. *Proceedings of the National Academy of Sciences of the United States of America* 114(40): 10695–10700.

Carvalho, F. A. and S. S. Renner. 2012. A dated phylogeny of the papaya family (Caricaceae) reveals the crop's closest relatives and the family's biogeographic history. *Molecular Phylogenetics and Evolution* 65: 46–53.

Chatrou, L., M. D. Pirie, R. H. J. Erkens, T. L. P. Couvreur, K. M. Neubig, J. R. Abbott, J. B. Mols, J. W. Maas, R. M. K. Saunders, and M. W. Chase. 2012. A new subfamilial and tribal classification of the pantropical flowering plant family Annonaceae informed by molecular phylogenetics. *Botanical Journal of the Linnean Society* 169: 5–40.

Christianini, A. V. and P. S. Oliveira. 2010. Birds and ants provide complementary seed dispersal in a neotropical savanna. *Journal of Ecology* 98: 573–582.

Costion, C., A. Ford, H. Cross, D. Crayn, M. Harrington, and A. Lowe. 2011. Plant DNA barcodes can accurately estimate species richness in poorly known floras. *PloS one* 6(11): e26841.

Couvreur, T. L. P., M. D. Pirie, L. W. Chatrou, R. M. K. Saunders, Y. C. F. Su, J. E. Richardson, and R. H. J. Erkens. 2011. Early evolutionary history of the flowering plant family Annonaceae: Steady diversification and boreotropical geodispersal. *Journal of Biogeography* 38: 664–680.

Couvreur, T. L. P. , A. J. Helmstetter, E. J. M. Koenen, K. Bethune, R. D. Brandão, S. A. Little, H. Sauquet, and R. H. J. Erkens. 2019. Phylogenomics of the major tropical plant family Annonaceae using targeted enrichment of nuclear genes. *Frontiers in Plant Science* [1941]. DOI: 10.3389/fpls.2018.01941.

Darriba, D., G. L., Taboada, R. Doallo, and D. Posada. 2012. jModelTest 2: more models, new heuristics and parallel computing. *Nature Methods* 9(8): 772.

Dias, M. C. 1988. *Estudos taxonômicos do gênero Xylopia L. (Annonaceae) no Brasil extra-amazônico.* Dissertação de Mestrado. Universidade Estadual de Campinas. Campinas.

Dias, M. C. and L. S. Kinoshita. 1998. A new species of Xylopia L. (Annonaceae) from Bahia, Brazil. *Kew Bulletin* 53: 471–474.

Doyle, J. J. and J. L. Doyle. 1987. A rapid DNA isolation procedure for small quantities of fresh leaf tissue. *Phytochemical Bulletin* 19: 11–15.

Doyle, J. A. and A. Le Thomas. 1994. Cladistic analysis and pollen evolution in Annonaceae. *Acta Botanica Gallica* 141: 149–170.

Doyle, J. A. and A. Le Thomas. 1996. Phylogenetic analysis and character evolution in Annonaceae. *Bulletin du Muséum national d'histoire naturelle. , Paris, Section B, Adansonia* 18: 279–334.

Doyle, J. A., P. C. Bygrave, P. C., and A. Le Thomas. 1998. Combined analysis of morphological and *rbc*L data: implications for phylogeny and morphological evolution in Annonaceae. *Annonaceae Newsletter* 12: 20–24.

Doyle, J. A., H. Sauquet, T. Scharaschkin, and A. Le Thomas. 2004. Phylogeny, molecular and fossil dating, and biogeographic history of Annonaceae and Myristicaceae (Magnoliales). *International Journal of Plant Sciences* S55–S67.

Drummond, A. J. and A. Rambaut. 2007. BEAST: Bayesian evolutionary analysis by sampling trees. *BMC Evolutionary Biology* 7: 214.

Erkens, R. H. J., L. W. Chatrou, J. Koek-Noorman, J. W. Maas, and P. J. M. Maas. 2007. Classification of a large and widespread genus of Neotropical trees, *Guatteria* (Annonaceae) and its three satellite genera *Guatteriella, Guatteriopsis* and *Heteropetalum*. *Taxon* 56: 757–774

Ferreira, M. E and D. Grattapaglia. 1995. *Introdução ao uso de marcadores moleculares em análise genética.* ed. 2. Brasília, CENARGEN-EMBRAPA.

Fonseca, L. H. M. and L. G. Lohmann. 2015. Biogeography and evolution of Dolichandra (Bignonieae, Bignoniaceae). *Botanical Journal of the Linnean Society* 179: 403–420.

Fries, R. E. 1930. Revision der Arten einiger Annonaceen-Gattungen I. *Acta Horti Bergiani* 10: 1–128.

Fries, R. E. 1959. Annonaceae. Pp. 1-171 in *Die natürlinchen Pflanzenfamilien*, ed. 2, 17aII, eds. Engler, A. and K. Prantl. Berlin: Duncker und Humblot.

Givnish, T. J., K. C. Millan, T. M. Evans, J. C. Hall, J. C. Pires, P. E. Berry, and K. J. Systma. 2004. Ancient vicariance or recent long-dispersal? Inferences about phylogeny and South American-Africa disjunctions in Rapateaceae and Bromeliaceae based on *ndh*F sequence data. *International Journal of Plant Science* 165: S35–S54.

Gonzaga, L. P. 1983. Notas sobre *Dacnis nigripes* Pelzeln, 1856 (Aves, Coerebidae). *Iheringia. Zoologia* 63: 45–58.

Guo, X., P. H. Hoekstra, C. C. Tang, D. C. Thomas, J. J. Wieringa, L. W. Chatrou, and R. M. K. Saunders. 2017. Cutting up the climbers: evidence for extensive polyphyly in *Friesodielsia* (Annonaceae) necessitates generic realignment across the tribe Uvarieae. *Taxon* 66(1): 3–19.

Hamilton, M. B. 1999. Four primer pairs for the amplification of chloroplast intergenic regions with intraspecific variation. *Molecular Ecology* 8: 521–523.

Hoorn, C., F. P. Wesselingh, H. Ter Steege, M. A. Bermudez, A. Mora, J. Sevink, I. Sanmartín, A. Sanchez-Meseguer, C. I. Anderson, J. P. Figueiredo, C. Jaramillo, D. Riff, F. R. Negri, H. Hooghiemstra, J. Lundberg, T. Stadler, T. Särkinen, and A. Antonelli. 2010. Amazonia through time: Andean uplift, climate change, landscape evolution, and biodiversity. *Science* 330: 927–931.

Houle, A. 1998. Floating islands: a mode of long-distance dispersal for small and medium-sized terrestrial vertebrates. *Diversity and distribution* 4: 201–216.

Houle, A. 1999. The origin of platyrrhines: an evaluation of the Antarctic scenario and the floating island model. *American Journal of Physical Anthropology* 109:541–559.

Huelsenbeck, J. P. and F. Ronquist 2001. MrBayes: Bayesian inference of Phylogenetic trees. *Bioinformatics* 17 (8): 754–755.

Johnson, D. M. and N. A. Murray. 2018. A revision of *Xylopia* L. (Annonaceae): the species of Tropical Africa. *PhytoKeys* 97: 1–252.

Kearse, M., R. Moir, A. Wilson, S. Stones-Havas, M. Cheung, S. Sturrock, S. Buxton, A. Cooper, S. Markowitz, C. Duran, T. Thierer, B. Ashton, P. Meintjes, and A. Drummond. 2012. Geneious Basic: An integrated and extendable desktop software platform for the organization and analysis of sequence data. *Bioinformatics* 28(12): 1647–1649.

Koek-Noorman, J., L. Y. T. Westra, and P. J. M. Maas. 1990. Studies in Annonaceae XII. The role of morphological characters in subsequent classifications of Annonaceae: a comparative survey. *Taxon* 39: 16-32.

Miller, M. A., W. Pfeiffer, and T. Schwartz. 2010. Creating the CIPRES Science Gateway for inference of large phylogenetic trees. Pp. 1–8 in *Proceedings of the Gateway Computing Environments Workshop (GCE)*. New Orleans: Gateway Computing.

Olmstead, R. G. and J. A. Sweere. 1994. Combining data in phylogenetic systematics: An empirical approach using three molecular data sets in the Solanaceae. *Systematic Biology* 43: 467–481.

Pirie, M. D. and J. A. Doyle. 2012. Dating clades with fossils and molecules: the case of Annonaceae. *Botanical Journal of the Linnean Society* 169: 84–116.

Pombo, M. M., D. M. Johnson, L. W. Chatrou, and C. E. Zartman. 2017. *Xylopia annoniflora* (Annonaceae): a new species from central Amazonia. *Phytotaxa* 317(2): 131–136.

Poulsen, J. R., C. J. Clark, and C. B. Smith. 2001. Seed dispersal by a diurnal primate community in the Dja Reserve, Cameroon. *Journal of Tropical Ecology* 17: 787–808.

Rambaut, A. 2018. *Figtree, a graphical viewer of phylogenetic trees.* Available from: <http://tree.bio.ed.ac.uk/software/figtree>. (last accessed September 2018)

Rambaut, A. and A. J. Drummond. 2019. *Tracer v.1.6*. Available from: http://tree.bio.ed.ac.uk/software/tracer/. (last accessed January 2019)

Raven, P. H. and D. I. Axelrod. 1974. Angiosperm biogeography and past continental movements. *Annals of the Missouri Botanical Garden* 61: 539–673.

Renner, S. S. 2004. Plant dispersal across the tropical Atlantic by wind and sea currents. *International Journal of Plant Science* 165(4): S23–S33.

Richardson, J. E., L. W. Chatrou, J. B. Mols, R. H. J. Erkens, and M. D. Pirie. 2004. Historical biogeography of two cosmopolitan families of flowering plants: Annonaceae and Rhamnaceae. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences* 359: 1495–1508.

Ronquist, F., M. Teslenko, P. van der Mark, D.L. Ayres, A. Darling, S. Höhna, B. Larget, L. Liu, M. A. Suchard, and J. P. Huelsenbeck. 2012. MrBayes 3.2: Efficient Bayesian phylogenetic inference and model choice across a large model space. *Systematic Biology* 61: 539–542.

Rozas, J., A. Ferrer-Mata, J. C. Sánchez-DelBarrio, S. Guirao-Rico, P. Librado, S. E. Ramos-Onsins, and A. Sánchez-Gracia. 2017. DnaSP 6: DNA Sequence Polymorphism Analysis of Large Datasets. *Molecular Biology and Evolution* 34: 3299–3302.

Samarakoon, T, S. Y. Wang, and M. H. Alford. 2013. Enhancing PCR amplification of DNA from recalcitrant plant specimens using a trehalose-based additive. *Applications in Plant Sciences 2013 1* (1): 1200236.

Stamatakis, A. 2014. RAxML version 8: A tool for phylogenetic analysis and post-analysis of large phylogenies. *Bioinformatics* 30: 1312–1313.

Stull, G. W., D. M. Johnson, N. A. Murray, T. L. P. Couvreur, J. E. Reeger, and C. M. Roy. 2017. Plastid and seed morphology data support a revised infrageneric classification and an African origin of the Pantropical genus *Xylopia* (Annonaceae). *Systematic Botany* 42: 211–225.

Taberlet, P., L. Gielly, G. Pautou, and J. Bouvet. 1991. Universal primers foramplifications of three non-coding regions of chloroplast DNA. *Plant Molecular Biology* 17: 1105–1109.

Tamura, K., G. Stecher, D. Peterson, A. Filipski, and S. Kumar. 2013. MEGA6: Molecular Evolutionary Genetics Analysis version 6.0. *Molecular Biology and Evolution* 30: 2725–2729.

ter Steege, H., R. W. Vaessen, D. Cárdenas-López, D. Sabatier, A. Antonelli, S. M. de Oliveira, N. C. A. Pitman, P. M. Jørgensen, and R. P. Salomão. 2016. The discovery of the Amazonian tree flora with an updated checklist of all known tree taxa. *Scientific Reports* 6: 1–15.

Thiers, B. 2018. [continuously updated] *Index Herbariorum: A global directory of public herbaria and associated staff.* New York Botanical Garden's Virtual Herbarium. Available from: http://sweetgum.nybg.org/science/ih/ (last accessed May 2018).

Thomas, D. C., L. W. Chatrou, G. W. Stull, D. M. Johnson, D. J. Harris, U. Thongpairoj, and R. M. K. Saunders. 2015. The historical origins of paleotropical intercontinental disjunctions in the pantropical flowering plant family Annonaceae. *Perspectives in Plant Ecology, Evolution and Systematics* 17: 1–16.

White, D. W. and E. W. Stiles. 1990. Co-occurrences of foods in stomachs and feces of fruit-eating birds. *Condor* 92: 291–303.

Whitney, K. D., M. K. Fogiel, A. M. Lamperti, K. M. Holbrook, D. J. Stauffer, B. D. Hardesty, V. T. Parker, and T. B. Smith. 1998. Seed dispersal by *Ceratogymna hornbills* in theDja Reserve, Cameroon. Journal of Tropical Ecology 14: 351–371

Zachos, J., M. Pagani, L. Sloan, E. Thomas, and K. Billups. 2001. Trends, rhythms, and aberrations in global climate 65 Ma to present. *Science* 292: 686–693.

TABLE 1. Initial hypothesis of *Xylopia brasiliensis* and *X. frutescens* complexes, and the current circumscription of these species and allies.

INITIAL HYPOTHESIS		**CURRENT CIRCUMSCRIPTION**
***X. brasiliensis* complex**	***X. frutescens* complex**	***X. amazonica***
X. amoena	***X. amazonica***	***X. brasiliensis***
X. brasiliensis	***X. densiflora***	***X. discreta***
X. calophylla	***X. discreta***	***X. frutescens***
X. micans	***X. frutescens***	***X. ligustrifolia***
X. pittieri	***X. ligustrifolia***	***X. pittieri***
X. pulcherrima	***X. polyantha***	*X. amoena* syn. nov.
	X. sericea	*X. calophylla* syn. nov.
	X. trichostemon	*X. micans* syn. nov.
		X. pulcherrima syn. nov.
		X. polyantha
		X. densiflora syn. nov.
		X. sericea
		X. trichostemon

TABLE 2. Alignment length, number of polymorphic sites (PS) and their percentage to each molecular matrix and substitution model for each analyzed region.

	***mat*K**	***ndh*F**	***psb*A-*trn*H**	***trn*L-F**	**Combined**
Alignment length	634	729	228	326	1917
PS	172	359	112	106	749
%PS	27,13	49,24	49,12	32,51	39,1
Substitution Model	GTR + G	GTR + I + G	HKY + G	GTR + G	GTR + G

3.1.9. Appendix 1. List of taxa and GenBank accession numbers of DNA sequences used in the phylogenetic analysis. When there is more than one specimen for a given species, a number of each specimen is given. Voucher information is given as following: country, locality (only for Brazil), collector, collector's number, and herbarium acronyms following Thiers (2018) in brackets. Taxa indicate with * are newly generated sequences for this study.

Artabotrys hexapetalus (L.f.) Bhandari, India, L. W. Chatrou 470 (U), AY238962, EF179284, AY841429, EF179317; *Artabotrys* sp., Gabon, Wieringa 4018 (U), DQ125052, EF179285, DQ125118, AY841676; *Asimina triloba* (L.) Dunal, USA, L. W. Chatrou 276 (U), AY743479, EF179287, AY841430, AY743460; *Duguetia staudtii* (Engl. & Diels) Chatrou, Cameroon, van Andel 3290 (WAG), AY740558, EF179294, DQ125124, AY740590; *Fusaea peruviana* R.E.Fr., Peru, L. W. Chatrou 179 (U), AY743483, EF179295, AY841436, AY743464; *Goniothalamus tapis* Miq., Thailand, Kessler 3193 (L), DQ125058, EF179297, DQ125126, AY841700; *Guatteria anomala* R.E. Fr., Mexico, Ishiki 2233 (U) (ndhF, psbA–trnH); Maas s. n. (U) (matK, trnL–F), AY740913, EF179298, AY841437, AY741011; *Mkilua fragrans* Verdc., Africa, L. W. Chatrou 474 (U), DQ125060, EF179303, DQ861696, AY841712; *Xylopia aethiopica* (Dunal) A.Rich., Tanzania, D. M. Johnson 1943A (OWU), KX998971, KX998991, KX999025, KX999064; *Xylopia amazonica* R.E.Fr., 1*: Brazil, Amazonas, A. F. Pontes-Pires & L. S. Mergulhão 915 (JPB), XXX, XXX, XXX, XXX; 2*: Brazil, Mato Grosso, A. F. Pontes-Pires et al. 981 (JPB), XXX, XXX, XXX, XXX; *Xylopia annoniflora* Pombo & C. E. Zartman, Brazil, Amazonas, Pombo et al. 667 (INPA), –, –, MF465025, MF465024; *Xylopia aromatica* (Lam.) Mart., 1: French Guiana, MP4941 (PMA), KP052711, KP052719, KP052727, KP052735; 2*: Brazil, Mato Grosso, A. F. Pontes-Pires & F. R. Borges 889 (JPB), XXX, XXX, XXX, XXX; 3*: Brazil, Mato Grosso, A. F. Pontes-Pires & F. R. Borges 893 (JPB), XXX, XXX, XXX, XXX; 4*: Brazil, Goiás, A. F. Pontes-Pires & F. R. Borges 897 (JPB), XXX, XXX, XXX, XXX; 5*: Brazil, Pará, C. Faveri PSACF_EX03693 (JPB), XXX, XXX, XXX, XXX; *Xylopia aurantiiodora* De Wild. & T. Durand, Central African Republic, Harris 2750 (OWU), –, –, KX999027, KX999066; *Xylopia* cf. *barbata* Hoffmanns. ex Mart.*, Brazil, Roraima, A. F. Pontes-Pires et al. 971 (JPB), XXX, XXX, XXX, XXX; *Xylopia benthamii* R.E.Fr., 1: French Guiana, Myc 3413 (ZT), KX998972, KX998993, KX999029, KX999068; 2*: Brazil, Amazonas, A. F. Pontes-Pires et al. 919 (JPB), XXX, XXX, XXX, XXX; 3*: Brazil, Pará, A. F. Pontes-Pires et al. 930 (JPB), XXX, XXX, XXX, XXX; *Xylopia brasiliensis* Spreng., 1*: Brazil, Rio de Janeiro, A. F. Pontes-Pires & G. A. Vieira 943 (JPB), XXX, XXX, XXX, XXX; 2*: Brazil, Rio de Janeiro, A. F. Pontes-Pires 906 (JPB); XXX, XXX, XXX, XXX; *Xylopia buxifolia* Baill., Madagascar, Rabehevitra et al. 682 (OWU), KP052735, KP052721, KP052729, KP052737; *Xylopia cayennensis* Maas, 1*: Brazil, Pará, A. F. Pontes-Pires et al. 929 (JPB), XXX, XXX, XXX, XXX; 2*: Brazil, Pará, A. F. Pontes-Pires et al. 934 (JPB), XXX, XXX, XXX, XXX; 3*: Brazil, Amapá, A. F. Pontes-Pires & R. A. Pontes 950 (JPB), XXX, XXX, XXX, XXX; 4*: Brazil, Amapá, A. F. Pontes-Pires & R. A. Pontes 952 (JPB), –, XXX, XXX, XXX; *Xylopia decorticans* D.M. Johnson & Lobão*, Brazil, Espírito Santo, A. Lobão et al. 1283 (RB) (leaf sample donated by the collector); XXX, XXX, XXX, XXX; *Xylopia discreta* (L.) Sprague & Hutch.*, Brazil, Roraima, A. F. Pontes-Pires et al. 977 (JPB), XXX, XXX, XXX, XXX; *Xylopia emarginata* Mart. 1*, Brazil, Mato Grosso, A. F. Pontes-Pires & F. R. Borges 895 (JPB), XXX, XXX, –, XXX; 2*: Brazil, Goiás, A. F. Pontes-Pires & F. R. Borges 899 (JPB), XXX, XXX, XXX, XXX; 3*:

Brazil, Pará, A. F. Pontes-Pires et al. 925 (JPB); XXX, XXX, XXX, XXX; *Xylopia* aff. *fananehanensis* Cavaco & Keraudren, Madagascar, Randrianaivo 681 (OWU), KX998988, KX999018, KX999055, KX999091; *Xylopia ferruginea* (Hook. f. & Thomson) Baill. Thailand, Johnson 2054 (OWU), KP052714, KP052722, KP052730, KP052738; *Xylopia flamignii* Boutique Gabon, Bradley et al. 1136 (OWU), –, KX998997, KX999031, KX999070; *Xylopia frutescens* Aubl., 1: Mexico, D. M. Johnson & N. A. Murray s. n. (OWU), KX998977, KX998999, KX999033, KX999072; 2: French Guiana, Myc 3401 (ZT), KX998978, KX999000, KX999034, KX999073; 3: French Guiana, Myc 3404 (ZT), KX998976, KX998998, KX999032, KX999071; 4*: Brazil, Paraíba, A. F. Pontes-Pires & J. R. Lima 913 (JPB), XXX, XXX, XXX, XXX; 5*: Brazil, Pará, A. F. Pontes-Pires et al. 931 (JPB), XXX, XXX, XXX, XXX; 6*: Brazil, Pará, A. F. Pontes-Pires et al. 939 (JPB), XXX, XXX, XXX, XXX; 7*: Brazil, Rondônia, A. A. Santos et al. 3642 (RB), XXX, XXX, XXX, XXX; 8*: Brazil, Alagoas, R. P. Lyra-Lemos 10030 (RB), –, XXX, XXX, –; 9*: Brazil, Pará, A. F. Pontes-Pires et al. 938 (JPB), XXX, XXX, XXX, XXX; 10*: Brazil, Amapá, A. F. Pontes-Pires & R. A. Pontes 964 (JPB), XXX, XXX, XXX, XXX; 11*: Brazil, Roraima, A. F. Pontes-Pires et al. 975 (JPB), XXX, XXX, XXX, XXX; 12*: Brazil, Mato Grosso, A. F. Pontes-Pires et al. 884 (JPB), XXX, XXX, XXX, XXX; 13*: Bolívia, Beni, N. R. Ledezma et al. 1005 (OWU), XXX, –, XXX, XXX; *Xylopia hypolampra* Mildbr. Gabon, Sosef 1866 (WAG), KX998980, KX999003, KX999036, KX999074; *Xylopia humblotiana* Baill., Madagascar, Rakotondrajaona, et al. 281 (OWU), –, KX999002, KX999035, –; *Xylopia involucrata* M. C. Dias & Kin.-Gouv.*, Brazil, Bahia, A. Lobão et al. 746 (JPB), –, XXX, XXX, XXX; *Xylopia kalabenonensis* D. M. Johnson, Deroin, & Callmander, Madagascar, Razafitsalama et al. 1041 (MO, OWU), KX998981, KX999004, KX999037, KX999075; *Xylopia laevigata* (Mart.) R.E. Fr., 1*: Brazil, Sergipe, L. A. Gomes 618 (JPB), XXX, XXX, XXX, XXX; 2*: Brazil, Paraíba, L. H. L. Moreira & P. P. A. C. Melo 45 (JPB), XXX, XXX, XXX, XXX; 3*: Brazil, Espírito Santo, J. C. Lopes et al. 360 (RB), XXX, XXX, XXX, XXX; 4*: Brazil, Rio de Janeiro, M. Nadruz et al. 2740 (JPB), –, XXX, XXX, –; *Xylopia langsdorffiana* A. St.-Hil. & Tul.*, Brazil, Rio de Janeiro, A. Lobão et al. 1706 (JPB), XXX, XXX, XXX, XXX; *Xylopia letestui* Pellegr., Gabon, SIMAB 012002 (MO), KX998982, KX999006, KX999041, KX999078; *Xylopia ligustrifolia* Dunal*, Brazil, Roraima, C. V. Castilho et al. 1524 (UFRR), –, –, XXX, XXX; *Xylopia maasiana* Pontes-Pires, Brazil, Mato Grosso, V. Matioli et al. 718 (JPB), –, XXX, XXX, XXX; *Xylopia malayana* Hook. f. & Thomson, Thailand, D. M. Johnson 2053A (OWU), KX998983, KX999009, KX999045, KX999081; *Xylopia mwasumbii* D.M. Johnson, Tanzania, D. M. Johnson 1964B (OWU), KP052715, KP052723, KP052731, KP052739; *Xylopia multiflora* R.E. Fr.*, Brazil, Rondônia, A. A. Santos et al. 3586 (RB), XXX, XXX, XXX, XXX; *Xylopia nitida* Dunal, 1: French Guiana, Myc 3409 (ZT), KX998984, KX999011, KX999047, KX999083; 2*: Brazil, Pará, A. F. Pontes-Pires et al. 922 (JPB), XXX, XXX, XXX, XXX; 3*: Brazil, Pará, A. F. Pontes-Pires et al. 933 (JPB), XXX, XXX, XXX, XXX; *Xylopia ochrantha* Mart., 1*: Brazil, Bahia, W. W. Thomas et al. 16535 (JPB), XXX, XXX, XXX, XXX; 2*: Brazil, Espírito Santo, D. A. Folli et al. 6623 (JPB), XXX, XXX, XXX, XXX; *Xylopia parviflora* Spruce, 1: Peru, M. Pirie 37 (OWU), –, KX999012, KX999049, KX999085; 2: Peru, M. Pirie 111 (OWU), KX998985, KX999013, –, –; *Xylopia peruviana* R.E.Fr., Peru, Chatrou 483 (U), AY238967, EF179312, DQ125134, EF179320; *Xylopia pierrei* Hance, Thailand, Johnson 2063 (OWU), KP052716, KP052724, KP052732, KP052739; *Xylopia pittieri*

Diels, 1: Peru, Pirie 49 (OWU), KX998973, KX998994, –, –; 2*: Brazil, Amazonas, A. F. Pontes-Pires & L. S. Mergulhão 918 (JPB), XXX, XXX, XXX, XXX; 3*: Brazil, Roraima, A. F. Pontes-Pires et al. 973 (JPB), XXX, XXX, XXX, XXX; 4*, Bolivia, Dept. Beni, P. J. M. Maas et al. 8720 (OWU), –, –, XXX, XXX; *Xylopia polyantha* R.E.Fr., 1: Bolivia, T. L. P. Couvreur & R. T. Vargas 216 (NY), –, KX999014, KX999051, KX999087; 2*: Brazil, Amazonas, A. F. Pontes-Pires et al. 921 (JPB), XXX, XXX, XXX, XXX; *Xylopia quintasii* Engl. & Diels, Ghana, Schmidt 2267 (MO), KP052718, KP052726, KP052734, KP052742; *Xylopia sericea* A.St.-Hil., 1*: Brazil, Espírito Santo, C. Farney et al. 4879 (JPB), XXX, XXX, XXX, XXX; 2*: Brazil, Minas Gerais, A. Cervi et al. CA7304 (NY), XXX, XXX, XXX, XXX; 3*: Brazil, Minas Gerais, D. M. Johnson et al. 1836 (OWU), XXX, XXX, XXX, XXX; 4*: Brazil, Minas Gerais, Paracatu, A. Quinet et al. 2060 (RB); XXX, XXX, XXX, XXX; 5*: Brazil, Rio de Janeiro, Silva Jardim, D. Paskin 102 (RB), XXX, XXX, XXX, XXX; 6*: Brazil, Espírito Santo, Linhares, J. Lopes et al. 321 (RB), XXX, XXX, XXX, XXX; 7*: Brazil, Espírito Santo, São Mateus, J. R. Pirani et al. 3355 (OWU), XXX, XXX, XXX, XXX; *Xylopia spruceana* Benth. ex Spruce*, Brazil, Amazonas, J. G. de Carvalho-Sobrinho et al. 943 (RB), XXX, –, XXX, XXX; *Xylopia staudtii* Engl. & Diels, Gabon, Niangadouma & Walters 144 (MO), KX998989, KX999023, KX999062, KX999098.

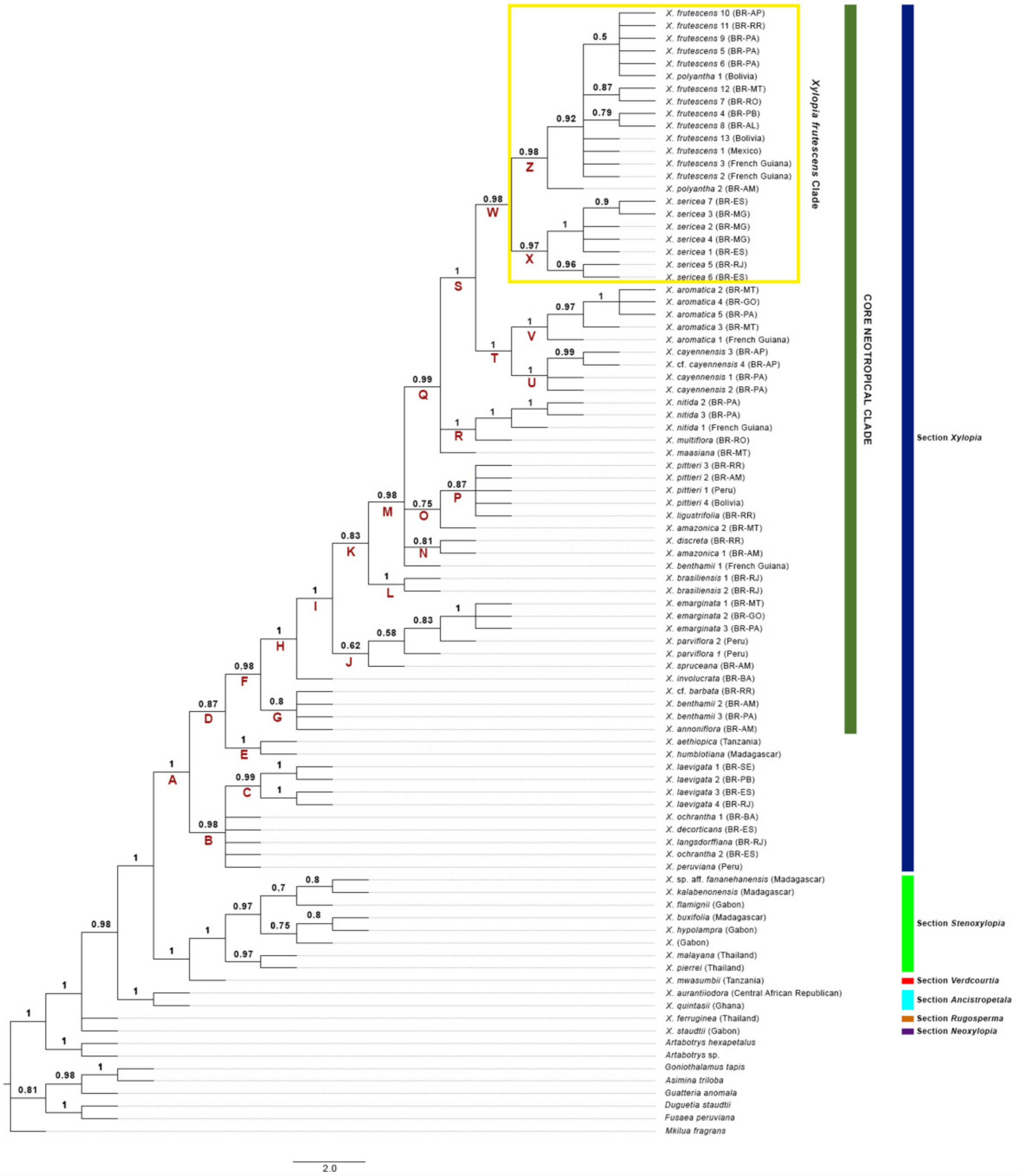

FIG. 1. Bayesian majority rule consensus tree for *Xylopia* resulting from the analysis of the four plastid loci combined matrix. Posterior probability is shown for each clade. The Core Neotropical Clade is displayed by the dark green bar. The dark blue, light green, red, light blue, orange, and purple bars indicate the sections *Xylopia, Stenoxylopia, Verdcourtia, Ancistropetala, Rugosperma*, and *Neoxylopia* (Johnson and Murray 2018), respectively. The *Xylopia frutescens* Clade is highlighted by the yellow rectangle. After each species name we have in brackets its geographic distribution, with country (and state, if in Brazil). (Caption: BR = Brazil, AL = Alagoas, AM = Amazonas, AP = Amapá, BA = Bahia, ES = Espírito Santo, GO = Goiás, MG = Minas Gerais, MT = Mato Grosso, PA = Pará, PB = Paraíba, RJ = Rio de Janeiro, RO = Rondônia, RR = Roraima, SE = Sergipe).

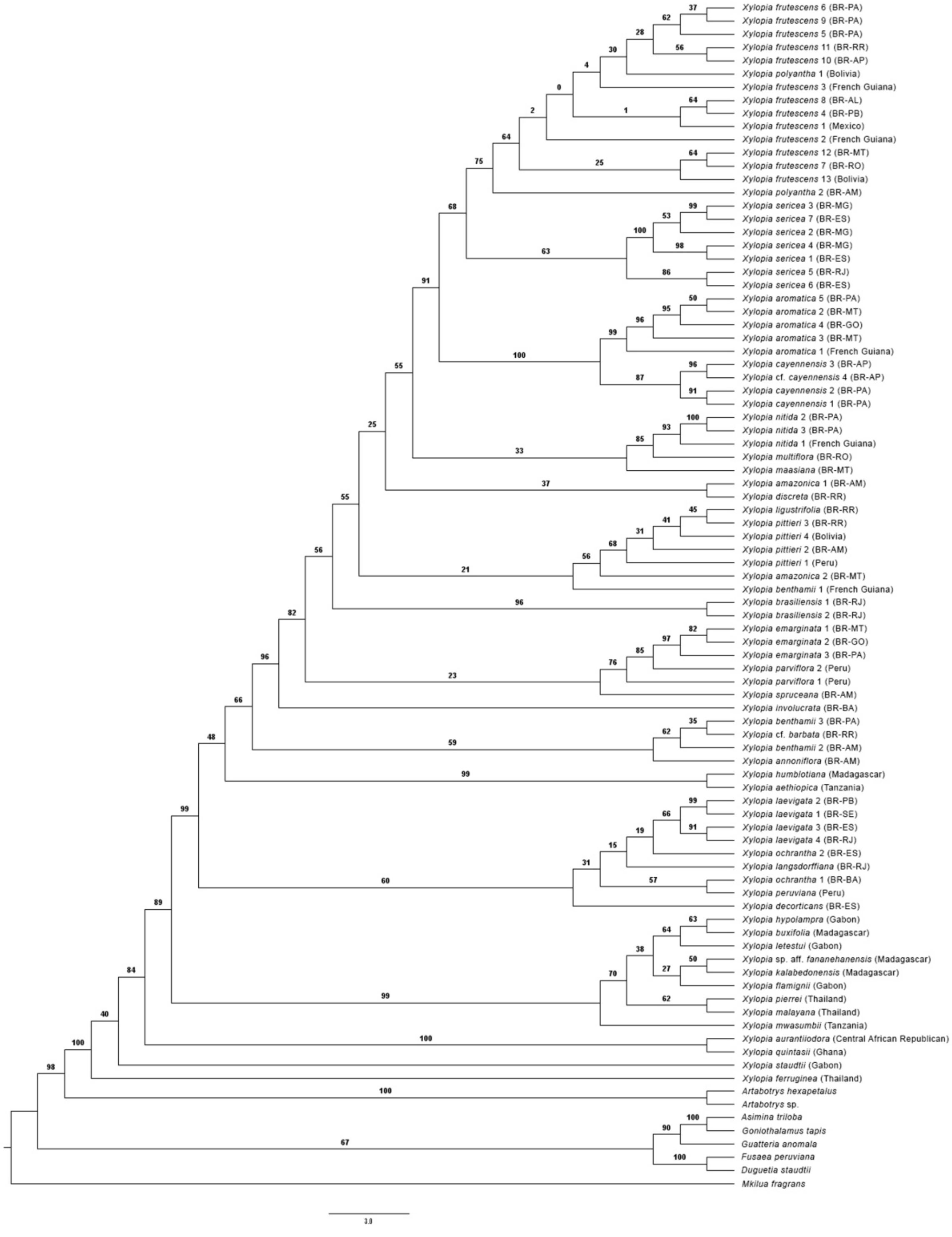

FIG. 2. Best-scoring Maximum Likelihood tree for *Xylopia* resulting from the analysis of the four plastid loci combined matrix. Bootstrap is shown in each clade.

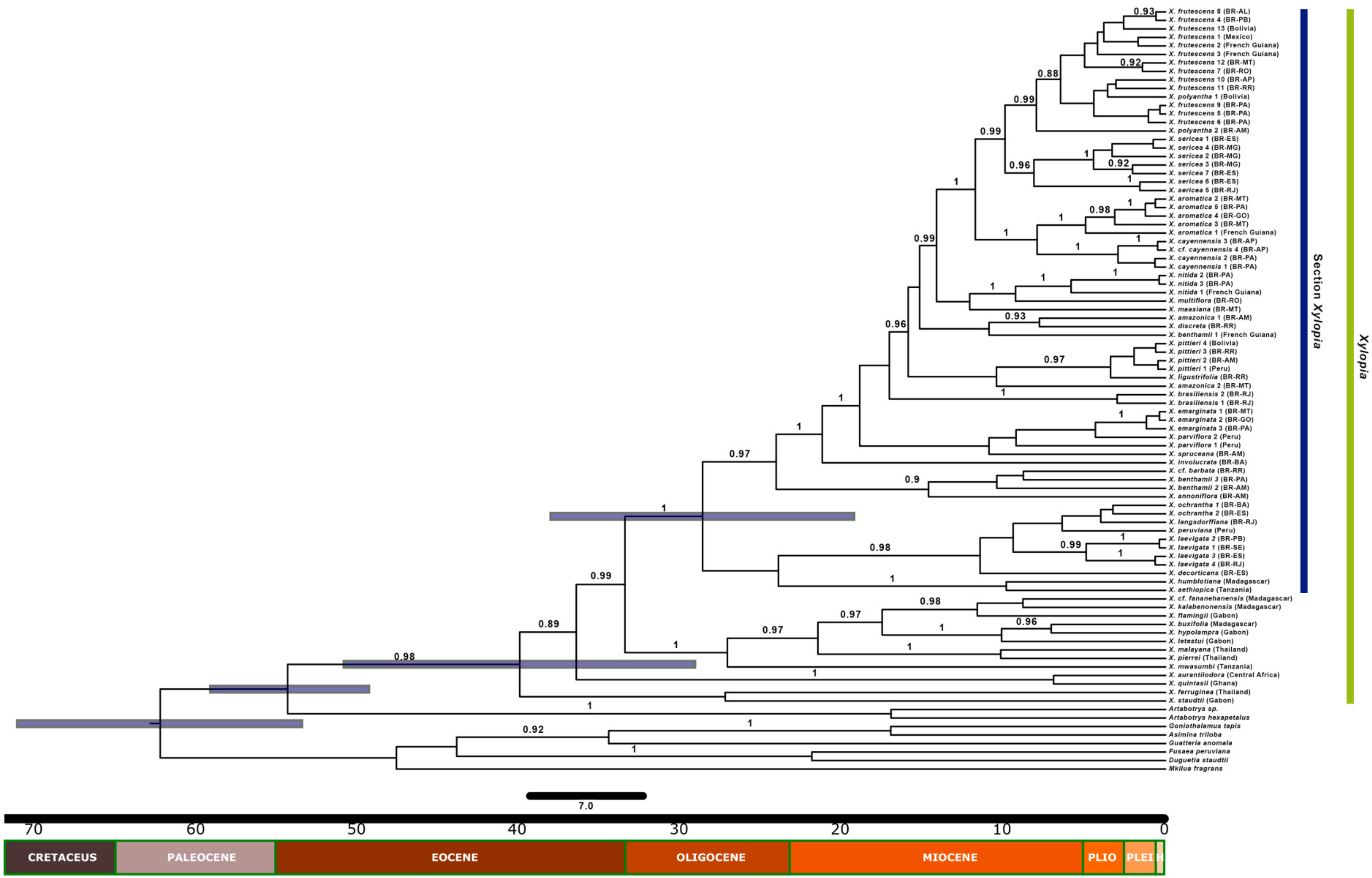
X. frutescens 8 (BR-AL)
X. frutescens 4 (BR-PB)
X. frutescens 13 (Bolivia)
X. frutescens 1 (Mexico)
X. frutescens 2 (French Guiana)
X. frutescens 3 (French Guiana)
X. frutescens 12 (BR-MT)
X. frutescens 7 (BR-RO)
X. frutescens 10 (BR-AP)
X. frutescens 11 (BR-RR)
X. polyantha 1 (Bolivia)
X. frutescens 9 (BR-PA)
X. frutescens 5 (BR-PA)
X. frutescens 6 (BR-PA)
X. polyantha 2 (BR-AM)
X. sericea 1 (BR-ES)
X. sericea 4 (BR-MG)
X. sericea 2 (BR-MG)
X. sericea 3 (BR-MG)
X. sericea 7 (BR-ES)
X. sericea 6 (BR-ES)
X. sericea 5 (BR-RJ)
X. aromatica 2 (BR-MT)
X. aromatica 5 (BR-PA)
X. aromatica 4 (BR-GO)
X. aromatica 3 (BR-MT)
X. aromatica 1 (French Guiana)
X. cayennensis 3 (BR-AP)
X. cf. cayennensis 4 (BR-AP)
X. cayennensis 2 (BR-PA)
X. cayennensis 1 (BR-PA)
X. nitida 2 (BR-PA)
X. nitida 3 (BR-PA)
X. nitida 1 (French Guiana)
X. multiflora (BR-RO)
X. maasiana (BR-MT)
X. amazonica 1 (BR-AM)
X. discreta (BR-RR)
X. benthamii 1 (French Guiana)
X. pittieri 4 (Bolivia)
X. pittieri 3 (BR-RR)
X. pittieri 2 (BR-AM)
X. pittieri 1 (Peru)
X. ligustrifolia (BR-RR)
X. amazonica 2 (BR-MT)
X. brasiliensis 2 (BR-RJ)
X. brasiliensis 1 (BR-RJ)
X. emarginata 1 (BR-MT)
X. emarginata 2 (BR-GO)
X. emarginata 3 (BR-PA)
X. parviflora 2 (Peru)
X. parviflora 1 (Peru)
X. spruceana (BR-AM)
X. involucrata (BR-BA)
X. cf. barbata (BR-RR)
X. benthamii 3 (BR-PA)
X. benthamii 2 (BR-AM)
X. annoniflora (BR-AM)
X. ochrantha 1 (BR-BA)
X. ochrantha 2 (BR-ES)
X. langsdorffiana (BR-RJ)
X. peruviana (Peru)
X. laevigata 2 (BR-PB)
X. laevigata 1 (BR-SE)
X. laevigata 3 (BR-ES)
X. laevigata 4 (BR-RJ)
X. decorticans (BR-ES)
X. humblotiana (Madagascar)
X. aethiopica (Tanzania)
X. cf. fananehanensis (Madagascar)
X. kalabenonensis (Madagascar)
X. flamingii (Gabon)
X. buxifolia (Madagascar)
X. hypolampra (Gabon)
X. letestui (Gabon)
X. malayana (Thailand)
X. pierrei (Thailand)
X. mwasumbi (Tanzania)
X. aurantiiodora (Central Africa)
X. quintasii (Ghana)
X. ferruginea (Thailand)
X. staudtii (Gabon)
Artabotrys sp.
Artabotrys hexapetalus
Goniothalamus tapis
Asimina triloba
Guatteria anomala
Fusaea peruviana
Duguetia staudtii
Mkilua fragrans
Section Xylopia
Xylopia
0.93
0.92
0.88
0.99
0.99
1
0.96
0.92
1
1
0.98
1
1
1
1
0.99
1
1
1
1
0.93
0.96
0.97
1
1
1
1
0.97
0.9
1
1
0.98
0.99
1
1
0.99
1
0.98
0.97
0.96
0.89
1
0.97
1
0.98
1
1
1
0.92
1
7.0
70
60
50
40
30
20
10
0
CRETACEUS
PALEOCENE
EOCENE
OLIGOCENE
MIOCENE
PLIO
PLEI
H

FIG. 3. Maximum clade credibility tree for *Xylopia* resulting from the divergence time estimation analysis of the four loci combined matrix, performed on BEAST. The genus *Xylopia* is displayed by the light green longitudinal bar. The *Xylopia* section *Xylopia* clade is displayed by the dark blue longitudinal bar. The 95% highest posterior probability (HPD) estimates are indicated by the light blue horizontal bars. After each species name we have in brackets its geographic distribution, with country (and state, if in Brazil). (Caption: BR = Brazil, AL = Alagoas, AM = Amazonas, AP = Amapá, BA = Bahia, ES = Espírito Santo, GO = Goiás, MG = Minas Gerais, MT = Mato Grosso, PA = Pará, PB = Paraíba, RJ = Rio de Janeiro, RO = Rondônia, RR = Roraima, SE = Sergipe).

TABLE S1. Description of the PCR reactions of *mat*K, *ndh*F, *psb*A-*trn*H, and *trn*L-F (modified PCR protocol from Stull et al. (2017) for *mat*K, *psb*A-*trn*H, and *trn*L-F; and protocol tested in the Laboratory to carry out amplification with lower use of dNTPs and primers for *ndh*F).

PCR REACTIONS			
***mat*K**	***ndh*F**	***psb*A-*trn*H**	***trn*L-F**
4 µl of 20 ng/µl genomic DNA	2, 3 or 4 µl of 20 ng/µl genomic DNA	4 µl of 20 ng/µl genomic	4 or 6 µl of 20 ng/µl genomic DNA
2.5 µl of 10 × *Taq* polymerase buffer	5 µl of 10 × *Taq* polymerase buffer	2.5 µl of 10 × *Taq* polymerase buffer	2.5 µl of 10 × *Taq* polymerase buffer
5 µl of 2.5 mM dNTPs	4 µl of 2.5 mM dNTPs	5 µl of 2.5 mM dNTPs	5 µl of 2.5 mM dNTPs
2.5 or 5 µl of 50 mM or 5 µl of 25 mM $MgCl_2$	3 µl of 50 mM or 6 µl of 25 mM $MgCl_2$	2.5 µl of 50 mM or 5 µl of 25 mM $MgCl_2$	2.5 µl of 50 mM or 5 µl of 25 mM $MgCl_2$
10 µl of 5 × TBT	10 µl of 5 × TBT	10 µl of 5 × TBT	10 µl of 5 × TBT
2 µl of 10 µmol F and R primers	0.5 µl of 10 µmol F and R primers	1.8 or 2 µl of 10 µmol F and R primers	1.8 or 2 µl of 10 µmol F and R primers
0.134 µl or 0.15 µl of *Taq* polymerase (Invitrogen) or 0.2 µl of labmade *Taq* polymerase	0.125 µl of *Taq* polymerase (Invitrogen) or 0.2 µl of a labmade *Taq* polymerase	0.15 µl of *Taq* polymerase (Invitrogen) or 0.2 µl of a labmade *Taq* polymerase	0.134 µl of *Taq* polymerase (Invitrogen) or 0.2 µl of a labmade *Taq* polymerase
H_2O to reach 50 µl of the final volume	H_2O to reach 50 µl of the final volume	H_2O to reach 50 µl of the final volume	H_2O to reach 50 µl of the final volume

3.2 ARTIGO 2 – *XYLOPIA MAASIANA* (ANNONACEAE): A NEW SPECIES HIDDEN IN THE BRAZILIAN AMAZON, AND NOTES ON A SIMILAR SPECIES*

Aline Fernandes Pontes-Pires,[1, 2, 5] Maria Regina de V. Barbosa,[3] and David M. Johnson[4]

[1] Instituto de Ciências Naturais, Humanas e Sociais, Campus Universitário de Sinop, Universidade Federal de Mato Grosso, Av. Alexandre Ferronato, 1200, Reserva 35, Setor Industrial, 78557-267, Sinop, Mato Grosso, Brazil; afpont@hotmail.com

[2] Programa de Pós-Graduação em Biologia Vegetal, Universidade Federal de Pernambuco, Av. Profº. Moraes Rego s/n, Cidade Universitária, 50670-901, Recife, Pernambuco, Brazil.

[3]Departamento de Sistemática e Ecologia, Universidade Federal da Paraíba, Caixa Postal 5065, Cidade Universitária, 58051-970, João Pessoa, Paraíba, Brazil; mregina@dse.ufpb.br

[4]Department of Botany and Microbiology, Ohio Wesleyan University, Delaware, Ohio 43015, USA; dmjohnso@owu.edu

[5]Author for correspondence

3.2.1 Abstract — During a taxonomic and phylogenetic study of *Xylopia* from the Amazon River basin of South America, we examined collections from the Brazilian states of Amazonas, Mato Grosso, Pará, Rondônia and Tocantins that resembled *Xylopia nitida* but differed consistently in a number of floral and fruit characters. These specimens also proved to be geographically remote from *X. nitida*. These specimens are described here as a new species, *Xylopia maasiana*. The new species is a small to medium-sized tree encountered mostly in riparian habitats of the southern Brazilian Amazon or in forests in the transition area between the Amazon rainforest and the Cerrado vegetation. A detailed description of *X. maasiana*, assessment of its conservation status, illustrations, a distribution map, a table of comparisons to *X. nitida,* and taxonomic comments on the latter are presented.

---

* This manuscript will be submitted to Systematic Botany.

Keywords— Endemic species, Cerrado, riparian forests.

3.2.2 Introduction

Xylopia L. is one of the largest genera of Annonaceae, comprising 160–180 species (Johnson and Murray 2018). It is the only pantropical genus in the family (Dias 1988, Stull et al. 2017, Johnson and Murray 2018) and is therefore of biogeographical importance. Molecular phylogenetic analyses including *Xylopia* species (Doyle et al. 1998, Chatrou et al. 2012, Thomas et al. 2015, Stull et al. 2017) have repeatedly shown the genus to be monophyletic. Stull et al. (2017), in the first phylogeny surveying the entire geographic distribution of the genus, using morphological data from seeds and molecular data from four plastid markers, recovered four principal clades within *Xylopia*, one of them including all Neotropical species sampled.

Revision of the Neotropical species of *Xylopia* was largely accomplished by R. E. Fries (1900, 1930, 1931, 1934, 1937, 1939, 1959), who ultimately recognized 48 Neotropical species. Thirty-two species of *Xylopia* are known from Brazil, 14 of them endemic to the country (Flora do Brasil 2020, under construction). The species occur in all regions of the country, often in forests and in transition zones between forest formations and savanna, but their greatest concentration is in the Amazon region (Dias 1988), where 26 species are currently known (Flora do Brasil 2020, under construction). Despite that the Amazonian species of *Xylopia* have not been comprehensively revised since the revisions of Fries in the 1900s. The rainforest of the Amazon River basin are widely recognized as one of the most diverse ecosystems on earth (ter Steege et al. 2016), and its flora has been recently estimated to comprise 6700 (Cardoso et al. 2017) to 11600 (ter Steege et al. 2016) tree species attaining a size of 10 cm d.b.h. or greater. The difference in numbers is partially the result of different geographic delimitations by the two sets of authors, but in both cases the authors list about 35 species of *Xylopia* as occurring in the region. Nonetheless, it is clear from our investigations that this number included synonyms and some species which do not occur in Amazon, and there are also undescribed *Xylopia* species in the Amazonian flora not quoted in their lists yet.

During a taxonomic and phylogenetic study of the Amazonian species of *Xylopia* we analyzed patterns of morphological variation among specimens that had often been identified in herbaria as *X. nitida* Dunal, a species originally described from French Guiana (Dunal 1817). One group of specimens, despite a superficial similarity to *X. nitida* in the shape and texture of the leaves were found, however, to differ consistently from *X. nitida* in characters of both the flowers and the fruits. In addition, these specimens were collected in the Brazilian states of Amazonas, Mato Grosso, Pará, Rondônia, and Tocantins, in and near the region known as the "Arc of Deforestation" (IBGE 2002), geographically separated from other populations of *X. nitida*, which lie north of the Amazon River. These specimens are being described here as a new species, but nomenclatural and distribution data for *Xylopia nitida* are also included to explain how the two species are to be distinguished.

3.2.3 Materials and Methods

We examined collections held in the following herbaria: CEN, ESA, F, HAMAB, HERBAM, HFSL, HUEFS, IAC, IAN, INPA, JPB, K, MBM, MG, MO, NY, OWU, R, RB, RON, SP, SPF, U, UB, UEC, UFP, UFMT, US, and TANG (acronyms following Thiers 2019). Collections were analyzed *in loco* and/or through loans, or by consulting the INCT - Virtual Herbarium of the Flora and Fungi (http://inct.splink.org.br), or by consulting individual herbarium websites. We analyzed 29 collections of *Xylopia maasiana* and around 40 of *X. nitida*. The study followed the standard methodologies used in plant taxonomy. The morphological terms utilized in the description were based on Radford et al. (1974), van Heusden (1992), and van Setten and Koek-Noorman (1992). Distribution, habitat, phenology data, flower and fruit color, and habit data were obtained from the herbarium labels. In the taxonomic description, the term stamens includes both fertile stamens and staminodes. The length of monocarps does not include stipe length. When the coordinates were not cited in the herbarium labels we searched for the locality (when possible) or municipality in "geoLoc", a tool of "speciesLink", an information system, available at http://splink.cria.org.br. The distribution map was made using the software Quantum GIS version 2.18 (Quantum GIS Development Team 2018). The evaluation of the conservation status of the new species was determined using *Geospatial Conservation Assessment Tool* software (GeoCAT) (Bachman et al. 2011).

3.2.4 Taxonomic Treatment

3.2.4.1 ***Xylopia maasiana*** Pontes-Pires, sp. nov. ined. TYPE: BRAZIL. Mato Grosso: Mun. Nobres [Sorriso], along Rio Celeste at BR163, 52 Km S of Sinop (Km 775), 12°18′S, 55°37′W, 16 Sep 1985, *W. W. Thomas, D. Ackerly & R. P. Lima 3813* (holotype: MG-191800!, isotypes: F 2019795!, HFSL 128, INPA 150327!, MG-121672!, MO-1922945!, NY!, SPF-00045525!, U-0134169 (digital image!), US 3101263!).

Xylopia maasiana resembles *X. nitida*, but can be distinguished from the latter by having narrowly oblong to narrowly triangular buds, nearly panduriform, slightly constricted above the base (*vs*. buds enlarged at the base, narrowing progressively towards the apex, without constriction, in *X. nitida*); sepals only slightly connate at the base, connate ca. ⅓–⅙ of their length, not forming a short cup-shaped calyx (*vs*. sepals connate from ½ to ⅔ of their length, forming a short cup-shaped calyx); 130–165 stamens (*vs*. 170–270), fertile stamens 0.6–0.8(–0.9) mm long (*vs*. 1–1.5 mm); 5–8 carpels (*vs*. 20–30), glabrous stigmas (*vs*. stigmas tomentellous at the apex); fruits of 3–7 monocarps (*vs*. 10–27); often compressed-falcate to obliquely clavate monocarps, slightly constricted between the seeds (*vs*. mostly narrowly cylindrical or extremely narrowly oblong, sometimes slightly falcate, torulose or moniliform); only 1–3 seeds per monocarp (*vs*. mostly 4–7, rarely 1–3), 7–7.5 mm long (*vs*. 5–6.5 mm), and oblong (*vs*. obovoid).

Trees 4–15(–20) m tall, and **shrubs** 2–3 m tall, d.b.h. 10–25 cm; **bole** with buttresses. Twigs, abaxial surfaces of leaves, inflorescences, and flowers with golden or golden hyaline hairs. **Twigs** tomentose to short sericeous, becoming sparsely tomentose, glabrate when older, pale brown to gray brown; with lenticels. **Petioles** 4–7 mm long, canaliculate, brown to dark brown, tomentose to short sericeous; **leaf blades** (4.2–)5.8–10.5(–11.8) × (1.8–)2.2–4.4(–5.8) cm, elliptic to oblong-elliptic, chartaceous to subcoriaceous, margin frequently slightly revolute to revolute, translucent glands rare (visible under stereomicroscope), pale brown to yellowish and densely short sericeous abaxially, brown and glabrous adaxially, apex mostly acute, sometimes short acuminate, less frequently rounded, acumen 3–6 mm long, base cuneate, acute or attenuate; midrib raised abaxially, forming a keel, impressed adaxially, secondary veins (9–)12–15(–17) per side, raised on both surfaces, more visible adaxially. **Inflorescences** axillary, generally 2–3(–4–6)-flowered**; peduncle** 1.5–3 mm long, tomentose; **pedicels** 1.2–1.5 mm long, tomentose; **buds** narrowly oblong to narrowly triangular, nearly panduriform, slightly constricted above the base; **bracts** 2, one at the base of the pedicel, and one at the midpoint, persistent, ca. 1.5 × 1 mm, triangular ovate, clasping, short sericeous abaxially, adaxially glabrous. **Sepals** slightly connate at the base, ca. ⅓–⅙ of their length connate, 1.5–2 × 1.5 mm, ovate, smooth, short sericeous abaxially, glabrous adaxially, apex acute; **petals** white, becoming maroon to purple towards the center; **outer petals** 13–14(–18) mm long, 2.5–5 mm wide at base, 1.5–2.5 mm wide at constriction, 2–3.5 mm wide at midpoint, narrowly triangular to narrowly oblong, lanceolate, slightly fleshy, reflexed in the median region at anthesis, apex acute, abaxially densely short sericeous, tomentellous, base enlarged and concave, papillate adaxially; **inner petals** 12–14 mm long, ca. 2 mm wide at base, 0.8 mm wide at constriction, ca. 1 mm wide at midpoint, linear from midpoint to apex, lanceolate, longitudinally keeled adaxially from midpoint to apex, tomentellous with base and convex region short sericeous abaxially, glabrous with the base slightly papillate and glabrous adaxially, apex acute to acuminate, base enlarged and concave; **stamens** 130–165; **fertile stamens** 80–100, slightly club-shaped, 0.6–0.8(–0.9) × 0.2 mm, glabrous, apex of connective 0.1–0.3 mm long, often rounded or slightly angular, flattened, papillate, anthers 6–8(–12)-locellate, filament 0.1–0.2 mm long; **outer staminodes** 35–40, 0.8–0.9 × 0.2 mm, slightly club-shaped, glabrous, anther connective apex 0.2–0.3 mm long, often rounded, or only slightly angular, or elongate, or sometimes longer and triangular, anthers(3–)4–6(–10)-locellate, filament ca. 0.1 mm long; **inner staminodes** 17–23, obtriangular, 0.5–0.8(–0.9) × (0.2–)0.3–0.4 mm, glabrous, apex of the connective ca. 0.2 mm long, very slightly dilated, or sometimes not differentiated, sometimes papillate, without locellate anthers and filaments; **staminal cone** depressed urceolate, 1.2–1.5 mm in diameter, 0.8 mm high, sometimes not concealing completely the ovaries; **carpels** 5–8, 3.2–4.5 mm long, ovary (0.5–)0.7–1 mm long, semi-fusiform to obclavate, densely sericeous; **ovules** 2–3, stigmas 2.7–3.5 mm long, linear, slightly geniculate above base, finely verruculose, glabrous. **Fruit** of 3–7 monocarps borne on **pedicels** 5–7.5 mm long, sparsely tomentose to glabrate; **torus** ca. 2.5 mm in diameter, 1.5 mm high, globose. **Monocarps** (6–)8–15(–17) × (5–)6–7.5 mm, 4–4.5 mm thick, oblong, compressed-falcate and obliquely clavate, slightly constricted between seeds, or obovoid and clavate (1-seed), glabrous to glabrate, becoming red, brown to dark brown when dried, obliquely wrinkled when dried, apex rounded or obtuse, sometimes obliquely apiculate, apiculus 1(–2) mm long; **stipes** 6–8 mm long, wrinkled when dried, glabrate. **Seeds** 1–3, oblong, 7–7.5 × 3–3.5 mm, ca. 3 mm thick, dark brown to black, shiny; aril yellowish beige, yellowish, orange, or transparent orange, lobes 1.5–2 × ca. 2.5 mm wide, ellipsoid, truncate or slightly oblique, fleshy. Figure 1.

Distribution and Habitat— *Xylopia maasiana* is endemic to the Brazilian Amazon, occurring only south of the Amazon River, in the states of Amazonas, Mato Grosso, Pará, Rondônia, and Tocantins (Figure 2). It is found in riverine forests, flooded forest (*igapó* forest), or seasonally flooded forest (*várzea* forest), and less frequently in lowland non-flooded forests (*terra firme* forest) in the Brazilian Amazon, or in forests in the transition areas at the border of the Amazon forest and the Central Brazilian savanna (*cerrado*).

Conservation— Using the criteria established by the IUCN (2012, 2017), the Extent of Occurrence (EOO) of *Xylopia maasiana,* approximately 771,000 km^2, results in its classification as of "*Least Concern*" (LC). However, its Area of Occupancy (AOO), 108 km^2, results in an "*Endangered*" (EN) classification. It is important to note that the areas of occurrence of *X. maasiana* are mostly within or near the "Arc of Deforestation" (IBGE 2002) – an area in the form of an arc that includes parts of the Brazilian states of Acre, Amazonas, Maranhão, Mato Grosso, Rondônia, and Tocantins that have experienced dramatic levels of forest loss along their southern and eastern borders (Fearnside 2005). Ter Steege et al. (2015) estimated that, by 2050, 34 to 66% and 42% to 76% of the forest in southern and eastern Amazonia, the region of the Arc of Deforestation, will be destroyed, depending on the scenario model of projected forest loss (Soares-Filho et al. 2006) used. *Xylopia nitida* was included in that paper (see the Appendix S2 of ter Steege et al. 2015) and listed as *Vulnerable* (VU) or *Endangered* (EN), based on the IUCN criteria, according to the scenario model of projected forest loss used. Because *Xylopia maasiana* was frequently misidentified in herbaria as *X. nitida*, we suspect that *X. maasiana* specimens may have been included as a fraction of what Ter Steege at al. (2015) called "*X. nitida.*" It is also important to mention that the greatest numbers of records of *X. maasiana* are from Mato Grosso State, and that recent collections there were made within areas that will be flooded by the Colíder Hydroelectric Plant reservoirs. This Hydroeletric Plant will be part of the Teles Pires River Hydroelectric Complex now under construction that will be composed of a total of six hydroelectric plants. That project thus represents a serious threat to the conservation of *X. maasiana*. Therefore, it is consistent to accept the categorization of *X. maasiana* as *Endangered* (EN). We hope this species could be conserved in some protected areas where the species has already been collected: at the Araguaia National Park (one specimen), a federal conservation unit, which is administered by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), an institute linked to the Brazilian Ministry of Environment; at a private area of environmental preservation (three specimens); and at the Xingu indigenous park (three specimens), an indigenous reserve linked to the Fundação Nacional do Índio (FUNAI).

Phenology— Specimens with flowers have been collected from May through October, and with fruits from May to September.

Etymology— The specific epithet honors Dr. Paul J. M. Maas, a Dutch botanist specializing in the flora of the Neotropics, and dedicated to the study of Annonaceae for more than 35 years. Dr. Maas led a large project investigating the systematics of the family (Maas 1983), and has contributed immensely to our knowledge of the taxonomy and phylogenetics of the family. In addition, he was responsible for the Flora Neotropica monographs of *Rollinia* A. St.-Hil. (Maas et al. 1992) and *Duguetia* A. St.-Hil. (Maas et al. 2003), and for the training of many specialists in the Annonaceae.

Taxonomy— The leaves of *Xylopia maasiana* closely resemble those of *X. nitida.* Both have leaves that are oblong-elliptic or elliptic, with a golden-hyaline to golden sericeous abaxial indument, and the midrib quite salient on the abaxial face, forming a small keel. *Xylopia maasiana* can be distinguished, however, by having a flower bud narrowly oblong to narrowly triangular, nearly panduriform (*vs.* narrowly oblong to oblong, narrowing progressively towards the apex in *X. nitida*), sepals only slightly connate at the base (*vs.* sepals connate from ½ to ⅔ of their length, forming a short cupuliform calyx); stamens 0.6–0.8(–0.9) mm long (*vs.* 1.1–1.5 mm long); 5–8 carpels (*vs.* 20–30); fruits with 3–7 monocarps (*vs.* 10–27); monocarps often compressed-falcate to obliquely clavate (vs. narrowly oblong-cylindrical); seeds 1–3 (*vs.* 4–7) (Table 1). In regard to sepals only slightly connate at base, sepal and petal shape and size, carpel number, monocarp shape and size, and seed number, we noticed *Xylopia maasiana* is more similar to the Amazonian species, *X. pittieri* Diels. But *X. maasiana* can be easily differentiated from the latter by the number of stamens (130–165 *vs.* (38–)50–60 in *X. pittieri*), number of locelli from anthers of fertile stamens (6–8(–12) *vs.* 2–4(–5)), indument of stigma (villous to tomentellous from the apex to the midpoint and glabrous from the midpoint to the base *vs.* entirely glabrous stigmas), monocarp stipe length ((2.5–)3–4.5 mm *vs.* 6–8 mm long), and seed shape (oblong *vs.* flattened obovoid, obovoid or ellipsoid) and width (3–3.5 mm *vs.* 4–4.5 mm).

Additional Specimens (Paratypes) Examined — **Brazil**. — AMAZONAS: Humaitá, estrada Humaitá-Jacarecanga, km 45, rio Maici-Mirim, 7°45′S, 62°32′W, 19 Jun 1982, *L. O. A. Teixeira et al. 1230* (INPA, JPB, MG, MO, NY, RB, US); Rio Curuquetê, vicinity of Cachoeira Santo Antônio, 14 Jul 1971, *G. T. Prance et al. 14205* (INPA, MG, MO, NY, OWU, R). — MATO GROSSO: Alta Floresta, área particular de preservação ambiental, delimitada pelo Parque Estadual do Cristalino e pelos Rios Teles Pires e Cristalino, a leste do Rio Cristalino, nas proximidades da margem do Rio Teles Pires, 9°00′S, 55°00′W, 17 Jul

2006, *D. Sasaki et al. 79* (INPA, K, SPF); ibid., propriedade particular de preservação ambiental delimitada pelo Parque Estadual do Cristalino e pelos rios Teles Pires e Cristalino, entre o Cristalino Jungle Lodge e base do Limão, em curva acentuada do rio Cristalino, 17 Dec 2006, *D. Sasaki et al. 1294* (HERBAM, K); Aripuanã, Núcleo Pioneiro de Humboldt, forest along margin of Rio Aripuanã, 59°21′S, 10°12′W, 20 Out 1973, *C. C. Berg et al. P19802* (INPA, MG, MO, NY, US); [Cocalinho], região de Cocalinho, 1997, *A. Rozza et al. 449* (ESA, JPB, UFMT, RB); ibid., 1997, *A. Rozza et al. 498* (ESA, JPB, UFMT, RB); Colíder, Resgate da Flora da UHE Colíder, Lote B de supressão, 255 m elev., 2 Oct 2014, *M. Lautert et al. s.n.* (MBM 402949, RB 653442, TANG 3918); Colíder, Resgate da Flora da UHE Colíder, Lote B de supressão, 385 m elev., 11 Aug 2015, *J. P. Battisti et al. s.n.* (MBM 403120, RB 641501, TANG 3111); Colíder, Resgate da Flora da UHE Colíder, Lote B de supressão, 257 m elev., 5 Sep 2014, *L. F. Sardelli et al. s.n.* (MBM 403114, RB 652317); Confresa, Faz. Promissão, 8 Aug 1997, *L. C. Bernacci 2326* (ESA, IAC); Expedition Base Camp, by the Suiá Missu Ferry, c. 40 km NW of base camp, 24 Sep 1968, *R. M. Harley & R. Souza 10240* (IAN, MO, NY, RB, UB); Itaúba, margem do Rio Renato, afluente do Rio Teles Pires, 14 Jul 2008, *V. Maioli et al. 718* (RB, SPF); ibid., Resgate da Flora da UHE Colíder, Lote C de supressão, 255 m elev., 19 Sep 2014, *D. C. Dias et al. s.n.* (HCF 24488, MBM 402618, RB 640724, TANG 3232); Luciara, Margem direita rio Preto, Parque Indígena do Xingu, 8 Jun 1990, *M. Macedo & S. Assumpção 2519* (INPA); Nova Canaã do Norte, Resgate de Flora da UHE Colíder, Lote A de supressão, 251 m elev., 10 Sep 2014, *S. A. Antoniazzi et al. s.n.* (MBM 398648, TANG 2235); ibid., Resgate de Flora da UHE Colíder, Lote A de supressão, 256 m elev., 14 Jul 2015, *H. R. W. Zanin s.n.* (MBM 404594, RB 669481); Novo Mundo, Ilha do Sol no Rio Teles Pires, 9°38′48″S, 55°55′06″W, 223 m elev., 14 Sep 2007, *G. S. Henicka et al. 91* (HERBAM, INPA, K, SPF); Parque Indígena do Xingu, Posto Leonardo, 15 Jul 1973, *M. Emmerich 3753* (R); Parque Indígena do Xingu, Posto Leonardo, Aldeia Savalapíti, 29 Sep 1974, *M. Emmerich 4199* (R); Parque Nacional do Xingu, Aldeia as Camaiuras, Sep 1965, *E. A. Filho & D. F. Coelho s.n.* (UEC 30821); Rio Juruena, nas proximidades da Cachoeira de Todos os Santos, SC 21 VB PT1, 20 May 1977, *N. A. Rosa & M. R. Santos 1947* (HAMAB, INPA, MG, NY [2 sheets]); Rio Teles Pires, Instituto Ecológico do Cristalino, 9°35′48″S, 55°55′55″W, 16 Aug 1994, *B. Dubs 1665* (ESA); Sinop, margem direita rio Nandico, 30 Mai 1995, *M. Macedo et al. 4165* (INPA, UFMT). — PARÁ: Conceição do Araguaia, entre Morro de Areia e Bacabau, 9 Sep 2001, *L. C. B. Lobato et al. 2848* (MG). — RONDÔNIA: Machadinho do Oeste, Tabajara, rio Machado, beira do rio

Marmelo, 8°57′24″S, 61°55′57″W, 1 Jun 2015, *N.* C. *Bigio et al. 1672* (MO, NY, RON); Porto Velho, Saída leste de Mutum Paraná, margem esquerda do rio Mutum Paraná, 9°37′32″S, 64°52′14″W, 90 m elev., 28 Jun 2010, *G. Pereira-Silva et al. 15543* (CEN, HUEFS, INPA, RB, RON). — TOCANTINS [GOIÁS, before the division]: Ilha do Bananal, Parque Nacional do Araguaia (IBDF) nr HQ, ca. 2 Km from Macauba, 10°30′S, 50°30′W, 17 Sep 1980, *J. A. Ratter et al. 4432* (MO, NY, UB, UEC).

Our herbarium and field studies have confirmed that this species in its strict sense is not known to occur south of the Amazon River in Brazil. In order to clarify some aspects of its nomenclature and geographic distribution, in anticipation of the full treatment of all Amazonian *Xylopia* species (Pontes-Pires et al, in preparation), the following summary is presented.

3.2.4.2 XYLOPIA NITIDA Dunal, Monogr. Anonac. 122. t. 20. 1817. *Xylopicrum nitidum* (Dunal) Kuntze, Rev. Gen. Pl. 1: 8. 1891. TYPE: FRENCH GUIANA. Hab. in montibus Orjac propè Cayennam, *Martin s.n.* (holotype: G-00201468 (digital image!) [photo in F!, MO!, NY!], isotypes: B-10-0249564 (digital image!) [photo in F!, MO!, NY!], FI-FI004818 (digital image!), FI-FI004819 (digital image!), K-000221079 (digital image!), P-00202480 (digital image!), P-P00202481 (digital image!), P-P00202482 (digital image!), P-P00202483 (digital image!), R 60814! [2 sheets, R-000060814 and R-000060814a] (digital image!), US-1379829!).

Xylopia cinerea Sandw., Bull. Misc. Inform. Kew. 10: 478. 1930. TYPE: GUYANA. Essequibo River, Moraballi Creek, near Bartica, 1 Nov 1929, *N. Y. Sandwith 543* (holotype: K-000221076 (digital image!), K-000221077 (digital image!), K-000221078 (digital image!), isotypes: B-100242294 (digital image!), F-893773 [fragment!], NY-00066756!, P-00202501 (digital image!) [photo in F!, MO!], RB-00577778!, U-0000438 (digital image!), US-00098772!).

Xylopia nitida Dunal var. *nervosa* R.E.Fr., Acta Horti Berg. 12(2): 286. 1937. TYPE: BRAZIL, Amazonas, Municipality of São Paulo de Olivença, 26 Oct - 11 Dec 1936, *B. Krukoff 8715* (holotype: NY!, isotypes: A-00039724 (digital image!), BM-000554090 (digital image!), G-00226130 (digital image!), GB-GB-0047048 (digital image!), F!, K-000221080 (digital image!), LA-00000050 (digital image!), LE-00001860 (digital image!), L-LP002769 (digital image!), MICH-1115460 (digital image!), MO!, P-00734913 (digital image!), S-R-6861 (digital image!), U-000418 (digital image!), US-00149228! [2 sheets]).

Distribution and Habitat— *Xylopia nitida* is a widely distributed species, occurring in Brazil, French Guiana, Guyana, Peru, Suriname, and Venezuela. In Brazil, it is found in the states of Amapá, Amazonas, and Pará. It occurs in lowland moist forests, in riverine seasonally flooded areas (*várzea* forest) or not (*terra firme* forest), and also in lowland dry forests, all, generally less disturbed.

Selected Specimens Examined— **Brazil**. — AMAPÁ: Calçoene, 11 Dec 1984, *B. V. Rabelo et al. 2985* (HAMAB, MG, OWU). — AMAZONAS: Manaus, Estação Biológica, Km 60, Manaus-Caracaraí, 16 Jan 1991, *D. Coelho & J. Coelho s.n.* (INPA 161808); ibid., E.E.F.T., Km 40, 6 Apr 2000, *V. F. Kinupp s.n.* (INPA 208836, JPB); ibid., Estrada do Jardim Tarumãzinho, a 2 Km da Cachoeira, 18 Nov 1975, *O. P. Monteiro s.n.* (INPA 53553). — PARÁ: Almeirim, Mt. Dourado, área do ideal, 07 Feb 1980, *N. T. Silva 5238* (INPA, MG); Ilha de Marajó, rio Anajás, logo acima de Anajás, 0°59′S, 49°55′W, 1 Nov 1987, *G. T. Prance et al. 30199* (EAC, F, INPA, HAMAB, MG, MO, NY, U); [Novo Repartimento], Remansão, Rio Tocantins, 1 Jul 1948, *R. L. Fróes 23508* (INPA); Peixe-boi, Vila do Ananim, 1 Apr 2000, *F. Cardoso et al. s.n.* (MG 105031); Prainha, Curuá-Una, Distrito de Barreirinha, Projeto Curuá-Una, 8 Sep 1977, *Pessoal do L.P F./Brasília 971* (INPA).— **French Guiana**. — CAYENNE, Piste de Saint-Elie – Interfluve Sinnamary/Counamana, Piste km 22, 5°20′S, 53°0′W, 9 Oct 1989, *D. Sabatier & M. F. Prevost 3032* (INPA, MO, NY, P, U, US). — **Guyana.** — Base of Mt. Makarapan, Makarapan Creek about 1/2 mile downstream from rapids, near abandoned balata bleeders camp, 3°59′N, 58°57′W, 80-130 m elev., 17 Sep 1988, *P. J. M. Maas et al. 7498* (HTSA, INPA, MG, NY, U); Ibid., 17 Sep 1988, *P. J. M. Maas et al. 7512* (F, INPA, MO, NY, U, US); Demerara compartment, CD 920 road forest, and Mabura region, Centra, 5°1.95′95″N, 58°37.73′73″W, 11 Mar 1993, *R. C. Ek 746* (NY); Kanuku Mts., Maipaima, Camp 3 on Tsikoma Creek, 3°22′N, 59°30′W, 160 m elev., 25 Nov 1987, *M. J. Jansen-Jacobs et al. 1232* (MO); Rupununi Distr., Bushmouth Shea to Quitaro R., Bowl Creek, 2°54′N, 59°7′W, 200 m elev., 28 Aug 1995, *M. J. Jansen-Jacobs et al. 4892* (NY); U. Takutu – U. Essequibo Region: Bulldozed treefall along road clearing, ca. 15 km NE of Surama village, 4°15′N, 58°56'W, 90 m elev., 27 Feb 1990, *T. McDowell et al. 2072*

(NY). — **Peru.** — LORETO: Requena, Centro Forestal J. Herrera, cerca al arboretum, márgem derecha del Río Ucayali, 25 Feb 1982, *F. Encarnación 26047* (MBM). — **Suriname.** — Jodensavanne-Mapane Creek área, rain forest near camp 8, 9 Nov 1968, *L.B.B. 1076* (U, digital image!); Sipaliwini, 3.13 km SW from Kwamalasamutu village center, access trail begins at confl. Peritu Eeku (creek) & Sipalawini R. (1.0 ha research plot "KW3"), 2°20′4″N, 56°48′21″W, 220 m elev., 26 Apr 2005, *B. Hoffman 6201* (U, digital image!). — **Venezuela.** — BOLÍVAR: Dist. Roscio, "El Abismo", dry forested slopes of small range S of río Samay and N of río Icabaru, 4°23′N, 61°38′W, 600-700 m elev., 23 Oct 1985, *B. K. Holst & R. Liesner 2436* (MO). — DELTA AMACURO: Bosque pluvial, este de rio Grande, Este-Noreste de El Palmar, cerca de los límites del Estado Bolívar, 25 Feb 1982, *L. Marcano-Berti 581* (INPA, MBM, NY, SP, UFP).

3.2.5 Acknowledgments

The authors thank the Fundação de Amparo à Pesquisa do Estado de Mato Grosso (FAPEMAT) for partially financing this project (Process no. 161293/2014) and for the doctoral grant awarded to AFPP; the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for the Doutorado Sanduíche no Exterior (PDSE) grant (Process no. 88881.135436/2016-01) awarded to AFPP; Ohio Wesleyan University (OWU) for kindly hosting AFPP during the Doutorado Sanduíche. This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001. We also thank the curators and staff of the herbaria mentioned in the text; Regina Carvalho for preparing the illustrations; Raimundo Luciano Soares Neto for preparing the distribution map; Guilherme Pontes Leitão for helping to prepare the figure plate; and Dr. Adriana Lobão and Dr. W. Wayt Thomas for their valuable comments and critical review of the manuscript.

3.2.6 Literature Cited

Bachman, S., J. Moat, A. W. Hill, J. de la Torre, and B. Scott. 2011. Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. In: Smith V, Penev L (Eds) e-Infrastructures for data publishing in biodiversity science. *ZooKeys* 150: 117–126. (Version BETA)*

Cardoso, D., T. Särkinen, S. Alexander, A. M. Amorim, V. Bittrich, M. Celis, D. C. Daly, P. Fiaschi, V. A. Funk, L. L. Giacomin, R. Goldenberg, G. Heiden, J. Iganci, C. L. Kelloff, S. Knapp, H. C. de Lima, A. F. P. Machado, R. M. dos Santos, R. Mello-Silva, F. A. Michelangeli, J. Mitchell, P. Moonlight, P. R. L. de Moraes, S. A. Mori, T. S. Nunes, T. P. Pennington, J. R. Pirani, G. T. Prance, L. P. de Queiroz, A. Rapini, R. Riina, C. A. V. Rincon, N. Roque, G. Shimizu, M. Sobral, J. R. Stehmann, W. D. Stevens, C. M. Taylor, M. Trovó, C. van den Berg, H. van der Werff, P. L. Viana, C. E. Zartman, and R. C. Forzza. 2017. Amazon plant diversity revealed by a taxonomically verified species list. *Proceedings of the National Academy of Sciences of the United States of America* 114(40): 10695-10700.

Chatrou, L., M. D. Pirie, R. H. J. Erkens, T. L. P. Couvreur, K. M. Neubig, J. R. Abbott, J. B. Mols, J. W. Maas, R. M. K. Saunders, and M. W. Chase. 2012. A new subfamilial and tribal classification of the pantropical flowering plant family Annonaceae informed by molecular phylogenetics. *Botanical Journal of the Linnean Society* 169: 5–40.

Dias, M. C. 1988. *Estudos taxonômicos do gênero Xylopia L. (Annonaceae) no Brasil extra-amazônico.* Dissertação de Mestrado. Campinas, São Paulo: Universidade Estadual de Campinas.

Doyle, J. A., P. C. Bygrave, and A. Le Thomas. 1998. Combined analyses of morphological and *rbc*L data: implications for phylogeny and morphological evolution in Annonaceae. *Annonaceae Newsletter* 12: 20-24.

Dunal, M. F. 1817. *Monographie de la famille Anonacées*. Paris: Treuttel et Würtz.

Fearnside, P. M. 2005. Deforestation in Brazilian Amazonia: History, Rates, and Consequences. *Conservation Biology* 19(3): 680–688.

Flora do Brasil 2020 under construction. *Xylopia* in Flora do Brasil 2020 under construction. Jardim Botânico do Rio de Janeiro. Available at: <http://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB110555>. (Accessed May 5 2019)

Fries, R. E. 1900. Beiträge zür Kenntnis der Süd-Amerikanischen Anonaceen. *Kungliga Svenska Vetenskapsakademiens Handlingar* 34(5): 1-59.

Fries, R. E. 1930. Revision der Arten einiger Annonaceen-Gattungen I. *Acta Horti Bergiani* 10: 1-128.

Fries, R. E. 1931. Revision der Arten einiger Annonaceen-Gattungen II. *Acta Horti Bergiani*

10: 129-341.

Fries, R. E. 1934. Revision der Arten einiger Annonaceen-Gattungen III. *Acta Horti Bergiani* 12: 1-220.

Fries, R. E. 1937. Revision der Arten einiger Annonaceen-Gattungen IV. *Acta Horti Bergiani* 12: 221-288.

Fries, R. E. 1939. Revision der Arten einiger Annonaceen-Gattungen V. *Acta Horti Bergiani* 12: 289-577.

Fries, R. E. 1959. Annonaceae. Pp. 1-171 in *Die natürlinchen Pflanzenfamilien*, ed. 2, 17aII, eds. Engler, A. and K. Prantl. Berlin: Duncker und Humblot.

Heusden, E. C. H. van. 1992. Flowers of Annonaceae: morphology, classification, and evolution. *Blumea* Supplement 7: 1–218.

IBGE - INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. 2002. Perfil dos Municípios Brasileiros Meio Ambiente 2002. Available at: https://biblioteca.ibge.gov.br/index.php/bibliotecacatalogo?view=detalhes&id=26063 (Last accessed May 2018)

IUCN. 2012. IUCN red list categories and criteria version 3.1. Ed. 2. Gland, Switzerland and Cambridge, UK: IUCN.

IUCN. 2017. Guidelines for using the IUCN Red List Categories and Criteria, version 13. IUCN.

Johnson, D. M. and N. A. Murray. 2018. A revision of *Xylopia* L. (Annonaceae): the species of Tropical Africa. *PhytoKeys* 97: 1–252.

Maas, P. J. M. 1983. Project systematics of Annonaceae. *Taxon* 32: 528-529.

Maas, P. J. M., L. Y. T. Westra, and collaborators. 1992. *Rollinia. Flora Neotropica Monograph* 57: 1-188.

Maas, P. J. M, L. Y. T. Westra, and L. W. Chatrou. 2003. *Duguetia. Flora Neotropica Monograph* 88: 1-274.

Quantum GIS Development Team. 2018. Quantum GIS Geographic Information System. Open Source Geospatial Foundation Project. http://qgis.osgeo.org/.

Radford, A. E., W. C. Dickison, J. R. Massey, and C. R. Bell. 1974. *Vascular plant systematics*. New York: Harper & Row.

Setten, A. K. van and J. Koek-Noorman. 1992. Studies in Annonaceae. XVII. Fruits and seeds of Annonaceae: morphology and its significance for classification and identification. *Bibliotheca Botanica* 142: 1-152.

Soares-Filho, B. S., D. C. Nepstad, L. M. Curran, G. C. Cerqueira, R. A. Garcia, C. A. Ramos, E. Voll, A. McDonald, P. Lefebvre, and P. Schlesinger. 2006. Modelling conservation in the Amazon basin. *Nature* 440: 520–523.

Stull, G. W., D. M. Johnson, N. A. Murray, T. L. P. Couvreur, J. E. Reeger, and C. M. Roy. 2017. Plastid and seed morphology data support a revised infrageneric classification and an African origin of the Pantropical genus *Xylopia* (Annonaceae). *Systematic Botany* 42: 211-225.

ter Steege, H., N. C. A. Pitman, T. J. Killeen, W. F. Laurance, C. A. Peres, J. E. Guevara, R. P. Salomão, C. V. Castilho, I. L. Amaral, F. D. A. Matos, L. S. Coelho, W. E. Magnusson, O. L. Phillips, D. A. Lima Filho, M. J. V. Carim, M. V. Irume, M. P. Martins, J. Molino, D. Sabatier, F. Wittmann, D. C. López, J. R. S. Guimarães, A. M. Mendoza, P. N. Vargas, A. G. Manzatto, N. F. C. Reis, J. Terborgh, K. R. Casula, J. C. Montero, T. R. Feldpausch, E. N. H. Coronado, A. J. D. Montoya, C. E. Zartman, B. Mostacedo, R. Vasquez, R. L. Assis, M. B. Medeiros, M. F. Simon, A. Andrade, J. L. Camargo, S. G. W. Laurance, H. E. M. Nascimento, B. S. Marimon, B. Marimon Jr., F. Costa, N. Targhetta, I. C. G. Vieira, R. Brienen, H. Castellanos, J. F. Duivenvoorden, H. F. Mogollón, M. T. F. Piedade, G. A. Aymard C., J. A. Comiskey, G. Damasco, N. Dávila, R. García-Villacorta, P. R. S. Diaz, A. Vincentini, T. Emilio, C. Levis, J. Schietti, P. Souza, A. Alonso, F. Dallmeier, L. V. Ferreira, D. Neill, A. Araujo-Murakami, L. Arroyo, F. A. Carvalho, F. C. Souza, D. D. do Amaral, R. Gribel, B. G. Luize, M. P. Pansonato, E. Venticinque, P. Fine, M. Toledo, C. Baraloto, C. Cerón, J. Engel, T. W. Henkel, E. M. Jimenez, P. Maas, M. C. P. Mora, P. Petronelli, J. D. C. Revilla, M. Silveira, J. Stropp, R. Thomas-Caesar, T. R. Baker, D. Daly, M. R. Paredes, N. F. da Silva, A. Fuentes, P. M. Jørgensen, J. Schöngart, M. R. Silman, N. C. Arboleda, B. B. L. Cintra, F. C. Valverde, A. Di Fiore, J. F. Phillips, T. R. van Andel, P. von Hildebrand, E. M. Barbosa, L. C. M. Bonates, D. de Castro, E. S. Farias, T. Gonzales, J. Guillaumet, B. Hoffman, Y. Malhi, I. P. A. Miranda, A. Prieto, A. Rudas, A. R. Ruschell, N. Silva, C. I. A. Vela, V. A. Vos, E. L. Zent, S. Zent, A. Cano, M. T. Nascimento, A. A. Oliveira, H. Ramirez-Angulo, J. F. Ramos, R. Sierra, M. Tirado, M. N. U. Medina, G. van der Heijden, E. V. Torre, C. Vriesendorp, O. Wang, K. R. Young, C. Baider, H. Balslev, N. de Castro, W. Farfan-Rios, C. Ferreira, C. Mendoza, I. Mesones, A. Torres-Lezama, L. E. U. Giraldo, D. Villarroel, R. Zagt, M. N. Alexiades, K. Garcia-Cabrera, L. Hernandez, I. Huamantupa-Chuquimaco, W.

Milliken, W. P. Cuenca, S. Pansini, D. Pauletto, F. R. Arevalo, A. F. Sampaio, E. H. V. Sandoval, and L. V. Gamarra. 2015. Estimating the global conservation status of more than 15,000 Amazonian tree species. *Science Advances* 1(10): e1500936.

ter Steege, H., R. W. Vaessen, D. Cárdenas-López, D. Sabatier, A. Antonelli, S. M. de Oliveira, N. C. A. Pitman, P. M. Jørgensen, and R. P. Salomão. 2016. The discovery of the Amazonian tree flora with an updated checklist of all known tree taxa. *Scientific Reports 6*: 1-15.

Thiers, B. 2019. [continuously updated] *Index Herbariorum: A global directory of public herbaria and associated staff.* New York Botanical Garden's Virtual Herbarium. Available from: http://sweetgum.nybg.org/science/ih/ (last accessed July 2019).

Thomas, D. C., L. W. Chatrou, G. W. Stull, D. M. Johnson, D. J. Harris, U. Thongpairoj, and R. M. K. Saunders. 2015. The historical origins of paleotropical intercontinental disjunctions in the pantropical flowering plant family Annonaceae. *Perspectives in Plant Ecology, Evolution and Systematics* 17: 1-16.

TABLE 1. Principal morphological characteristics that differentiate *Xylopia maasiana* from *X. nitida*.

Characteristic	*Xylopia maasiana*	*Xylopia nitida*
Total numbers of flowers in the inflorescence	generally 2–3(–4–6)	(2–)4–8(–15), generally more than 3 flowers.
Shape of the floral bud	Narrowly oblong to narrowly triangular, nearly panduriform, slightly constricted above the base	Narrowly oblong to oblong, narrowing progressively towards the apex, without constriction
Fusion of the sepals	Sepals only slightly connate at the base, connate ca. ⅓–⅙ of their length, not forming a short cup-shaped calyx	Sepals connate from ½ to ⅔ of their length, forming a short cup-shaped calyx
Number of stamens	130–165	170–270
Length of the stamens	0.6–0.8(-0.9) mm	1–1.5 mm
Number of carpels	5–8	20–30
Indument of stigma	Glabrous	Tomentellous at the apex
Number of monocarps per fruit	3–7	10–27
Size of the monocarps (length x width)	(6–)8–15(–18) x (5–)6–7.5 mm	(6–)10–32(–50) x 3–5 mm
Shape of the monocarps	Compressed-falcate and obliquely clavate, or clavate to obovoid (when having only one 1 seed); slightly constricted between the seeds	Narrowly cylindrical or extremely narrowly oblong, sometimes slightly falcate, torulose or moniliform
Number of seeds per monocarp	1–3	4–7, very rarely 1–3
Lenght of the seeds	7–7.5 mm	5–6.5 mm
Shape of the seeds	Oblong	Obovoid

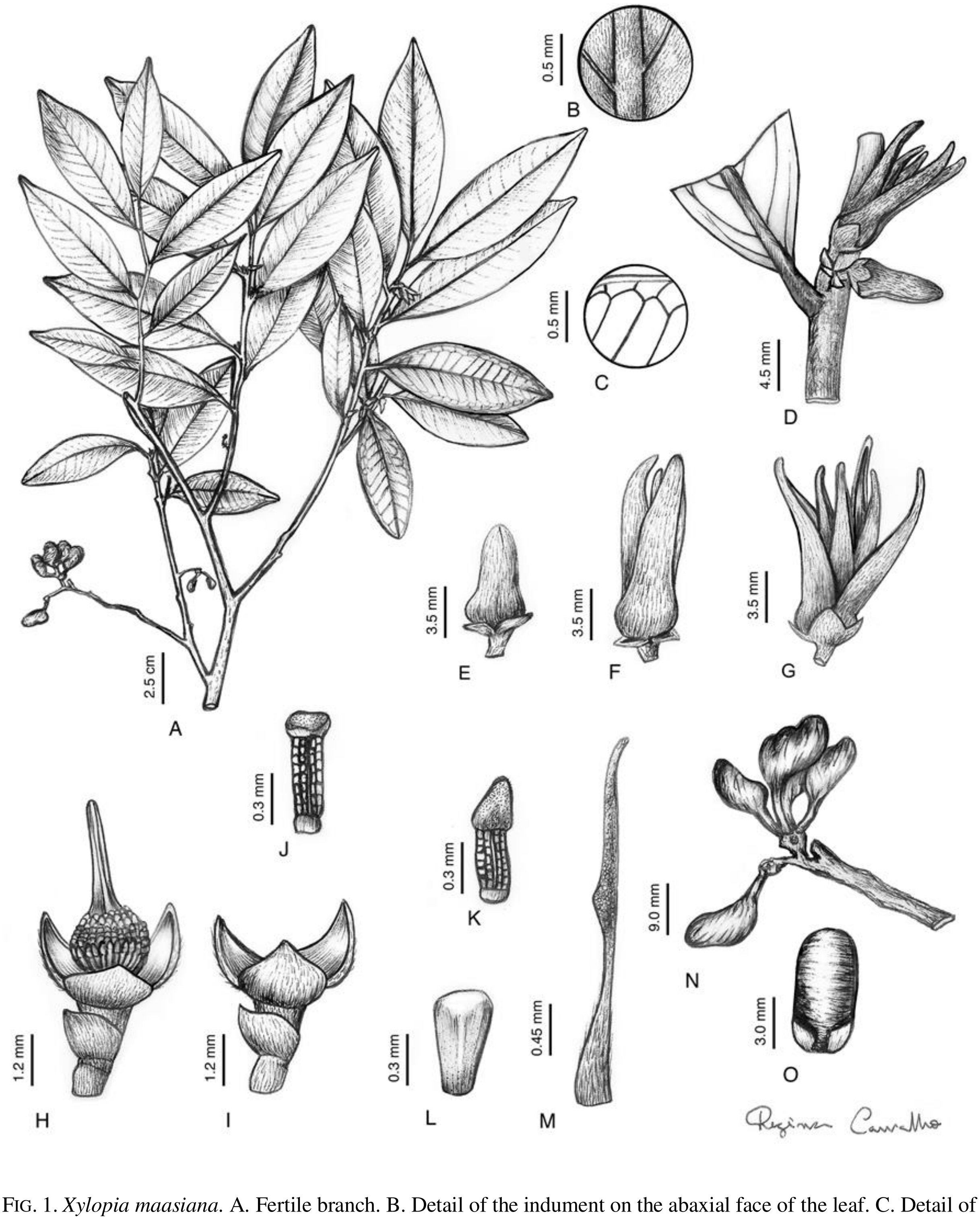

FIG. 1. *Xylopia maasiana*. A. Fertile branch. B. Detail of the indument on the abaxial face of the leaf. C. Detail of the secondary veins and the arcs of the tertiary veins near the leaf margins on the adaxial face. D. Detail of the axillary inflorescence with two flowers. E. Young floral bud. F. Flower at the beginning of anthesis. G. Flower. H. Floral receptacle after removing the outer and inner petals, showing the stamens, staminodes, and carpels (center). I. Calyx with sepals only slightly connate at their base. J. Stamen in frontal view. K. Outer staminode in frontal view. L. Inner staminode. M. Carpel. N. Detail of a portion of a branch with two fruits, one fruit with only a single monocarp and the other with four monocarps. O. Seed with a bilobed aril. (A-K, N, O: from *W. W. Thomas, D. Ackerly & R. P. Lima 3813*; L, M: *B. Dubs 1665*).

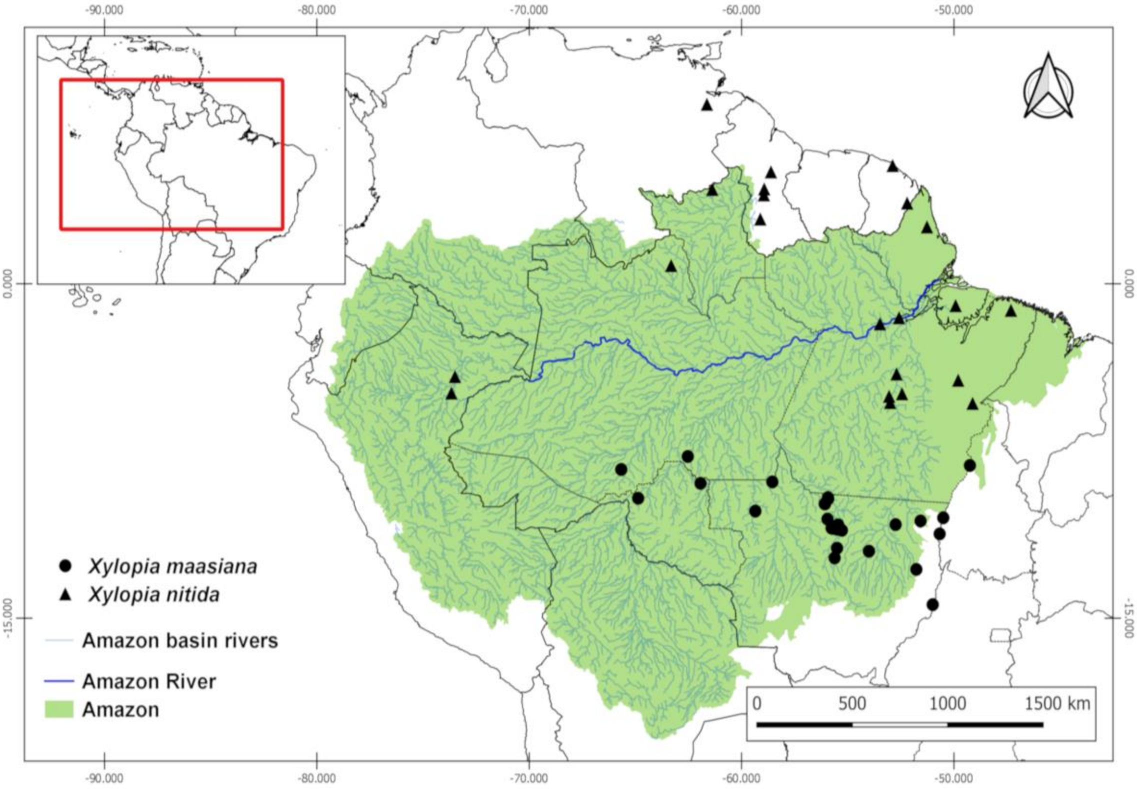

FIG. 2. Geographic distribution map showing the localities of occurrence for *Xylopia maasiana* and *X. nitida*.

3.3 ARTIGO 3 – TAXONOMIC REVISION OF *XYLOPIA* L. (ANNONACEAE) FROM THE AMAZON BASIN[*]

Aline Fernandes Pontes-Pires,[1,2,5] Maria Regina de V. Barbosa,[3] and David M. Johnson[4]

[1] Instituto de Ciências Naturais, Humanas e Sociais, Campus Universitário de Sinop, Universidade Federal de Mato Grosso, Av. Alexandre Ferronato, 1200, Reserva 35, Setor Industrial, 78557-267, Sinop, Mato Grosso, Brazil; afpont@hotmail.com

[2] Programa de Pós-Graduação em Biologia Vegetal, Universidade Federal de Pernambuco, Av. Profº. Moraes Rego s/n, Cidade Universitária, 50670-901, Recife, Pernambuco, Brazil.

[3] Departamento de Sistemática e Ecologia, Universidade Federal da Paraíba, Caixa Postal 5065, Cidade Universitária, 58051-970, João Pessoa, Paraíba, Brazil.

[4] Department of Botany and Microbiology, Ohio Wesleyan University, Delaware, Ohio 43015, USA.

[5] Author for correspondence

3.3.1 Abstract — *Xylopia* is one of the largest genera of Annonaceae and the only pantropical genus within the family. The genus is monophyletic and belongs to the tribe Xylopieae, in the subfamily Annonoideae. *Xylopia* is composed of trees or rarely shrubs, occurring mostly in lowland rainforests across its distribution. *Xylopia* presents numerous stamens with locellate anthers, staminodes and frequently a staminal cone surrounding the ovaries, pollen shed in tetrads or polyads, free carpels, free and dehiscent monocarps, and seeds mostly arillate (always in Neotropics). The genus is currently represented by ca. 55 species in the Neotropics, mostly in the Amazon Basin. A taxonomic revision of the *Xylopia* species from the Amazon Basin is presented here. We recognized 35 species, including one new species. We also designated lectotypes for 18 names, proposed one new combination and one new status, and established ten new synonyms. An identification key, descriptions and taxonomic comments

---

[*] This manuscript will be submitted to Systematic Botany.

for all the accepted species, and nomenclature updates, new taxonomic circumscriptions, distribution maps, pictures and illustrations for some of the species are also presented here.

Keywords— Brazilian Amazon, lectotypification, pantropical genus, *Xylopia frutescens*, *Xylopia pittieri*, *Xylopia* section *Xylopia*.

3.3.2 Introduction

Xylopia is the second largest and only pantropical genus within Annonaceae, comprising 160-180 species that occur mostly in lowland tropical rainforests across this distribution (Johnson & Murray 2018).

In the Neotropics, the genus is currently represented by about 55 species, mostly occurring in the Amazon (Dias 1988, Fries 1930). Maas et al. (2015) listed 33 species of *Xylopia* for Brazil, 27 occurring in the Brazilian Amazon.

Linnaeus (1759) described *Xylopia*, now a "*nomen conservandum*" against *Xylopicrum* P. Browne (1756), mentioning only two species from Jamaica: *X. muricata*, corresponding to one of the species of *Xylopicrum* from Browne (1756); and *X. glabra*, referring to the illustration presented by Plukenet (1691), and the other species cited by Browne (1756). Afterward, Kuntze (1891) proposed new combinations in *Xylopicrum* (Browne 1756), but later the name *Xylopia* was conserved against it. *Xylopia muricata* L., the conserved type species of the genus, had the specimen LINN 1077.1 designated by van Setten and Maas as its lectotype (Jarvis et al. 1993).

During the 18th Century some other Annonaceae generic names were somehow related to *Xylopia*: *Krockeria* and *Bulliarda*, described by Necker in 1790; and *Unona* L.f., published by Linnaeus filius (1782). *Krockeria* was validated with a citation of "*Waria* Aublet". Aublet (1775) quoted *Waria zeylanica* L., a mis-print for *Uvaria zeylanica* L., a plant from Sri Lanka, and he also included under this name material from French Guiana. *Uvaria zeylanica* L. was later incorporated by Lamarck (1785) in his circumscription of *Uvaria aromatica* Lam. (basionym of *Xylopia aromatica* (Lam.) Mart.). But even later, *Uvaria zeylanica* was excluded from the circumscription of *Uvaria aromatica* by Willdenow (1799), who described *Unona concolor* choosing the Guianan material described by Aublet as its type. According to Johnson and Murray (2018), *Bulliarda*, seems to be a superfluous name to *Unona* L.f. (Linnaeus filius 1782), which is corroborated by the description of *Bulliarda* (Necker 1790) as "*baccae, umbelliformes, gibosae, 2-spermae, divergentes*" (our translation: "umbellate, divergent and gibbous fruits, 2-seeded"), characters also present in the original description of *Unona*. Currently, *Unona* L.f. (Linnaeus filius 1782) and *Krockeria* (Necker 1790) are *Xylopia* synonyms.

At the beginning of the 19th Century, in the first monograph of the family, Dunal (1817) recognized eight species of *Xylopia* from tropical America. Among these species, three were new, and were based on the generic name proposed by Linnaeus. *Xylopia* was distinguished by Dunal (1817) mainly by its frequently campanulate calyx, outer petals larger than the inner ones, and short-stipitate compressed monocarps, with only 1–2-seed.

Alphonse de Candolle (1832) extended the circumscription of *Xylopia*, treating ten tropical American species. In the same work, he described the genera, *Habzelia* and *Coelocline*, also related to *Xylopia*. De Candolle (1832) observed the similarities among *Coelocline*, *Habzelia*, *Unona*, and *Xylopia*, but distinguished each of them.

In subsequent important treatments of the genus, it encompassed only American species (Johnson and Murray 2018). Lamarck (1785), however, described *Uvaria aromatica* including African material from what today is *Xylopia aethiopica* (Dunal) A.Rich. (1841, considering the date of publication according to Brizicky (1962)). Therefore, Richard (1841) was the first to include within *Xylopia* species from Africa, changing the concept of the genus to what would become its modern sense (Johnson and Murray 2018). However, Richard (1841) did not accept the genera *Habzelia* and *Coelocline*, and transferred species from these to *Xylopia*. Bentham (1862), Baillon (1864, 1868), and Oliver (1968) accepted his concept and extended this to other African species. Hooker and Thomson (1855, 1872) extended the circumscription of *Xylopia* to include species from Asia. Currently, the pantropical circumscription of *Xylopia* is accepted (Johnson and Murray 2018).

Considering that the major diversity of species of *Xylopia* occurs in the Amazon, about the history of the Amazonian species, Aublet (1775) was the first to describe a species from the Amazon Basin, *X. frutescens*, from French Guiana. Dunal (1817) described three other species from the Amazonian region, *X. ligustrifolia* and *X. salicifolia* Humb. & Bonpl. ex Dunal, from Colombia; and *X. nitida*, from French Guiana.

Martius (1841), in "*Flora Brasiliensis*", recognized eight Brazilian species of *Xylopia*, and two of them, *X. barbata* Hoffmanns. ex Mart. and *X. ligustrifolia* Dunal, were cited as occuring in the Brazilian Amazon. Spruce (1861) described *Xylopia parviflora*, from San Carlos de Río Negro, and *X. spruceana*, from the Casiquiare, both from Venezuela. Sagot

(1881) described *Xylopia nitida* Dunal var. *longifolia*, from French Guiana, this taxon is now *X. cayennensis* Maas. More recently, Dias (1988) cited the species *Xylopia aromatica*, *X. emarginata* Mart., *X. frutescens* Aubl., *X. langsdorffiana* A.St.-Hil. & Tul., *X. ochrantha* Mart., and *X. sericea* A.St.-Hil., as occurring also in the Brazilian Amazon.

There is no comprehensive revision of *Xylopia*. However, several important taxonomic studies within the genus were performed in the 20th Century, mainly by Fries (1900, 1930, 1931, 1934, 1937, 1939, 1959), who eventually recognized a total of 48 neotropical species on these studies. Almost a third of the species accepted here were described by Fries in these works. Fries' studies from 1900, 1930 and 1959 are the most important for understanding the taxonomy and diversity of *Xylopia* in the Neotropics.

Regarding phylogenetic relationships among Annonaceae, *Xylopia* is monophyletic, and together with *Artabotrys* R.Br., belong to the tribe Xylopieae, in the subfamily Annonoideae (Chatrou et al. 2012). The placement of *Artabotrys* as its sister group, was confirmed by Doyle et al. (1998), Richardson et al. (2004), Chatrou et al. (2012), Thomas et al. (2015), and Stull et al. (2017), in their studies based on phylogenies with morphological characters and/or with molecular data using plastid markers.

Recently, however, Couvreur et al. (2019) published the first phylogenetic study based on Next Generation Sequencing (NGS) of a hundred of nuclear loci in Annonaceae, and in their results *Artabotrys* did not emerg as the sister group of *Xylopia*. In their Maximum likelihood tree, *Artabotrys* is grouped in a clade with *Letestudoxa* Pellegr., *Fusaea* Saff., and *Duguetia* A.St.-Hil. (all from tribe Duguetieae), and *Xylopia* alone as sister to this group. So, the relationship between *Artabotrys* and *Xylopia* is still unclear. But Couvreur et al. (2019) also discussed that the tribe Xylopieae had been proposed based on the phylogenetic analysis of eight plastid loci, but without morphological synapomorphies to support this tribe, as also remarked previously by Chatrou et al. (2012). However, Couvreur et al. (2019) stressed the phylogenetic placement of *Artabotrys* needs more careful study, and the taxonomic implications should be re-assessed.

Stull et al. (2017), in the first molecular phylogenetic study carried out specifically with *Xylopia*, adapted the infrageneric classification of the genus proposed by Engler and Diels (1901), and recognized five sections within *Xylopia*: *Ancistropetala, Neoxylopia, Rugosperma*, *Stenoxylopia*, and *Xylopia*, which correspond to the five main groups from their Maximum clade credibility tree of the molecular study based on four plastid loci. However, the group *Xylopia* sect. *Xylopia* (Posterior probability, PP = 0.87, and Bootstrap, BS = 67) recovered by Stull et al. (2017) was weakly supported. But, beyond being based in the results from the molecular phylogeny of the plastid loci, aril types and other seed characters were confirmed as taxonomically important in the genus, and were also used by Stull et al. (2017) to characterize each section. Johnson and Murray (2018) proposed another section, *Xylopia* sect. *Verdcourtia*, and distinguished it from the section *Stenoxylopia* by its cupular aril and floral characters. Therefore, six sections are now recognized within *Xylopia.*

The eight Neotropical species sampled by Stull et al. (2017) emerged, together with four species from Africa and Madagascar, in a single clade classified as *Xylopia* section *Xylopia*. Recently, Pontes-Pires et al. (in preparation, Manuscript 1) performed another molecular phylogenetic study within the genus including 82 accessions from 40 species, of which 67 accessions were from 25 Neotropical species. Their results shown the monophyly of *Xylopia* sect. *Xylopia*, and also the Neotropical and Old World species emerged together in the same clade.

The Neotropical species present remarkable morphological characters, such as the outer and inner petals ovate to linear, with the outer petals a little longer and larger than the inner ones, a staminal cone completely concealing the ovaries; and seeds with a bilobed aril (Stull et al. 2017). Despite that, several species present regional variations that suggest they may constitute groups of related but distinct species, rather than a single one.

Species groups in South American *Xylopia* were noticed by Dias (1988) who recognized a complex including *X. frutescens* Aubl. and *X. sericea*, and another one including *X. laevigata* (Mart.) R.E.Fr., *X. lanceolata* R.E.Fr., *X. langsdorffiana*, and *X. ochrantha*. Other species groups were mentioned by Berry and Johnson (1993), comprising *X. emarginata*, *X. plowmanii* P.E.Berry & D.M.Johnson, *X. spruceana* Benth. ex Spruce and *X. venezuelana* R.E.Fr.; and by Bagstad and Johnson (1999), that cited a group including *X. orinocensis* Bagstad & D.M.Johnson, *X. rigidiflora* Bagstad & D.M.Johnson, and *X. barbata*. All the species mentioned above where studied in the present work, except *X. laevigata*, *X. lanceolata*, and *X. langsdorffiana*, which do not occur in Amazonia Basin.

In the molecular phylogenetic study of Pontes-Pires et al. (in preparation, Manuscript 1) was hypothesized that *X. amoena* R.E.Fr., *X. brasiliensis* Spreng., *X. calophylla* R.E.Fr., *X. micans* R.E.Fr., *X. pittieri* Diels, and *X. pulcherrima* Sandwith, would be a natural group of related species, which we named as the *Xylopia brasiliensis* Complex (Table 1); and also that *X. amazonica* R.E.Fr*.*, *X. densiflora* R.E.Fr., *X. discreta* (L.) Sprague & Hutch., *X. frutescens*, *X. ligustrifolia*, *X. polyantha* R.E.Fr., *X. sericea*, and *X. trichostemon* R.E.Fr. (Table 1), would be another natural group named as the *Xylopia frutescens* Complex. These latter two hypothesized complexes, which include mostly Amazonian species, were chosen for closer taxonomic and molecular phylogenetic evaluation.

Due to the great diversity of Neotropical species in the Amazon Basin we chose these species as the subject of the present revision, aiming to understand the taxonomy and the morphology of the genus in the region, and to contribute to the revision of the Neotropical species.

3.3.3 Materials and Methods

The Amazon Basin was considered according to the regionalization of the Neotropical region presented by Morrone (2014).

We examined ca. 9400 specimens of *Xylopia* from the Neotropics in the following herbaria (Acronyms follow Thiers 2019): CNMT, CVRD, ESA, F, HERBAM, IAC, IAN, INPA, JPB, MBM, MBML, MIRR, MG, MO, NY, OWU, R, RB, SPF, UEC, UFP, UFRR, US, and VIES. Additional dried specimens were also examined through loans from ALCB, BHCB, CEN, EAFM, FUEL, HUEFS, SPSF, TEPB, and UB. Digital images and/or extra data of specimens were consulted from: A, AAU, B, BM, BR, C, CAS, COL, CORD, FI, G, GB, GH, GOET, HAL, HFSL, K, L, LA, LE, LINN, LP, M, MEL, MICH, MPU, P, RON, RSA, S, TCD, U, UC, VEN, W, and WIS.

Eight field trips were carried out in the Brazilian Amazon, in the states of Amapá, Amazonas, Maranhão, Mato Grosso, Pará and Roraima. Five additional field trips were conducted in the extra-Amazonian Brazilian states of Espírito Santo, Goiás, Paraíba, and Rio de Janeiro.

The present study follows the standard methodology used in plant taxonomy. In the taxonomic descriptions, the term calyx tube corresponds to the measurement of the connate part of the sepals. The term stamens includes both fertile stamens and staminodes. The length of monocarps does not include stipe length. General morphological terms were based on Radford et al. (1974), and on van Heusden (1992). Distribution, habitat, habit (height and d.b.h.), phenology, and flower and fruit color data were compiled from herbarium labels. Distribution maps of *Xylopia amazonica* R.E.Fr., *X. annoniflora*, *X. aromatica* (Lam.) Mart., *X. barbata* Hoffmanns. ex Mart., *X. benthamii* R.E.Fr., *X. crinita* R.E.Fr., *X. egleriana* Aristeg. ex Maas, *X. emarginata* Mart., *X. frutescens* Aubl., *X. glomerulosa* D.M.Johnson, N.A.Murray & Pontes-Pires, *X. maasiana* Pontes-Pires, *X. multiflora* R.E.Fr., *X. nervosa* (R.E.Fr.) Maas, *X. nitida* Dunal, and *X. uniflora* R.E.Fr., made using the software Quantum GIS version 2.18.3 (Quantum GIS Development Team 2018), are provided. To make the distribution maps, when coordinates of the specimens were not cited in the herbarium labels, we searched for the coordinates from the locality (when possible) or municipality in "geoLoc", a tool of "*speciesLink*", an information system available from http://splink.cria.org.br.

In the "Specimens Examined" we included all the specimens used to describe the species and one specimen per municipality (or equivalent), state (or department), and country, to cover the species geographic distribution in the Amazon Basin. Specimens with a barcode are indicated by a hyphen between the herbarium acronym and the barcode number, and when the herbarium specimen only had an accession number we used a blank space between the herbarium acronym and the accession number. When the voucher had an accession number and also a barcode, we only cited the barcode number.

We were not able to analyze flowers and/or fruits of the following species, and their descriptions were based on the protologues: *Xylopia annoniflora* Pombo & Zartman, *X. barbata* Hoffmanns. ex Mart., *X. cuspidata* Diels, *X. egleriana* Aristeg. ex Maas, *X. excellens* R.E.Fr., *X. longicuspis* R.E.Fr., *X. parviflora* Spruce, *X. orinocensis* Bagstad & D.M.Johnson, *X. rigidiflora* Bagstad & D.M.Johnson, *X. platypetala* R.E.Fr., *X. surinamensis* R.E.Fr. and *X. xylantha* R.E.Fr.

3.3.4 Results

We recognize 35 species of *Xylopia* in the Amazon Basin, including a new one. From these, 30 are endemic to this region and 14 are rare. The species grow mostly in lowland moist tropical forests, mainly along the rivers. Some occur in open forest or shrub vegetation on white sandy soils, in Peru, or in the Orinoco/Amazonas rivers basins (see Bagstad and Johnson 1999). *Xylopia aromatica, X. emarginata, X. frutescens,* and *X. sericea* are broadly distributed species in the Neotropics. *Xylopia ochrantha* is disjunct between the Amazon and Atlantic coastal forest in Brazil.

The *Xylopia brasiliensis* and *X. frutescens* complexes were not confirmed as complexes of one single broadly variable species, but some taxonomic and phylogenetic related distinct species, as shown in the results of the molecular phylogenetic study conducted by Pontes-Pires et al. (in preparation, Manuscript 1).

Xylopia amoena, X. calophylla, X. micans, X. pulcherrima and *X. pittieri*, previously hypothesized as included in the *X. brasiliensis* Complex (Table 1), are accepted here now as only one distinct species, synomyzed under *X. pittieri,* the oldest name available, as discussed under this species.

Xylopia brasiliensis, an extra-Amazonian species not included in this treatment, was analysed to understand its morphological relationship with *X. pittieri* and *X. ligustrifolia.* It can be distinguished from both latter by its leaf blades 0.6–1.4 mm wide, 80–90 stamens, the fertile ones 0.8–1.1 mm long, and stigmas pubescent from the midpoint to the apex, and glabrous or with less hairs from midpoint to the base.

Xylopia polyantha had its circumscription revised, and *Xylopia densiflora* and *X. polyantha* var. *nicaraguensis* were synonymized under *X. polyantha.*

Furthermore we designated here lectotypes for 18 names, a one new combination and new status was proposed, and ten new synonyms were established.

3.3.5 Taxonomic Treatment

XYLOPIA L., Syst. Nat., ed. 10. 2: 1241, 1250, 1378. 1759, nom. cons. *Xylopicrum* P. Browne, Civ. Nat. Hist. Jamaica 250. tab. 5, fig. 2. 1756, nom. rej. *Xylopicron*, orth. mut., Adanson, Fam. 2: 365. 1763. – TYPE SPECIES: *Xylopia muricata* L., typ. cons. (lectotype, designated by Setten and Maas, Regnum Vegetabile 127: 99, 1993: *Browne s.n.*, LINN 1077.1).

Unona L.f., Suppl. pl. 270. 1782 [“1781”]. *Bulliarda* Necker, Elem. bot. 2: 321. 1790, nom. superfl., non DC., 1801. TYPE SPECIES: *Unona discreta* (L.) L.f.

Krockeria Necker, Elem. bot. 2: 317–318. 1790. TYPE SPECIES: *Unona concolor* Willd. (lectotype, designated by Johnson and Murray 2018).

Coelocline A.DC., Mém. Soc. Phys. Genève 5: 208–209. 1832. TYPE SPECIES: *Coelocline acutiflora* (Dunal) A.DC.

Parartabotrys Miq., Fl. Ned. Ind., Eerste Bijv. 3: 154, 374. 1861 [“1860”]. TYPE SPECIES: *Parartabotrys sumatranus* Miq.

Pseudanona (Baillon) Saff., J. Wash. Acad. Sci. 3: 17. 1913, "*Pseudannona*." *Xylopia* Section *Pseudanona* Baillon, Adansonia 4: 141–142. 1864. TYPE SPECIES: *Pseudanona amplexicaulis* (Lam.) Saff. (lectotype, designated by Safford 1913).

Trees up to 43 m tall, rarely **shrubs**. **Bole** straight, sometimes with buttresses, bark smooth, or wrinkled longitudinally, or rarely scaly, peeling in small strips. Indument of simple hairs. **Twigs** densely or sparsely lenticellate, with densely to sparsely appressed, oblique, or erect, straight or slightly crooked hairs, rarely glabrous, glabrate, pubescent or puberulous since young. **Leaves** simple, alternate, distichous; **petioles** canaliculate, often short, hairs as in the twigs, often glabrous at groove; **leaf blades** elliptic, elliptic lanceolate, oblong, oblong elliptic, lanceolate, less frequently ovate, oblanceolate or obovate, margin entire and flat, rarely slightly undulate close to the margins (only in *Xylopia ligustrifolia*) or revolute, membranous to coriaceous, hairs on abaxial surface as in the twigs, glabrous or with rare hairs on the midrib or close to the petiole on adaxial surface; midrib raised abaxially, sometimes keeled, impressed adaxially, rarelyflat, secondary veins slightly raised on both surfaces, rarely strongly raised abaxially, rarely flat or strongly impressed adaxially, tertiary and quaternary veins sometimes conspicuously raised on both surfaces, apex acuminate, acute, emarginate, retuse, or cuspidate, sometimes with a tuft of hairs at the tip, base acute, cuneate, obtuse, rounded, cordate, asymmetric, or attenuate, and often with oblique angles at both sides close to the petiole. **Inflorescences** 1–22-flowered, rarely composed by small cymes, or occasionally flowers solitary, axillary, sometimes born in older twigs, or cauliflorous; **buds** triangular, oblong, linear, ovoid, or ellipsoid, sometimes slightly panduriform or enlarged at the base; **flowers** bisexual; **bracts** 1–3, mostly one close to the base of the pedicel and other at the midpoint, rarely all close to the base, triangular to ovate, commonly splitted at midpoint, clasping, caducous to persistent, basal bract often caducous, apex acute or with a tiny sharp tip, with appressed, oblique, or erect, straight hairs abaxially, often denser close to the apex, glabrous adaxially, margin sometimes ciliate. **Sepals** 3, slightly connate at the base to up to more than 2/3 of their length, rarely almost completely connate, forming a short or long cup-shaped calyx, calyx smooth or verruculose (in *X. egleriana* Aristeg. ex Maas), calyx tube rim persistent, when calyx lobes are detached (in *X. egleriana*), sepals or calyx lobes triangular to ovate, apex acute or obtuse, with a small sharp point, or acuminate, with densely or sparsely appressed, oblique, or erect, straight hairs abaxially, glabrous to rarely glabrate adaxially, smooth or verruculose (only in *X. egleriana*); **petals** 6, free, in two whorls of three; **outer petals** triangular, linear, linear lanceolate, oblong, elliptic, or ovate, rarely obovate, sometimes narrow, sometimes slightly panduriform, often nearly lanceolatelanceolate, rarely obliquely cut on both sides of the base, sometimes longitudinally keeled abaxially, apex acute, acuminate or slightly rounded, base enlarged or not, concave or flattened, crass to fleshy, often with densely appressed, oblique, or erect, straight hairs abaxially, rarely glabrous, often sparsely pilose and glabrous at the base or papillate adaxially, rarely entirely glabrate to glabrous; **inner petals** often narrower and shorter than the outer petals, oblong, triangular, linear oblong, elliptic, or lanceolate, often linear from midpoint to apex, nearly lanceolate, triangular, tetrangular or rhombic in cross section at midpoint, often longitudinally keeled at one of the surfaces or both, apex acute to acuminate, often enlarged and concave at the base, crass to fleshy, with short or tiny hairs, appressed, oblique, or erect, densely to sparsely abaxially, sparsely pilose to glabrous adaxially; **stamens** 38–350, sometimes hard to differentiate the outer staminodes from the fertile stamens; **fertile stamens** club-shaped, narrowly oblong, narrowly obtriangular, flattened dumbbell-shaped, or spatulate, glabrous, apex of connective capitate, enlarged, angular, truncate, slightly hemispheric, or mushroom-shaped, discoid, papillate, setulose or strigose at the apex, anthers (1–)2–16-locellate, filament oblong or rarely obtriangular; **outer staminodes** similar to fertile stamens in shape, mostly flatter and longer, sometimes curved or falcate, sometimes appressed to the stigmas, glabrous, apex of connective triangular, capitate, or irregular-shaped, sometimes not differentiated, papillate, setulose or strigose at the apex, anthers with less locelli than in the fertile stamens, or without locelli, filament oblong or rarely obtriangular; **inner staminodes** obtriangular, obpyramidal, oblong or square-shaped, mostly shorter and wider than fertile stamens and outer staminodes, glabrous, apex of the connective slightly differentiated, slightly enlarged, or not differentiated, papillate, setulose or strigose at the apex tip, mostly without locellate anthers or with less locelli than in fertile stamens, without filaments; **staminal cone** conical, flattened, urceolate, globose, pyramidal, cupuliform or cylindrical, deeply concave in the center, completely concealing the ovaries, or not, glabrous, or rarely pubescent or tomentose around the circumference, a few times nearly irregularly incomplete at the circumference edges; **carpels** 3–35(–40), ovary obclavate, fusiform, filiform, lanceolate, or slightly falcate, densely sericeous or velutinous, **ovules** 1–8, in a single row, stigmas obclavate, filiform, fusiform, falcate, or linear clavate, geniculate or slightly curved above base, or not, rarely nearly geniculate or enlarged close to the apex, slightly or finely verruculose, entirely glabrous or pilose, or sometimes with hairs concentrated in the apex or from midpoint to apex. **Fruits** of 1–35(–40) monocarps borne on a short **pedicel** and often enlarged **torus**. **Monocarps** ovoid, obovoid, globose, ellipsoid, oblong, reniform, clavate, slightly curved, or falcate, not constricted between seeds, or moniliform to torulose, stipitate or almost sessile, apex rounded, obtuse, acute, acuminate, or cuspidate, sometimes apiculate, smooth, wrinkled, or rugulose when dried, pubescent, glabrate or glabrous, sometimes densely to sparsely pilose; **stipes** wrinkled to rugulose when dried, sparsely pilose to glabrous. **Seeds** 1–7, in a single row, ellipsoid, oblong or obovoid, sometimes flattened, lobes ovoid, nearly circular, semicircular, ellipsoid, rounded, truncate, slightly oblique, or nearly square.

3.3.5.1 Key to the Species of *Xylopia* L. (Annonaceae) from the Amazon Basin

1. Young twigs glabrous, or glabrate, or pubescent, or puberulous..2
  2. Leaf blade with small black dots on both surfaces, visible under light microscope, more conspicuous abaxially, and sometimes, on young leaves..................33. *Xylopia trichostemon*
  2. Leaf blade without small black dots...3
    3. Carpels 20–25, 1.3–1.8 mm long; fruits of 9–17 monocarps…….6. *Xylopia cayennensis*
    3. Carpels 2–10, more than 4 mm long; fruits up to 6 monocarps.......................................4
      4. Petioles 3–4.5 mm long; leaf blades membranous to subcoriaceous, smooth; apex of the connective on fertile stamens papillate, filament 0.2–0.4 mm long..............................5
        5. Leaf blade membranous or subchartaceous; inflorescences 1-flowered; peduncles 2.5–3 mm long; pedicels 5–8 mm long; fruit pedicels 5–8 mm long................................ ....19. *Xylopia nervosa*
        5. Leaf blade chartaceous or subcoriaceous; inflorescences 2(–3)-flowered; peduncles 1–2.2 mm long; pedicels 2.8–4 mm long; fruit pedicels ca. 10 mm long………………... ....27. *Xylopia plowmanii*
      4. Petioles 5–11 mm long; leaf blades chartaceous to coriaceous, scabrous; apex of the connective of fertile stamens short setulose or short strigose at the apex, filament 0.5–0.8 mm long....………………………......…...……………………34. *Xylopia uniflora*

1. Young twigs sericeous, or tomentose, or tomentellous, or villous, or velutinous.................6
  6. Leaf blade up to 16.5 cm long...7

7. Leaf blade with small black dots on both surfaces, visible under light microscope, more conspicuous abaxially, and sometimes, on young leaves................33. *Xylopia trichostemon*

7. Leaf blade without small black dots...8

8. Leaf blade verruculose on the adaxial surface…………………32. *Xylopia surinamensis*

8. Leaf blade smooth on the adaxial surface..9

9. Leaf blades with apex emarginate, retuse, or attenuate to acuminate mostly with a retuse tip……………………………..……………………………..……………10

10. Sepals connate more than ⅓ to ½ of their lenght, forming a short cup-shaped calyx; outer petals long sericeous or velutinous abaxially.................4. *Xylopia barbata*

10. Sepals slightly connate at the base or up to ⅓ of their length, not forming a cup-shaped calyx; outer petals short sericeous abaxially...11

11. Sepals ca. 1.5 mm long; outer petals ca. 5 mm long; fertile stamens ca. 0.5 mm long; carpels 4...23. *Xylopia parviflora*

11. Sepals 2–4 mm long; outer petals more than 12 mm long; fertile stamens 0.7–1.5 mm long; carpels 8–13...12

12. Sepals 2–3 mm long; carpels 3.3–4.2 mm long...............11. *Xylopia emarginata*

12. Sepals 3.5–4 mm long; carpels 4.8–5.3 mm long.............31. *Xylopia spruceana*

9. Leaf blade with apex acute, acuminate, attenuate, cuspidate, or obtuse....................13

13. Buds narrowly triangular, narrowly oblong, or linear..14

14. Sepals slightly connate at the base or up to ⅓ of their length, not forming a cup-shaped calyx...15

15. Outer petals ca. 5 mm long; carpels 4................................23. *Xylopia parviflora*

15. Outer petals 7–19 mm long; carpels 5–10...16

16. Outer petals 7–8 mm long...9. *Xylopia discreta*

16. Outer petals 8.5–19 mm long...17

17. Stamens 38–60……………………..……………………………………..18

18. Leaf blade with margins flat, densely short sericeous on abaxial surface; inflorescences sometimes born in older twigs, (2–)3–9(–20)-flowered; stigmas villous to tomentellous from the apex to the midpoint, hairs crooked and erect, from the midpoint to the base glabrous………………………25. *Xylopia pittieri*

18. Leaf blade slightly undulate close to the margins, sericeous to pubescent on abaxial surface, sometimes sparsely; inflorescences in the midpoint of twigs, or

cauliflorous *in sched.*, mostly 2–flowered, ocasionaly 1–flowered; stigmas sericeous to tomentose from the apex to the midpoint, hairs straight and adpressed less dense from the midpoint to the base……………………………..
……………………….……………………………15. *Xylopia ligustrifolia*

17. Stamens 90–190……….……………………..………..…………….…..…….19

19. Outer petals 8.5–12.5 mm long………..………………..………..….........20

20. Sepals 1.5–2.5 mm long………………..……………………………..21

21. Fruit pedicels ca. 5 mm long; monocarps ovoid or obovoid, clavate, stipitate, not constricted between the seeds, apex rounded, often obliquely apiculate; seeds 5–5.5 × 3.5–4 mm, ellipsoid...............1. *Xylopia amazonica*

21. Fruit pedicels ca. 6.5 mm long; monocarps broad oblong or obovoid, or reniform, slightly falcate, and clavate; or sometimes just obovoid, and clavate, slightly constricted between the seeds, stipitate, apex obtuse; seeds ca. 6.5 × 4.8 mm, flattened ellipsoid to flattened obovoid…………………...
………………………..……………………..…….28. *Xylopia polyantha*

20. Sepals 3–3.5 mm long…………………………..……………………..22

22. Monocarps almost sessile, never falcate; stipes ca. 1 mm long………….
…..………..…………………………...…...........13. *Xylopia frutescens*

22. Monocarps clavate, slightly falcate; stipes 3–3.5 mm long…....................
…………………………………………………...30. *Xylopia sericea*

19. Outer petals 13–19 mm long………..…………………..……..………….23

23. Leaf blade (12.3–)14.5–18.4 cm long, extremely dense sericeous on abaxial surface; inflorescences glomerular, generally congested, (5–)9–22-flowered; monocarps 12–16 mm wide…....................................14. *Xylopia glomerulosa*

23. Leaf blade up to 12 cm long, sericeous or short sericeous on abaxial surface; inflorescences fasciculate, sometimes dense, but never congested, 1–8-flowered; monocarps 4–9 mm wide……………..…………………………....24

24. Monocarp stipes 6–8 mm long; seeds oblong……....17. *Xylopia maasiana*

24. Monocarp stipes 2–5 mm long; seeds ellipsoid, flattened ellipsoid or flattened obovoid…………………………..…………………………….……..25

25. Fruit pedicels ca. 5 mm; monocarps ovoid, apex rounded, often slightly obliquely tiny apiculate; seeds 5–5.5 × 3.5–4 mm, ellipsoid………………... ……………………….…..…………………......……..1. *Xylopia amazonica*

25. Fruit pedicels ca. 6.5 mm; monocarps broad oblong, obovoid, or reniform, slightly falcate, or sometimes obovoid, apex obtuse; seeds ca. 6.5 × 4.8 mm, flattened ellipsoid or flattened obovoid…………………….……. ....28. *Xylopia polyantha*

14. Sepals connate more than ⅓, or close to ½, or more than ½ of their length, forming a cup-shaped calyx..26

26. Carpels 20 or more……………………..……………..……………......27

27. Young twigs villous, often hairs dense, crooked or erect, less frequently rare; inflorescences cauliflorous, or rarely ramiflorous; stamens 325–350; carpels 4.6–7.5 mm long ……………..……………………...…………..5. *Xylopia benthamii*

27. Young twigs tomentose or sericeous, hairs dense, straight, tangled, appressed or oblique; inflorescences axillary, sometimes born in older twigs; stamens 100–290; carpels 1.5–3.5 mm long……..……………………...……..……………...28

28. Leaves short sericeous to tomentellous on the midrib at the base adaxially, midrib raised and half-terete abaxially……………………..3. *Xylopia aromatica*

28. Leaves glabrous adaxially; midrib raised and keeled abaxially……..……..29

29. Leaf blade (1.5–)2.2–3.2 cm wide, apex short acuminate to acute; stamens 170–270; carpels 2.8–3.4 mm long, stigmas tomentellous at the apex……..…………………………………………….……..20. *Xylopia nitida*

29. Leaf blade (4.5–)5.8–8.2 cm wide, apex cuspidate, rarely acute; stamens ca. 100; carpels 1.5–2 mm long, stigmas glabrous……….…18. *Xylopia multiflora*

26. Carpels 4–9……………….…………………………………..……………....30

30. Leaf blade elliptic or elliptic ovate, 2.3–3.8 cm wide, apex cuspidate; outer petals 2.5–4 mm wide at midpoint; carpels 9, ovary ca. 2 mm long………………. ……………………………...…………………………29. *Xylopia rigidiflora*

30. Leaf blade elliptic, oblong, narrowly oblong, narrowly elliptic, narrowly lanceolate, sometimes lanceolate elliptic to lanceolate, 0.8–2.1 cm wide, apex acute, short acuminate, acuminate, obtuse or retuse; outer petals 1–2.2 mm wide at midpoint; carpels 4–5, ovary 0.7–1.2 mm long……………………….…………31

31. Leaves densely velutinous to sericeous on abaxial surface; petals yellow, inner petals ca. 1 mm wide at the midpoint; carpels 5.2–4.8 mm long, ovary 1–1.2 mm long, stigma 4.2–5.6 mm long……………………….4. *Xylopia barbata*

31. Leaves sparsely pubescent, tomentose or velutinous on abaxial surface; petals orange, inner petals 0.5–0.6 mm wide at the midpoint; carpels ca. 4.2 mm long, ovary ca. 0.7 mm long, stigma ca. 3.5 mm long…………………………… …………………………………………………………...22. *Xylopia orinocensis*

13. Buds oblong, oblong ellipsoid, ellipsoid, broad triangular, sligthly obovoid, triangular ovoid, or ovoid..32

32. Buds ellipsoid, slightly obovoid, oblong ellipsoid, or oblong............................33

33. Leaf blade lanceolate elliptic to lanceolate; petioles 2–2.5 mm long; calyx densely tomentose to velutinous abaxially………………………..7. *Xylopia crinita*

33. Leaf blade elliptic or oblong; petioles 3–9 mm long; calyx sericeous abaxially…………………………………………..……………………...….34

34. Leaf blades oblong; inflorescences axillary, sometimes born in older twigs, 1–3-flowered; buds oblong; outer petals 6–9 mm wide at midpoint…………………. ……………………………………….......................…...12. *Xylopia excellens*

34. Leaf blades elliptic; flowers solitary, axillary; buds ellipsoid to slightly obovoid; outer petals 11–12 mm wide at midpoint…………..35. *Xylopia xylantha*

32. Buds triangular, triangular ovoid or ovoid…………..……………………........35

35. Leaf blades sparsely to rarely pubescent to glabrate abaxially............................ …………………………………………………………..24. *Xylopia peruviana*

35. Leaf blades sparsely sericeous, sometimes denser and longer at the midrib abaxially……………………………………..……………………….......36

36. Sepals connate around ½ of their length, forming a cup-shaped calyx, with a persistent calyx rim (when calyx lobes apparently appear to be detached from calyx tube), calyx verruculose; outer petals ca. 10 mm long, 3–4 mm wide at midpoint…………………..…..……………………………..10. *Xylopia egleriana*

36. Sepals connate at base, or around ⅓ of their length, or from ⅓ up to close to ½ of their length, never forming a long cup-shaped calyx, but sometimes forming a calyx tube short and spreading, 2–3 mm long; calyx rim absent, calyx or sepals smooth; outer petals 13–23 mm long, 6–15 mm wide at midpoint…....................37

37. Leaf blades chartaceous; outer petals ca. 13 mm long……………………….. …………………………………………..……………21. *Xylopia ochrantha*

37. Leaf blades membranous or subchartaceous, outer petals 15–23 mm long……………………………………………………………….…………38

38. Inflorescences 1–4-flowered, axillary or cauliflorous; outer petals ca. 15 × 6–8 mm, inner petals 8–12 mm long…………….………..8. *Xylopia cuspidata*

38. Flowers solitary, axillary; outer petals 20–23 × 10–15 mm; inner petals ca. 18 mm long………………………..…………………26. *Xylopia platypetala*

6. Leaf blade more than 16.5 cm long...39

39. Buds narrowly oblong; outer petals 2.2–5.5 mm wide at midpoint…………………..40

40. Leaf blades extremely densely sericeous abaxially; inflorescences glomerular, generally congested, (5–)9–22-flowered; outer petals up to 17 mm long; carpels 4–6; fruits of 4–5 monocarps, pedicels 3–6 mm long; monocarps reniform, or oblong, slightly curved, obliquely clavate, not constricted between seeds, woody, 14–22 × 12–16 mm, pubescent, apex rounded; stipes (1.5–)3–4.5 mm long…………..14. *Xylopia glomerulosa*

40. Leaf blades densely short sericeous abaxially; inflorescences fasciculate, sometimes dense, but never congested, (3–)4–10-flowered; outer petals more than 20 mm long; carpels 20–25(–35); fruits of more than 15 monocarps, pedicels 10–15 mm long; monocarps narrowly oblong, moniliform or torulose, (22–)30–62 × 3–4.5 mm, glabrate to glabrous, apex acuminate to cuspidate; stipes 9–13 mm long...…….18. *Xylopia multiflora*

39. Buds oblong or ovoid; outer petals 6–16 mm wide at midpoint……….........……41

41. Buds oblong; sepals connate in ½ of their length or more, forming a long cup-shaped calyx…………..………..…………………..…..…….…………..12. *Xylopia excellens*

41. Buds ovoid; sepals connate at base, or around ⅓ of their length, or from ⅓ up to close to ½ of their length, never forming a long cup-shaped calyx, but sometimes forming a calyx tube short and spreading, 2–3 mm long…………………………..……..……....42

42. Outer petals ca. 15 mm long; inner petals ca. 12.5 mm long……………………........... …..…………………………………………………………8. *Xylopia cuspidata*

42. Outer petals 20–32 mm long; inner petals 15–23 mm long…….…………………43

43. Cataphylls at twigs apex or close to them associated with young leaves; flower peduncles 1–2 mm long………………………..………………..2. *Xylopia annoniflora*

43. Cataphylls absent; flower peduncles 5–10 mm long……….………………..……....44

44. Leaf blade sparsely sericeous abaxially; flower axillary, flower peduncle ca. 5 mm long; outer petals 20–23 mm long….……………………....26. *Xylopia platypetala*

44. Leaf blade sparsely tomentose abaxially; flowers cauliflorous, flower peduncle ca. 10 mm long; outer petals 28–30 mm long………………...16. *Xylopia longicuspis*

3.3.5.1.1 XYLOPIA AMAZONICA R.E.Fr., Acta Horti Berg. 12(3): 562. 1939. TYPE: BRAZIL. Amazonas: Manaus, loco Estrado do Aleixo, silva non inundabili, blühend, 16 July 1936, *A. Ducke s.n.* (holotype: S-R-6843 (digital image!), isotypes: RB-00534161!, U-0000401 (digital image!)).

Trees 4–35 m tall, d.b.h. 10–51 cm; **bole** with buttresses extending from the base; bark scaly, reddish or reddish brown, peeling in small strips, mainly on young plants. Twigs, petioles, abaxial surfaces of leaves and fruits with white, golden hyaline, rusty hyaline, or brown hairs. Inflorescences and flowers with golden to golden hyaline hairs. **Twigs** lenticellate, grayish brown, tomentose or sericeous, hairs becoming sparse when older. **Petioles** 1.5–4 mm long, canaliculate, dark brown to black, tomentose to sparsely tomentose; **leaf blades** 5.7–8.4 × (0.6–)1.4–2.4 cm, elliptic to elliptic lanceolate, papyraceous to chartaceous, opaque brown and sericeous abaxially, grayish brown and glabrous adaxially, apex acuminate, acumen 7–18 mm long, base acute or cuneate, midrib raised abaxially, impressed adaxially. **Inflorescences** axillary, 1–4-flowered; **pedicels** 1–2 mm long, tomentose or tomentelous; **buds** narrowly triangular; **bract** 1–2, ca. 1 × 2 mm, ovate to triangular ovate, clasping, tomentose abaxially, glabrous adaxially, apex acute. **Sepals** slightly connate at the base, ca. 1.5 × 1.5 mm, ovate to triangular ovate, smooth, glabrous adaxially, sericeous abaxially, apex acute; **petals** white, cream to yellow, or pink (Argent 6778) *in sched.*; **outer petals** 11–15(–16) mm long, ca. 2 mm wide at the midpoint, linear to narrowly triangular, slightly panduriform, slightly fleshy, sericeous abaxially, apex acute; **inner petals** linear to extremely narrowly triangular, (8–)12–14 mm long, 1–1.5 mm wide at the midpoint, fleshy, apex acute; **stamens** ca. 100; **fertile stamens** ca. 80; 0.5–0.9 mm long, nearly club-shaped, glabrous, apex of the connective papillate; **outer staminodes** ca. 12, 0.5–0.7 mm long, nearly club-shaped, glabrous, apex of the connective finely papillate; **inner staminodes**

5–6, glabrous, **carpels** 6–7, ca. 3 mm long, ovary ca. 0.5 mm long, densely sericeous; **ovules** 1–3, stigmas ca. 2.5 mm long, glabrous. **Fruits** of (2–)5–7 monocarps, borne on **pedicels** ca. 5 mm long; **torus** nearly globose. **Monocarps** 6–9 × 4–7 mm, ovoid or obovoid, clavate, apex rounded, often obliquely apiculate, not constricted between the seeds, stipitate, green, green reddish, yellow reddish, green with purplish red blush, and red, slightly wrinkled, glabrate to glabrous; **stipes** (2–)3–5 mm long. **Seeds** 1–3, 5–5.5 × 3.5–4 mm, ellipsoid. Figure 1C.

Illustration— Steyermark et al. (1995: 467, Fig. 391).

Distribution and habitat— *Xylopia amazonica* occurs in Bolivia, Brazil, Suriname and Venezuela, growing in lowland and riverine forests, on sandy or clay soil, flooded or not, and in savannas (*cerrado*) or open vegetation on sandy soils (*campina* and *campinaranas*). In the Brazilian Amazon, it occurs in the states of Acre, Amazonas, Mato Grosso, Pará, Rondônia and Roraima (Figure 2).

Vernacular Names— "*Envira facheiro*" (Brazil, *H. de M. Bastos 44,* RB), "*Envira sarassará*" (Brazil, *J. A. Souza 158*, INPA), "*Envira-vassourinha*", "*Envira-vermelha*" (Brazil, *W. A. Rodrigues 10023,* INPA), "*Envireira-vermelha*" (Brazil, *L. F. Coelho s.n.*, INPA 1729, US), "*Envira preta*" (Brazil, *A. A. Oliveira 142*, NY, US), "*Memiri (grande) (nombre Yekuana)*" (Venezuela, *E. Marin 346*, MO), "*Memidi (nombre Yekuana)*" (Venezuela, *I. Goldstein & L. Salas 275*, MO), "*Palo de bara*" (Venezuela, *B. Stergios et al. 19525*, MO), "*Pindaíba*" (Brazil, *G. C. G. Argent 6778*, RB), "*Pindaíba preta*" (Brazil, *R. M. Harley & R. Souza 10266*, NY), "*Pindaíba vermelha*" (Brazil, *R. R. de Santos & R. Souza 1177*, RB), "*Tëtëmëtsisi Jihui (chacobo name)*" (Bolivia, *B. M. Boom 4936*, NY), "*Vassourinha preta*" (Brazil, *A. Medeiros s.n.*, RB 483171).

Uses— "*Usada em caibros, linhas de construção, etc*" (Our translation: Used as rafters in construction) (Brazil, *L. F. Coelho s.n.*, INPA 1729). "*Wood used in house construction*" (Bolivia, *B. M. Boom 4936*, NY).

Phenology— Specimens with flowers have been collected from July to November, and also in February and May, and specimens with fruits have been collected from November to April, and also in June.

Notes— *Xylopia amazonica* is characterized by its small to medium leaf blades (5.7–8.4 × (0.6–)1.4–2.4 cm), with an acuminate apex (acumen 7–18 mm long), and golden hyaline or brownish sericeous indument on abaxial surface; buds narrowly triangular; sepals slightly connate at the base; petals white, cream, yellow or pink, outer petals 11–15(–16) mm long × ca. 2 mm wide at midpoint, inner petals (10–)12–14 mm long × ca. 1.5 mm wide at midpoint;

fertile stamens ca. 80, 0.5–0.9 mm long; carpels 6–7, ca. 3 mm long; fruits of (2)5–7 monocarps, monocarps 6–9 × 4–7 mm, ovoid or obovoid, clavate, apex rounded, often obliquely apiculate; and stipes (2–)3–5 mm long.

Xylopia amazonica resembles *X. discreta, X. frutescens,* and *X. polyantha*. It can be distinguished from *X. discreta* by its leaf blades 5.7–8.4 × (0.6–)1.4–2.4 cm (vs. 3.2–5.4 × 0.6–1.1 cm), golden hyaline or brown hyaline sericeous indument on the abaxial surface (*vs*. densely silver or pearly sericeous); outer petals 11–15(–16) mm long (*vs*. 7–8 mm), inner petals (10–)12–14 mm long (*vs*. 5–6 mm); monocarps 6–9 × 4–7 mm (*vs*. 12–14 × ca. 7 mm), rugulose when dried (*vs*. wrinkled when dried).

Xylopia amazonica differs from *X. frutescens* by its sepals ca. 1.5 × 1.5 mm long (*vs*. ca. 3 × 2 mm); ovary ca. 0.5 mm long (*vs*. ca. 0.8 mm); fruit pedicels ca. 5 mm long (*vs*. ca. 2 mm); ovoid, clavate, apiculate, stipitate monocarps (*vs*. ellipsoid, obovoid or globose, not apiculate, almost sessile); and stipes (2–)3–5 mm long (*vs*. ca. 1 mm).

In general, all the structures in *X. amazonica* are smaller than in *X. polyantha*, and it can be differentiated from the latter by its fruit pedicels ca. 5 mm long (*vs*. ca. 6.5 mm), monocarps 6–9 × 4–7 mm (*vs*. 9–15 × 7–9 mm), ovoid with a rounded apex, mostly slightly obliquely apiculate, not constricted between the seeds (*vs*. falcate to sometimes ovoid monocarps, with an obtuse apex, slightly constricted between the seeds).

Xylopia amazonica also resembles *X. brasiliensis* Spreng., an extra-Amazonian species not included in this taxonomic treatment, and sterile specimens were frequently misidentified as *X. brasiliensis* in some herbaria. Although both have a reddish or brown-reddish scaly bark, and the shape and size of leaf blades similar, the scaly portion of the bark is a litte smaller in *X. amazonica* (and it is more striking on young specimens). However, *X. amazonica* can be readily distinguished from *X. brasiliensis* by its white, cream, yellow or pink petals (*vs*. red in *X. brasiliensis*), and the ovoid or obovoid monocarps (*vs*. oblong).

***Selected Specimens Examined*— Bolivia.** — PANDO: Maruripi Province, cerca el rio Manuripe, 35 Km al norte de Puerto America, 11°36′01″S, 68°08′55.9″W, 180 m elev., 7 Sep 1995, *A. Jardim 2392* (MO); Madre de Dios Province, Concesión de Mobil Oil, Line 116, 11°50′S, 67°15′W, 170 m elev., 25 Aug 1992, *T. Killeen 4500* (MO). — BENI: Prov. of Vaca Diez, Vicinity of Chácobo village Alto Ivon, 11°45′S, 66°02′W, elevation ca. 200 m, 1 Apr 1984, *B. M. Boom 4936* (NY). — **Brazil.** — ACRE: Rio Cantá, Oct 1951, *G. A. Black 51-13909* (US). — AMAZONAS: 1 km ao Sul da Serra Aracá, no caminho entre a pista de pouso e a encosta, e a 11 km a Leste do rio Jauari, a 40 min apé do acampamento, situado ao pé da encosta da Serra, 0°49′N, 63°19′W, 60 m elev., 8–12 Mar 1984, *W. A. Rodrigues et al. 10619* (IAN, INPA, MO, NY); Estrada Manaus - Caracaraí, km 58, Reserva Biológica INPA - SUFRAMA, Sep 1976, *D. Coêlho & C. Damião 865* (INPA); Manaus, BR-17, km 3, entrada à direita, 26 Aug 1955, *L. F. Coelho s.n.* (IAN 21776, INPA 1729, US); id., Cucuí, Rio Negro, Rio Xié, 30 min. upstream from mouth by motorboat, 0°58′N, 67°10′W, 24 Oct 1987, *D. C. Daly et al. 5461* (F, IAN, INPA, NY, RB); id., Igarapé do Buião, 17 Nov 1960, *W. A. Rodrigues & J. Chagas 1915* (IAN, INPA); id., Ponta Negra, Hotel Tropical, 19 Jul 1977, *W. A. Rodrigues 9995* (INPA); id., Reserva Florestal Ducke, Manaus-Itacoatiara, km 26, 02°53′S, 59°58′W, 18 Jul 1997, *R. C. Forzza 296* (INPA); ibid., Igarapé do Acará, 31 Aug 1995, *J. E. L. S Ribeiro et al. 1674* (IAN, INPA, MG, US); Presidente Figueiredo, REBIO Uatumã, entorno, ilha na Represa Uatumã, 10 km para Noroeste da Base WABA, 1°00′S, 59°00′W, 6 Aug 2006, *C. E. Zartman et al. 5924* (INPA); Rio Cuieras, 2 km below mouth of rio Brancinho, 12 Sep 1973, *G. T. Prance et al. 17842* (IAN, INPA, MO, NY, US); Rio Negro, rio Juauperi, Estirão Tacuera, 18 Fev 1977, *M. R. Santos 38* (IAN, MO, NY). — MATO GROSSO: Gaúcha do Norte, 13°09′96″S, 53°15′06″W, 25 Mar 1997, *F. R. Dário et al. 1028* (ESA, SPF); Nobres [Sorriso], 1.5–2 km E of BR-163, 18 km S of Rio Celeste, ca. 70 km S of Sinop, 12°27′S, 55°40′W, 19 Sep 1985, *W. W. Thomas et al. 3873* (IAN, INPA, MO, NY, US); Nova Ubiratã, local do levantamento fitossociológico, 13°01′12″S, 55°09′67″W, 2 May 1997, *A. G. Nave et al. 1370* (ESA, SPF); Novo Mundo, Parque Estadual Cristalino, limite Nordeste do parque, leste do Olho da Xuxa, 9°34′56.2″S, 55°12′07.3″W, 341 m elev., 21 Aug 2008, *D. Sasaki et al. 2328* (MO); ca. 50 km N of the Base Camp of the Expedition on the Xavantina – São Félix road, Base Camp, 12°54′S, 51°52′W, 7 Apr 1968, *J. A. Ratter et al. 875* (IAN, NY, RB); Serra do Roncador, track to Garapu to rio Sete Setembro, 29 Sep 1964, *G. T. Prance et al. 59162* (F, NY, US); São Félix do Araguaia, área da Faz. Jamaica, 28 km S do cruzamento das estr. BR-158 e MT-242, Posto da Mata, 11°–12°S, 51°–52°W, 16 Oct 1985, *C. A. Cid Ferreira et al. 6489* (F, IAN, INPA, NY); Sinop, BR-080, a 142 km da BR-163, estr. da Faz. Flor da Mata, km 04, 10°40′S, 53°55′W, 3 Oct 1985, *C. A. Cid Ferreira et al. 6317* (IAN, INPA, MO, NY, US). — PARÁ: Oriximiná, rio Mapuera margem esquerda, a 1 km da margem, acima do acampamento Mapium, 01°09′S, 57°13′W, 19 Aug 1986, *C. A. Cid Ferreira et al. 7861* (F, IAN, INPA, MO, NY, US); [Prainha], rio Curuatinga, Planalto de Santarém, 11 Mar 1955, *R. L. Fróes 31645* (RB); Santarém, Curua-Una, estrada do Franco, 30 Jan 1979, *M. R. Santos 607* (HAMAB, NY); Serra do Cachimbo, km 854, 490 m elev., 8 Nov 1977, *G. T. Prance et al. P25067* (IAN, MO, NY, RB, US); Terra Santa, Igarapé Xingú, Feb 2009, *A. Medeiros s.n.* (RB 483171). — RONDÔNIA: Costa Marques, a 10 km da cidade de Costa Marques, 10°22′S, 64°12′W, 29 Apr 1987, *C. A. Cid Ferreira et al. 8719* (MO, US); Near BR-364, 85 km from Vilhena toward Guaporé, 9 Nov 1979, *B. W. Nelson et al. 392* (F, IAN, INPA, MO, NY, RB, US); Porto Velho, Serra do Balateiro a 07 km da Vila Campo Novo, 10°35′S, 63°39′W, 24 Apr 1987, *C. A. Cid Ferreira et al. 8923* (INPA); Vilhena, estrada velha para Colorado do Oeste, a 20 km de Vilhena, Serra dos Parecis, 13 May 1984, *J. U. Santos et al. 858* (IAN). — RORAIMA: Boa Vista – Caracaraí road, BR-174, 68 km S of Boa Vista, 31 Jan 1969, *G. T. Prance et al. 9534* (IAN, INPA, MO, NY, US); Caracaraí, próximo à Vila de Caucubi, 01°01′43″S, 61°05′21″W, 17 Feb 2004, *J. G. Soler & E. F. Barbosa 40* (IAN, RB). — **Suriname.** — Tafelberg, Table Mountain, km 22, 420 feet, 21 Sep 1944, *B. Maguire 24818* (F, MO, NY, RB, US); Lucie Rivier, 3°20′N, 56°49′W – 3°32′N, 56°26′W, 2 km below confluence of Oost Rivier, 225 m elev., 6 Sep 1963, *H. S. Irwin et al. 55410* (MO, NY); Zuid Rivier, 2 km of confluence with Lucie Rivier, 3°20′N, 46°49′W – 3°10′N, 46°29′W, 220 m elev., 18 Sep 1963, *H. S. Irwin et al. 55845* (F, MO, NY, US). — **Venezuela.** — AMAZONAS: Cerro Duida, forest at base of South-eastern slopes along Caño Negro (tributary Caño Iguapo), altitude 260 m, 28–29 Aug 1944, *J. A. Steyermark* 58068 (F); Depto. Atabapo, 5 km desde la desembocadura del rio Padamo em el Orinoco (planície), 02°40′N, 65°13′W, 170 m elev., Mar 1990, *E. Marín 897* (MO); Depto. Atabapo, base of slope of Duida near Culebra on Río Cunucunuma, 3°44′N, 65°44′W, 210 m elev., 23 Feb 1985, *R. L. Liesner 17839* (F, MO); Depto. Rio Negro, rio Casiquiare, Sector "El Pijiguao", 3 km al S del El Porvenir, 2°2′N, 66°28′W, 132 m elev., 2 Feb 1992, *G. Aymard et al. 9938* (MO); Municipio Rio Negro, 01°37′N, 64°33′W, 488 m elev., Nov 1992, *A. Valera 118* (MO); Misíon río Mavaca, 1°58′N, 65°6′W, entre 200–230 m elev., 3 Feb 1991, *B. Stergios & M. Yánez 15127* (MO); Sector das Carmelitas del Medio Ventuari, 766232 E, 4584797 N, 100 m elev., Mar 2002, *B. Stergios et al. 19525* (MO). — BOLIVAR: Municipio Aripao, río Yudi, Helipuerto 10, 05°27′N, 64°49′W, 280 m elev., May 1989, *E. Marín 346* (MO, US); Río Tabaro, Campamento Dedemai, Cuadrícula de investigación, 6°21′N, 64°59′W, 22 May 1992, *I. Goldstein & L. Salas 275* (MO) — ZULIA: Aricuiza, 7 Nov 1979, *Veillon 100* (US); Distrito Cólon, 3 km E of the río de Oro settlement on the río de Oro, ca. 9°18′N, 72°28′W, 100–250 m elev., 26–28 Jun 1980, *G. Davidse et al. 18619* (MO, NY); Dtto. Perijá, alrededores de la Estación Hidrológica Aricuaisá-Pie de Monte, 9°35′30″N, 72°53′55″W, 100–250 m elev., 1–3 May 1982, *B. S. Bunting et al. 11505* (NY).

3.3.5.1.2 XYLOPIA ANNONIFLORA Pombo & Zartman, Phytotaxa 317(2): 131–136. 2017. TYPE: BRAZIL. Amazonas: Municipality Presidente Figueiredo, Balbina Village, Uatumã Biological Reserve, Fuzarca Island, 1°50′10.88″S, 59°82′25.99″W, 78 m, 26 Aug 2015, *M. Pombo et al. 667* (fl., fr.) (holotype: INPA).

Trees 2–5 m or **shrubs** up to 1 m tall, d.b.h. 3–5 cm. Twigs, petioles and abaxial surfaces of leaves with long and erect to oblique hairs. Twigs with golden to rusty hairs. Petioles, abaxial surfaces of leaves, inflorescences, flowers and fruits with golden hairs. Cataphylls present at the twigs apex or close to them, associated with young leaves. **Twigs** dark brown with yellow to pale brown, or beige lenticels, velutinous to villous, becoming glabrate when older; 3–5 mm long, triangular, rusty simple adpressed hairs abaxially. **Petioles** (1–)4–6(–10) mm, canaliculate, dark brown, velutinous; **leaf blades** 16.5–24.5(–29) × 3.4–7.6(–8.6) cm, oblong to elliptic, papyraceous to subchartaceous, sparsely to rarely velutinous abaxially, glabrous adaxially, apex acuminate, less frequently cuspidate, acumen or cusp 5–15 mm long, base rounded and asymmetric, midrib raised abaxially, impressed adaxially; secondary veins (8–)14–16(–17) pairs, strongly impressed adaxially, raised abaxially. **Flowers** solitary, axillary or cauliflorous (*C. A. Cid Ferreira et al. 795*, INPA); **peduncles** 1–2 mm long, velutinous; **buds** ovoid; **bracts** 1–2, 7 × 4 mm, triangular, brown. **Sepals** connate at the base, 12–14 × 4–8 mm, triangular, smooth, velutinous, with hairs abaxially; **petals** white *in vivo*, **outer petals** 21–28 mm long, 2–7 mm wide at base, 15–16 mm at midpoint, ovate, slightly concave, velutinuous abaxially, apex rounded; **inner petals** 15–26 mm long, 1–3 mm wide at the base, 9–12 mm wide at midpoint, elliptic, concave, velutinous abaxially, apex acute; **stamens** 200–250, **fertile stamens** ca. 3 mm long, spatulate, apex of the connective capitate 1–2 mm long, papillate, anthers 8–10-locellate, filaments 1–2 mm long; **staminodes** 25–30; **outer staminodes** ca. 3 mm long, clavate, flattened, apex of the connective capitate, 1–2 mm long, papillate; **inner staminodes** ca. 3 mm long, clavate, flattened, apex of the connective capitate, 1–2 mm long, papillate; **carpels** 20–21, 7–12 mm long; ovary 1–3 mm long, lanceolate, densely velutinous, **ovules** 1–2; stigmas 6–9 mm long, falciform, with simple hairs. **Fruits** of (9–)21 monocarps. **Monocarps** (15–)20–30 × 9–18 mm, flattened obliquely clavate, sometimes nearly reniform, nearly rhombic apex obtuse or rounded, tiny apiculate, apiculus ca. 1 mm long, whitish green *in vivo*, sparse to rare erect simple hairs present to glabrous; **stipes** (1–)2–2.5 × 1–1.5 mm, rarely covered with simple trichomes to glabrous, slightly and finely verruculose. **Seeds** 1–2, (10–)12–15 × 5–6 mm ellipsoid to oblong, dark-brown to black, aril white *in vivo*, yellowish and translucent *in sicco*, lobes 1–1.5(–4) × 2–2.5 mm, ovoid.

Additional Illustration**—** Pombo *et al.* (2017: 134, Fig. 3 A–F).

Distribution and habitat**—** This species is known only by six specimens, five collected in islands at the of Uatumã Biological Reserve (REBIO), in the municipality of President Figueiredo, Amazonas, Brazil (Figure 3). According to Pombo *et al.* (2017) these islands are remnants of hilltops flooded during the construction of the Balbina Dam in 1985. Only one specimen (*C. A. Cid Ferreira et al. 795*), mentioned here for the first time as belonging to this species, was collected before the construction of the Dam.

Phenology**—** Specimens with flowers and fruits have been collected in August.

Notes**—** The remarkable characters of *Xylopia annoniflora* are the cataphylls present at the twigs apex or close to; the larger leaves (16.5–24.5(–29) mm long) with strongly impressed secondary veins on the adaxial surface; the ovoid buds, the ovate and concave outer petals, and falcate and pilose stigmas.

Despite the protologue mentioning that the holotype and other five specimens (paratypes) of *X. annoniflora* were at INPA, we could not find them and examined only the one specimen cited above. So, in the description we used flower characters from the original description.

Xylopia annoniflora seems *X. cuspidata* Diels, *X. longicuspis* R.E.Fr. and *X. platypetala* R.E.Fr. Nevertheless, the cataphylls described for *X. annoniflora* are not mentioned in the original descriptions of *X. cuspidata*, *X. longicuspis* and *X. platypetala* (Fries 1934), and were not observed on the type specimens of either species. The fruits and seeds of *X. cuspidata*, *X. longicuspis*, and *X. platypetala* were unknown at the time of the original description and the latter two remain unknown.

However, *Xylopia annoniflora* can be distinguished from *X. cuspidata* by its velutinous to villous young twigs (*vs*. sericeous to tomentose), with cataphylls (*vs*. cataphylls absent); leaf blades with an acuminate apex (*vs*. cuspidate), and rounded and asymmetric base (*vs*. cuneate to acute), sparsely to rarely velutinous (*vs*. short sericeous, denser and longer at midrib); fertile stamens with 8–10-locellate anthers (*vs*. 12–14-locellate); and falciform stigmas (*vs*. filiform), with simple hairs (*vs*. glabrous).

Xylopia annoniflora differs from *X. longicuspis* by its papyraceous to subchartaceous leaf blades (*vs*. membranous), sparsely to rarely velutinous abaxially (*vs*. sparsely tomentose), with acuminate apex (*vs*. cuspidate), acumen 5–15 mm long (*vs*. cusp 20–50 mm long), rounded and asymmetric base (*vs*. obtuse to broad cuneate); pedicels 1–2 mm long (*vs*. 10 mm long, according to Fries 1934), fertile stamens ca. 3 mm long (*vs*. ca. 3.5 mm long); and pilose stigmas (Pombo *et al.* 2017) (*vs*. almost glabrous stigmas, according to Fries 1934).

Xylopia annoniflora can also be distinguished from *X. platypetala* by its leaf blades sparsely to rarely velutinous abaxially (*vs*. sparsely sericeous, with denser, longer and darker hairs at midrib), with acumen 5–15 mm long (*vs*. acumen or cusp 20–27 mm long), rounded and asymmetric base (*vs*. broad cuneate, sometimes with oblique angles at both sides); and peduncles 1–2 mm long (Pombo et al. 2017) (*vs*. 5 mm long, Fries 1934).

Specimen Examined— **Brazil.** — AMAZONAS: Presidente Figueiredo, Rio Uatumã, lado direito, perto do rio Pitinga, 25 Aug 1979, *C. A. Cid Ferreira et al. 795* (INPA).

3.3.5.1.3 XYLOPIA AROMATICA (Lam.) Mart., Fl. bras. 13(1): 43. 1841. *Uvaria aromatica* Lam., Encycl. 1: 596. 1785. *Unona aromatica* (Lam.) Dunal. Monogr. Anonac. 112. 1817. *Habzelia aromatica* (Lam.) DC. Mém. Anon. 208. 1832. *Xylopicrum aromaticum* (Lam.) Kuntze, Rev. Gen. Pl. 1: 8.1891. TYPE: [PERU] PÉROU. *J. Jussieu s.n.* (lectotype, designated by Fries 1930: P-00673544).

Unona lucida DC. ex Dunal, Monogr. Anonac. 116. 1817. *Coelocline lucida* (DC. ex Dunal) A. DC., Mém. Anon. 209. 1832. *Xylopia lucida* (DC. ex Dunal) Baill. Hist. Pl. (Baillon) 1: 278. 1868. TYPE: [PERU]. Hab. in Peruvia, *J. Jussieu s.n.* (holotype: P-00673544 (digital image!)).

Unona xylopioides Dunal, Monogr. Anonac. 117. t. 21. 1817. *Xylopia longifolia* A.DC., Mém. Anon. 210. 1832. nom superf. *Xylopicrum longifolium* (A.DC.) Kuntze, Rev. Gen. Pl. 1: 8. 1891. *Xylopia xylopioides* (Dunal) Standl. J. Wash. Acad. Sci. 15: 285. 1925. TYPE: [Orinoco] Hab. ad Orenocum [Maypure], *A. von Humboldt & A. J. A. Bonpland s.n.* [894] (holotype: P-00322483 (digital image!), isotypes: B-W10393010 (digital image!), B-W10393020 (digital image!), B-W10393030 (digital image!), HAL-098071 (digital image!)).

Xylopia grandiflora A. St.-Hil., Fl. Bras. Merid. 1: 40. t. 8. 1825. *Xylopicrum grandiflorum* (A. St.-Hil.) Kuntze, Rev. Gen. Pl. 1: 8. 1891. TYPE: [BRAZIL]. Inveni in sylvis primaevis provinciae Rio de Janeiro, florebat Februario, *Anonymous collector s.n.* [*A. F. C. P. de Saint-Hilaire s. n.*] (holotype: P-00734902 (digital image!)).

Xylopia cubensis A.Rich., Hist. Phys. Cuba, Pl. Vasc. 36. t. 6. 1841 ["1845"]. TYPE: [CUBA]. [Florebat a Junio ad Septembrem], *R. de la Sagra s. n.* (lectotype, here designated: P-00734897 (digital image!)).

Trees 3–20 m tall **and shrubs** up to 1.5 m or, d.b.h. 6–25 cm; **bole** with bark wrinkled longitudinally. Twigs, petioles, buds and fruits with golden, golden hyaline, to pale rusty hairs. Abaxial surfaces of leaves and flowers with golden to golden hyaline hairs. **Twigs** brown, pale brown and grayish brown and becoming grayish brown and dark brown when older, generally with beige or grayish lenticels, but sometimes it is difficult to observe the lenticels because of the dense indumentum, densely to sparsely tomentose, less frequently glabrate to glabrous when mature. **Petioles** 3–6(–7.5) mm long, canaliculate, dark brown, densely tomentose; **leaf blades** 4.7–13.5(–16.5) × 1.7–4.5(–6.5) cm, elliptic lanceolate, elliptic, narrowly elliptic or lanceolate, chartaceous to coriaceous, translucent glands present, grayish green, or greenish brown, or pale brown, or brown on both surfaces, tomentose or sericeous abaxially, rarely glabrous, hairs denser at the midrib and on young leaves, short sericeous to tomentellous on the midrib at the base adaxially, apex acute to short acuminate, acumen 4–5 mm long, base obtuse, rounded, slightly asymmetric, or slightly truncate with oblique angles at both sides of base, midrib raised and hemi-terete abaxially, impressed adaxially, secondary veins (9–)11–15(–17) pairs. **Inflorescences** axillary, sometimes born in older twigs, 1–5-flowered; **peduncles** 1.5–2.5 mm long, tomentellous to tomentose; **pedicels** 2–3(–4) mm long, tomentellous to tomentose; **buds** narrowly triangular, narrowly pyramidal, or narrowly oblong; **bracts** 1–2, sometimes caducous, 2.5–3 × 4–6 mm, ovate, often tearing irregularly, clasping, sericeous abaxially, glabrous adaxially, mainly close to the apex, apex acute. **Calyx** cup-shaped, smooth, calyx tube 2–2.5 mm long, **sepals** connate from ½ of their length to more, calyx lobes 1.5–2 × 4–5 mm, broadly ovate, sericeous to tomentellous abaxially, glabrous adaxially, apex acute; **outer petals** 25–35(–48) mm long, 3–7 mm wide at midpoint, narrowly triangular or linear from the apex to the midpoint, nearly lanceolate, fleshy, rusty to reddish abaxially and white adaxially *in vivo*, densely sericeous abaxially, tomentellous with base glabrous adaxially, apex acute; **inner petals** 20–35(–40) mm long, 1–3(–3.5) mm wide at the midpoint, linear, nearly narrowly lanceolate, triangular in cross-section, fleshy, white *in vivo*, tomentellous with base glabrous on both surfaces, apex acute to acuminate; **stamens** 230–290, hard to differentiate outer and inner staminodes; **fertile stamens** 0.8–1.1 mm long, nearly oblong to club-shaped, glabrous, apex of connective papillate, anthers 11–13-locellate; **outer staminodes** (25–)40–60, 0.8–1.2 mm long, nearly oblong to club-shaped, flattened, glabrous; **inner staminodes** 30–40, 0.7–1.1 mm long,; **staminal cone** 1.5–3 mm in diameter, 1–1.5 mm high; **carpels** 20–35, 2–3.5 mm long, ovary 1–1.5 mm long, nearly obclavate to lanceoloid, densely sericeous; **ovules** 3–8, stigmas 1–2 mm long, nearly fusiform, sometimes geniculated or dilated close to the apex, glabrous or with rare hairs in the apex. **Fruits of** 10–35 monocarps borne on a **pedicel** 10–12 mm long. **Monocarps** 14–21 × 5–8 mm, oblong to narrowly oblong, moniliform to torulose, apex rounded, generally tiny apiculate, apiculus 1(–2) mm long, greenish red, red to reddish *in vivo*, wrinkled when dried, with rare hairs to glabrate abaxially; **stipes** 7–8 mm long, glabrate or glabrous, slightly wrinkled. **Seeds** 2–6, 7.5–8 × 4–5 mm, flattened ellipsoid, aril white *in vivo*, lobes ca. 2 × 3 mm. Figures 1D, 4A, 5A-H.

Distribution and habitat**—** *Xylopia aromatica* is the most common Annonaceae in the Neotropics (Maas et al. 2002). It occurs in South America (Bolivia, Brazil, Colombia, French Guiana, Guyana, Paraguay, Peru, Suriname, and Venezuela), Central America (Costa Rica, Honduras, Nicaragua, and Panama), and in the Caribbean (Cuba, and Trinidad) (Figure 6).

In the Brazilian Amazon, *X. aromatica* inhabitats the states of: Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, and Tocantins. It also occurs in the states of Bahia, Goiás, Mato Grosso do Sul, Minas Gerais, Paraná, Piauí, Rio de Janeiro (only the type of *X. grandiflora* A. St.-Hil.), São Paulo, and in the Federal District. It is the most widely distributed *Xylopia* in Brazil and one of the best known species within Annonaceae in the country.

Besides the lowland forest in the Amazon, in the same region, *Xylopia aromatica* also occurs in flooded riverine vegetation (*igarapés* and *restingas*) (Dias 1988), in open vegetation on sandy soil (*campinarana*), and in the vegetation on ferrous rock outcrops at Serra dos Carajás (*canga*), Pará, Brazil (Lobão 2016). It also occurs in the savanna in Central Brazil (*cerrado*), and in the Atlantic Forest, and in the ecotone zones between both, being very common in disturbed vegetation, along roadsides, as for example, along BR-163, from Cuiabá to Nova Mutum, in the state of Mato Grosso.

Vernacular Names**—** "*Chirinyo ipipin*" (Venezuela, *B. Boom & M. Grillo 6279*, MO), "*Copillo*" (Colombia, *R. Romero-Castañeda 8347*, MO), "*Envira*" (Brazil, Pará, *E. Soares 198*, MBM), "*Fruta de burro*" (Venezuela, *E. L. Little Jr. 17585*, MO; Venezuela, *B. Trujillo*

& J. Pulido 15416, MO), "*Fruto de burro*" (Venezuela, *W. Diaz & L. Delgado 669*, MO), "*Laurel*" (Bolivia, *M. Saldias & J. C. Cornejo 1062*, NY), "*Malagueto*" (Panama, *J. H. Howell 49*, MO), "*Piraquina*" (Bolivia, *R. Guillén & R. Choré 3589*, NY, MO).

Uses— "*Madera de construccíon y corteza para amarrar*" (Our translation: Wood used in construction and bark for tying) (Bolivia, *I. G. Vargas C. et al. 2793*, NY).

Phenology— Specimens collected with flowers and fruits throughout the year.

Notes— *Xylopia aromatica* is characterized by its densely tomentose to tomentose young twigs; sericeous to tomentose leaf blades abaxially; narrowly triangular, narrowly pyramidal or narrowly oblong buds; cup-shaped calyx, calyx tube 2–2.5 mm long, calyx lobes 1.5–2 mm; outer petals 25–35(–48) mm long, 3–7 mm wide at midpoint, inner petals 20–35(–40) mm long, 1–3(–3.5) mm wide at the midpoint; 230–290 stamens, fertile stamens 0.8–1.1 mm long; 20–35 carpels, 2–3.5 mm long; 10–35 monocarps, 14–21 × 5–8 mm, oblong to narrowly oblong, moniliform to torulose, stipitate, apex rounded, generally tiny apiculate, wrinkled when dried, with rare hairs to glabrate abaxially.

Xylopia aromatica is morphologically similar to *X. cayennensis* Maas, but it can be distinguished by its densely tomentose to tomentose young twigs (*vs*. glabrate to glabrous, rarely pubescent to puberulent); sericeous to tomentose leaf blades abaxially (*vs*. mostly glabrate to glabrous, sometimes pubescent, puberulent or sparsely short sericeous); with obtuse, rounded, slightly asymmetric, or slightly truncate leaf base, with oblique angles laterally located at base close to the petiole (*vs*. acute to cuneate); outer petals 25–35(–48) mm long (*vs*. 15–22 mm long), inner petals 20–35(–40) mm long (*vs*. 11–16 mm long); and moniliform or torulose monocarps in general, less woody and slightly wrinkled when dried (*vs*. not constricted between the seeds, more woody and smooth when dried).

Xylopia aromatica is also similar to *X. surinamensis*, but *X. aromatica* differs from *X. surinamensis* by its smooth leaf blades (*vs*. verruculose); outer petals 25–35(–48) mm long (*vs*. 13–15 mm), 3–7 mm wide at midpoint (*vs*. ca. 2 mm), inner petals 20–35(–40) mm long (*vs*. 12–13 mm); stamens length 0.8–1.1 mm long (*vs*. 1.2–1.5 mm); fruit pedicels 10–12 mm long (*vs*. ca. 20 mm); and stipes 7–8 mm long (*vs*. 9–10 mm).

Xylopia aromatica was cited in "*Flora Brasiliensis*" (Martius 1841) in a note printed in smaller font after the citation of *Xylopia ochrantha* Mart., and that was understood by Dias (1988) as a footnote comment for *X. ochrantha*. Fries (1930) interpreted this quotation from Martius (1841) as a new combination and included the species in his revision of Annonaceae from the New World. We agree with Fries (1930), after the name *X. aromatica*, there is a cross and this sign was used by Martius (1841) to indicate new taxa in the text. So, we suppose the name was only accidentally printed with small size letters in the publication.

Fries (1930) cited the specimen P-00673544 as the type species of *X. aromatica* and we considered it the lectotype.

In the protologue of *Xylopia cubensis,* A. Richard (1841) mentioned that this species grew in two localities in Cuba, Vuelta del Abajo and Pinos Island, but we only found one specimen of Ramon de la Sagra, from Richard Herbarium, now at P (P-00734897), which one of the labels has the information: "*Xylopia cubensis Nob., Fl. Cuba, Ramon de la Sagra*". Therefore, it was chosen here as the lectotype because it matches the original description, and it is similar to the illustration showed by A. Richard (1841) in Tab. VI.

Selected Specimens Examined— **Bolivia.** — BENI: Mamore, 1 mi. SW San Joaquin, 19 Mar 1964, *E. L. Tyson & M. Kuns 1001* (MO). LA PAZ: Prov. Abel Iturralde, Luisita, sabana húmeda, W del Río Beni, 13°05′S, 67°15′W, 180 m [elev.], 22 Feb 1984, *S. G. Beck & R. Haase 9924* (NY); Prov. Abel Iturralde, Parque Nacional Madidi, Rio Health, 13°02′03″S, 68°50′34″W, 170–180 m [elev.], 6 Sep 2004, *A. Araujo M. et al. 906* (NY); Prov. Itenez, Serranía San Simón, 14°25′S, 62°03′W, 200 m [elev.], *R. Quevedo et al. 919* (MO); Prov. Larecaja, 3.2 Km al SO de Tipuani por el caminho a Unutuluni, 15°35′S, 68°00′W, 700 m [elev.], 24 Jan 1988, *J. C. Solomon 17719* (NY); Mapiri, Apr 1886, *H. H. Rusby 1225* (NY). — SANTA CRUZ: Abel Iturralde, Puerto Muscoso, donde llega la pampa nas cercas del Río Heath, 13°1′S, 68°50′W, 190 m elev., 25 Jul 1995, *N. Helme & L. Kruger 844* (MO); Cerro de Santiago, near Santiago, 18°20′S, 59°39′W, 750 m elev., 17 May 1991, *A. Gentry et al. 74058* (MO); Prov. Chiquitos, Santiago de Chiquitos, 3 a 5 Km al NE del pueblo, tramo entre el Pueblo y la Serranía de Santiago de Chiquitos, 18°20′S, 59°35′W, Elev. 500 a 700 m, 22–24 Oct 1994, *I. G. Vargas C. et al. 3459* (NY); Prov. Guarayos, Reserva de Vida Silvestre dos Rios Blanco y Negro, Río San Martín (Concesión Oquiriquia), a 2–3 Km al SW del acampamento sobre el Río San Martín, 15°03′21″S, 61°48′12″W, elev. ca. 300 m, 11 Sep 1993, *I. G. Vargas C. et al. 2793* (NY); Prov. Nuflo de Chávez, Estancia Las Lajas, 15 Km NW de San Javier, 16°10′S, 62°34′W, 784 m [elev.], 12 May 1990, *M. Saldias & J. C. Cornejo 1062* (NY); Prov. Velasco, alredores de la Hacienda San Roque, 15°0′37″S, 61°7′42″W, 280 m [elev.], 6 Aug 1996, *R. Guillén et al. 151* (MO, NY); Prov. Velasco, Campamento La Toledo, a 1000 m al E de la casa, 14°42′S, 61°09′W, 160 m [elev.], 21 Oct 1994, *R. Guillén & R. Choré 2453* (MO, NY); Prov. Velasco, Parque Nacional Noel Kempff Mercado, 3–15 Km of southwest of camp Los Fierros road towards Meseta, 14°35′S, 60°51′W, Alt. 225 m, 16 Oct 2001, *L. W. Chatrou et al. 310* (MO, NY); Prov. Velasco, Reserva Ecologica El Refugio, a 300 m al E del acampamento Toledo sobre el caminho hacia el Río Paragua, 14°42′32.7″S, 61°09′18.9″W, 200 m [elev.], 16 May 1995, *R. Guillén & C. Medina 3704* (MO, NY), id., próximo al Aserradero La Fatiga y los Limones, 15°3′16″S, 61°29′44″W, 300 m [elev.], 2 May 2001, *I. G. Vargas & C. Jordan 6227* (MO); Prov. Velasco, San José de Campamento, a 8 Km del Pueblo sobre el caminho al río Paraguá, 5°9′20″S, 60°59′29″W, 230 m elev., *R. Guillén & Roca 4379* (MO). — **Brazil.** — AMAPÁ: Rio Araguari, 8 Oct 1961, *J. M. Pires et al. 51582* (ALCB 9990, UB). — AMAZONAS: Basin of rio Demeni, vicinity of Totobí, 2 Mar 1969, *G. T. Prance et al. 10932* (MO); Barcelos, Serra de Aracá, Km 2 ao Sul da parte central da Serra do Aracá e 8 Km a Leste do Rio Jauari, estacionamento 1, imventariado situado a 1 Km da encosta, *W. A. Rodrigues 10903* (INPA); Borba, Rio Abacaxis, Vila Uaxiní, 4°10′S, 58°41′W, 6 Jul 1983, *C. A. Cid Ferreira 4078* (INPA, MO); Campo Amélia, Faz. Belo Horizonte, entre igarapé Acajatuba e margem direita do rio Negro, 3°2′S, 60°35′W, 21 Apr 1986, *G. T. Prance et al. 30052* (MO); Coari, Freguesia Velha, 14 Jul 1912, *A. Ducke 12389* (INPA); Humaitá, near Tres Casas, basin of rio Madeira, 14 Sep – 11 Oct 1934, *B. A. Krukoff 6486* (MO); Novo Aripuanã, Rodovia do Estanho a 120 Km da Transamazônica, entroncamento das estradas das minerações Igarapé Preto e São Francisco, 21 Apr 1985, *C. A. Cid Ferreira et al. 5693* (INPA, UB); Rio Negro, Tapuruquara, 22 jan 1978, *W. C. Steward et al. 467* (MO); São Gabriel da Cachoeira, Rio Uaupés, 15 Feb 1959, *P. B. Cavalcante 617* (INPA). — BAHIA: Alagoinhas, 7 Km N of limit of town of Alagoinhas on BR-101, ca. 12°04′S, 38°23′W, 23 Jan 1993, *J. A. Kallunki & J. R. Pirani 386* (MO); Correntina, Chapadão Ocidental da Bahia, about 9 Km SE of Correntina, on road to Jaborandi, 13°24′S, 44°35′W, ca. 550 m elev., 27 Apr 1980, *R. M. Harley et al. 21849* (MO); São Sebastião do Passé, região metropolitana de Salvador, Lamarão do Passé, lado direito da Caraíba Metais, 12°35′S, 38°24′W, 18 Dec 2004, *M. L. Guedes et al. 11254* (MBM). — DISTRITO FEDERAL: Brasília, Papuda, cava de cima, ca. de 40 Km ao Sul de Brasília, 27 Sep 1982, *A. E. Ramos 105* (CEN, INPA, UEC); Córrego Gama, between Gama and Brasília, near road to Anápolis, 1175 m elev., 26 Sep 1965, *H. S. Irwin et al. 8695* (MO); near Planaltina, 950 m elev., 12 Mar 1966, *H. S. Irwin et al. 13914* (MO); Parque Recreativo do Gama, 16°2′54″S, 48°3′18″W, 2 Jun 2000, *D. S. de Brito et al. 34* (MBM). — GOIÁS: Alto do Paraíso de Goiás, estrada para Colinas, 3.5–4 Km da sede do IBDF, 31 Nov 1988, *T. B. Cavalcanti et al. 36* (MO, SPF); Aporé, Rodovia Aporé-Serranópolis, ca. 5 km de Aporé (57 até a entrada da fazenda), 19°57′S, 52°1′W, ca. 55 m elev., 2 Aug 1995, *M. R. P. da Silva et al. 2336* (MBM); Cerrado and gallery margin ca. 22 Km NE of Catalão, 875 m elev., 22 Jan 1970, *H. S. Irwin et al. 25166* (MO); Chapada dos Veadeiros, 13 Km by road S of Terezina, ca. 1000 m elev., 16 Mar 1973, *W. R. Anderson 7244* (MO); Corumbá de Goiás, 20 Km N of Corumbá de Goiás, on road to Niquelândia, in valley of rio Corumbá, Serra dis Pirineus, 1150 m elev., 18 Jan 1968, *H. S. Irwin et al. 18773* (MO); Cristalina, Serra dos Cristais, 17°S, 48°W, 1200 m elev., 6 Mar 1966, *H. S. Irwin et al. 13641* (MO); Rio da Prata, ca. 6 Km S of Posse, 800 m elev., 7 Apr 1966, *H. S. Irwin et al. 479* (MO); Tocantinópolis, Ribeirão do Córrego, 55Km southwest of Estreito along Belém-Brasília highway, BR-153, 27 Feb 19, *T. C. Plowmann et al. 9232* (INPA, MO). — MARANHÃO: Barra do Corda, 16 Aug 1909, *A. Lisbôa s.n.* (INPA 11171); Grajaú, 20 km N of Grajaú, along highway 006, 5°40′S, 46°11′W, 10 Mar 1983, *G. E. Schatz et al. 1010* (MO). — MATO GROSSO: Acorizal, Estrada da Guia, próximo à entrada para Acorizal, 15°13′19,6″S, 56°15′5,5″W, 223,5 m elev., 13 Apr 2015, *A. F. Pontes-Pires & F. R. Borges 891* (JPB); Barra do Garças, 256 Km along new road NNE of village of Xavantina, 5,7 Km due SW of Royal Society – Royal Geographic Society Base Camp, along main road, 12°51′S, 51°45′W, ca. 450 m elev., 6 Dec 1969, *G. Eiten & L. T. Eiten 9779* (MO); Chapada dos Guimarães, Rodovia entre Cuiabá e Chapada, 21 Nov 1982, *J. U. M. dos Santos & C. S. Rosário 445* (INPA); Colíder, Estrada Santarém-Cuiabá, BR-163, Km 763, 19 Apr 1983, *I. L. do Amaral 843* (INPA, MO); Cuiabá, Instituto Linguístico, 9 Nov 1990, *M. Macêdo 2991* (INPA); Ilha do Bananal, na divisa com o Parque Nacional do Araguaia, coletas no Parque Indígena, 10°25′S, 50°30′W, 11 Oct 1985, *J. R. Pirani et al. 1241* (MO); Luciara, Lake 2Km NW of Luciara, 8 Oct 1985, *W. W. Thomas et al. 4316* (INPA, MO); Nobres, BR-163, Rod. Cuiabá-Sinop, a 145 Km ao S de Sinop, próximo à Lucas do Rio Verde, 17 Sep 1985, *C. A. Cid Ferreira et al. 6082* (INPA, MO); Nova Canaã do Norte, Resgate da Flora da UHE Colíder, estrada de supressão, 632988, 8794760, 418 m elev., 30 Oct 2014, *A. Z. Bronholi et al. s.n.* (MBM-402955); Santo Antônio de Leverger, ca. 70 Km of Cuiabá, 5 Km SW of São Vicente near Gruta do São Vicente (“Casa de Pedra”), 23 Oct 1983, *W. W. Thomas et al. 4519* (INPA, MO); Serra do Roncador, ca. 75 Km N of Xavantina, 550 m elev., 5 Jun 1966, *H. S. Irwin et al. 16650* (MO); Sinop & Colíder, along BR-080, ca. 94 Km E of jct with BR-163, 10°27′N, 54°08′W, 3 Oct 1985, *W. W. Thomas et al. 4172* (MO); Vila Bela da Santíssima Trindade, BR-364, rodovia Cuiabá-Porto Velho, km 80, Distrito de Patronal, 10 Jun 1984, *C. A. Cid Ferreira et al. 4440* (INPA, MO). — MATO GROSSO DO SUL: Amambai, Coronel Sapucaia, 30 Oct 1986, *T. M. Petersen 14775* (MO); Aquidauana, Fazenda Coração de Boi, Serra Maracaju, 21 Jun 2006, *E. Barbosa & J. M. Silva 1640* (MBM); Corumbá, trilha de acesso ao córrego Retiro, 17°57′30,9″S, 57°33′33″W, 25 Nov 2001, *G. A. Damasceno Junior et al. 3092* (MBM); Dourados, 42 Km from Dourados, on road to Rio Brilhante, 17 Feb 1975, *T. M. Petersen 11093* (MO); Nioaque, near Nioaque, 24 May 1976, *T. P. Ramamoorthy 611* (MO); Rio Brilhante, Zuzu, BR-267, Km 233, 12 Nov 1979, *A. Krapovickas & C. L. Cristóbal 34553* (MO); Três Lagoas, beira do rio da Prata, Fazenda Santa Alice, 5 Oct 2010, *M. L. Brotto & F. Marinero 467* (MBM). — MINAS GERAIS: Caete, Serra da Piedade, 20 Oct 1973, *C. Koczicki 275* (MBM); Caratinga, Lagoa Silvana, 29 Mar 2002, *D. S. Pifano & M. O . D. Pivari 330* (MBM); Curvelo, 15 Km ao sul da cidade, na estrada BR-135 para Paraopeba, 18°35′S, 44°28′W, 580 m elev., 11 Oct 1988, *R. M. Harley et al. 24816* (MO); Gallery woods, much cut-over, ca. 12 Km W of Corinto, 600 m elev., 4 Mar 1970, *H. S. Irwin et al. 26946* (MO); Lagoa Santa, estrada Lagoa Santa / Baldim, 800 m elev., 16 Jan 1985, *C. Farney et al. 537* (MO); Marliéria, Parque Estadual do Rio Doce, on península at Lake Helvecio, 19°46′S, 42°36′W, 400–450 m elev., 21 Sep 1975, *E. P. Heringer & G. Eiten 15114* (MO); Uberaba, Caldas, 29 Sep 1849, *A. F. Regnell 254* (MO); Uberlândia, Km 10 da BR-365 (para Goiânia), 14 Oct 1981, *R. C. Vieira & C. Egypto 158* (INPA). — PARÁ: Altamira, Travessão 5, 11 Apr 2013, *C. S. Rosário et al. s.n.* (MBM-405917); Alto Tapajós, Rio Curú, forest and shrubby campo S of Missão Cururú, at “Maloca Duas Casas”, 7°35′S, 57°31′W, ca. 150 m elev., 9 Feb 1974, *W. R. Anderson 10708* (MO); Belém, E. F. de Alcobaça, Breu Branco, 1 Jan 1915, *A. Ducke s.n.* (INPA 11161); Faro, rio Nhamunda atrás do lago Mamuriacá, Campos Nazaré, 13 Sep 1980, *C. A. Cid Ferreira et al. 2441* (MO); Itaituba, 5 Sep 1902, *A. Ducke 2969* (INPA); Óbidos, 20 Dec 1903, *A. Ducke 4848* (INPA); Oriximinã, Rio Mapuera, margem direita entre a Cachoeira da Madame e a Cachoeira das Ilhas, 1°3′S, 57°28′W, 15 Aug 1986, *C. A. Cid Ferreira et al. 7787* (MO); id., Cachoeira Porteira, 18 Jun 1980, *C. Davidson & G. Martinelli 10358* (INPA, MBM); Porto Trombetas, Vila de Porto Trombetas, *E. Soares 198* (MBM); Santarém, Região do Tapajós, Arredores de Porto Novo, 1 Nov 1978, *U. N. Maciel 97* (INPA); Serra dos carajás, 6 Km northeast of AMZA camp N-5, 6°3′S, 50°6′W, 650 m elev., *C. R. Sperling et al. 6278* (MO); Tucuruí, approx. 25 Km S of Tucuruí, just off old BR-422 at junction with old railroad bed, 30 Oct 1981, *D. C. Daly 1087* (INPA, MO). — PARANÁ: Guaíra, Parque Nacional de Sete Quedas, 24°4′S, 54°11′W, *A. Custódio Filho & M. Kirizawa 810* (UEC); Sete Quedas, picada entre os Saltos, 18 Mar 1982, *M. R. F. Melo 330* (ESA, US). — PIAUÍ: Baixo Grande do Ribeiro, EEUU, margem do Rio Uruçuí-Una, 8°52′38,6″S, 44°57′38,6″W, 334 m elev., 25 Set 2000, *R. Ramos et al. 940*

(UEC); Brejo das Meninas, Ribeiro Gonçalves, 12 Apr 1984, *A. Fernandes & V. Rodrigues s.n.* (UEC 35472). — RIO DE JANEIRO: only the type of *X. grandiflora*. — RONDÔNIA: Colorado do Oeste, BR 364, Porto Velho-Cuiabá, estrada para Colorado do Oeste, km 25, 7 Jun 1984, *C. A. Cid Ferreira et al. 4321* (INPA, MBM, MO); Manicoré, BR-230, 140 km ao L de Humaitá, 8°52′S, 62°00′W, 16 Apr 1985, *C. A. Cid Ferreira et al. 5606* (INPA, UB); Rio Pacáas Novos, próximo à 1ª cachoeira, ao redor do acampamento, 26 Mar 1978, *J. U. Santos et al. 263* (MO); Vilhena, ca. 4 Km de Vilhena, 12°54′S, 60°10′W, 25 Oct 1979, *M. G. Vieira et al. 613* (MO). — RORAIMA: Alto Alegre, Ilha de Maracá. Road between Estação and Boa Vista, Ilha de Maracá, on road between SEMA Estação and Boa Vista, 14 Km from Island, 17 Jun 1986, *M. J. G. Hopkins et al. 806* (INPA, MIRR, MO); Boa Vista, 30 Nov 1983, *I. L. do Amaral 1436* (INPA); Bonfim, 2 May 1992, *M. L. Absy 2* (INPA); Mucajaí, margem do rio Mucajaí, 2°30′N, 60°55′W, 6 Aug 1986, *E. L. S. Silva 723* (INPA, MO). — SÃO PAULO: José Bonifácio, estrada de terra municipal José Bonifácio – Nova Aliança, Fazenda Jacaré, entre Córregos Jacaré-Fartura, 31 Dec 1992, *M. R. Silva 509* (MO); Mogi-Guaçu, Reserva Legal da International Paper, 22°22′S, 46°58′W, 25 Feb 2008, *M. L. Brotto 63* (MBM); Nova Aliança, estrada de terra José Bonifácio-Nova Aliança, ca. 7 Km de Nova Aliança, 15 Fev 1993, *M. R. Silva et al. 708* (MO); Paraguaçu Paulista, along road 5 Km SW of center of city of Paraguaçu Paulista, 22°26′S, 50°36′W, 500 m elev., 8 Feb 1965, *G. Eiten et al. 5933* (MO); Rancharia 14 Feb 1970, *G. Hatschbach* 23508 (MBM); São Carlos, ca. 15 Km NW of Santa Eudóxia, or ca. 35 Km ENE of Araraquara, 21°42–43′S, 47°55–56′W, 20 Jun 1961, *G. Eiten et al. 3090* (MO); Zacarias, ca. 5 km da cidade, Rodovia Zacarias até entroncamento com a SP-425, margem da Rodovia, 21°04′S, 50°3′W, 6 Dec 1995, *M. R. P. da Silva 2239* (MBM). — TOCANTINS: Araguaína, Gaúcho Camp, 500 ft. elev., 11 Aug 1963, *B. Maguire et al. 56094* (MO); Lajeado, 9°46′N, 48°19′W, *R. F. Haidar & M. Q. Matos 214* (MBM). — **Colombia.** — AMAZONAS: Vicinity of Leticia, road behind airport, disturbed forest edge and roadside, 14 Mar 1977, *A. Gentry & D. Daly 118276* (MO). — ANTIOQUIA: Municipio de Caucasia, Hacienda “La Candelaria”, Universidad de Antioquia, 8°4′N, 75°05′W, 150 m elev., 5 Sep 2000, *R. Fonnegra et al. 7176* (MO), El Bagre, along road near airport, 7°38′N, 74°48′W, 150 m elev., *J. L. Zarucchi 3259* (MO). — CUNDINAMARCA: Guaduas, Camino al Salto de Versalles, 1000 m elev., 27 Mar 1983, *E. Forero et al. 9400* (MO). GUAINÍA, Puerto Inírida, resguardo Indígena Almidón-La Ceiba, Comunidade La Ceiba, margen isquierdo del rio Inirida, 3°38′N, 67°52′W, 80 m elev., 18 Mar 1998, *P. Franco et al. 5920* (MO). — GUAVIARE: Municipio de San Jose del Guaviare, Inspección de La Fuga, en bosque poco intervenido, alredor del caño La Fuga, 2°46′31.1″N, 72°17′33.6″W, 31 Oct 1995, *R. López et al. 575* (MO). — META: llanos Orientales, serrania al oeste del hato Mamona, 10 May 1963, *J. Blydenstein & C. Saravia T. 919* (MO); Municipio La Macarena, región de la Reserva de La Macarena, caminho 15 Km NO hacia Conejos, 2°15′N, 73°45′W, 450 m elev., 7 Aug 1988, *R. Calejas & O. Marulanda 6904* (MO). — SANTANDER: Puerto Wilches, entre La Gómez y el kilometro 80 del ferrocarril del Atlántico, 100–200 m elev., 20 Apr 1960, *R. Romero-Castañeda 8347* (MO). — TOLIMA: Cundin Amarca order, Melgar airport, 14–15 Jan 1966, *J. W. Walker 257* (MO); Mariquita, bosque del Pueblo, 550 m elev., 26–27 Nov 1984, *R. Bernal et al. 808* (MO); West of Chaparral, ca. 2 km, Cordillera Central, 880 m elev., 16 Jul 1950, *S. G. Smith 1275* (MO). — VAUPÉS: Mitú and vicinity, along Río Vaupés, at Tatú Rapida, 29 Mar 1975, *J. L. Zarucchi et al. 1125* (MO). — VICHADA: Parque Nacional Natural "El Tuparro", ca. 14 Km W of Centro Administrativo north of roado to El Tapón, Cerro Penilla, 5°19′N, 67°58′W, ca. 120 m elev., 26 Feb 1985, *J. L. Zarucchi & C. E. Barbosa 3465* (MO). — **Costa Rica.** — PUNTARENAS: Buenos Aires, Reserva Indígena Boruca, Fila Costeña, 1 km antes de Boruca, 8°59′24″N, 83°19′48″W, 700 m elev., 7 Mar 1993, *S. Rojas & R. Zúñiga 185* (MO); id., Valle del General, Carretera Interamericana km 220, sabanas secas ca. 5 km N de Paso Real, 9°1′48″N, 83°14′24″W, 150 m elev., 3 May 1991, *B. E. Hammel 18209* (MO); 4 km beyond the ferry crossing over the Río Térraba at the Interamerican Highway, on the road to San Vito, 8°58′N, 83°10′W, 300 m elev., 30 Jun 1984, *G. E. Schatz et al. 1000* (MO). — SAN JOSÉ: Pérez Zeledón, roadside near airstrip for pineapple plantation, southeast of Palmares, 9°19′8″N, 83°39′6″W, 9 Feb 1971, *W. T. Gillis 10057* (MO); id., Vicinity of El General, 9°22′27″N, 83°39′25″W, 730 m elev., *A. F. Skutch 3917* (MO). — **Cuba.** — Isla de la Juventud, 29–31 Dec 1901, *W. W. Rowlee 92* (NY-1369954 digital image). — PROVINCE OF PINAR DEL RÍO: Alturas Pizarrosas del Sur, Zona de Pizarras a lo largo de la carr. entre Pinar del Río y Vinales, km 12–15, 22°50′N, 83°42′W, 140 m elev., 7 Jul 1993, *P. Acevedo-Rodríguez et al. 5699* (NY-395868 digital image); Herradura, 25 Jun 1922, *E. L. Ekman 14101* (NY-1369960 digital image); San Diego de los Baños, 30 Aug - 3 Sep 1910, *N. L. Britton et al. 6725* (NY); Sandino, Sabanalamar Protected Area, Lake beside Sabanalamar Crocodile Rearing Station, 22°8′28″N, 83°58′27″W, 10 Nov 2012, *W. W. Thomas et al. 15936* (NY); Santa Catalina, 18 Oct 1905, *H. A. van Hermann 3275* (NY-1369956 digital image). — **French Guiana.** — Bourg de Maripasoula, Bassin du Maroni, 3°37′N, 54°5′W, 5 May 1986, *M. Fleury 209* (NY, US); Lieux de Récoltes, Rivière Tampoc, 18–24 Sep 1961, *M. Lemoine*

7891 (NY); Rivière, grand Inini et en aval de amont de Grand Fourmi, 16 Sep 1985, *J. J. de Granville et al. s.n.* (U-0133633 digital image, U-0133634 digital image); Trois Saut, Haut Oyapock, 11 Dec 1974, *Grenand 574* (NY, U-0133491 digital image). — **Guyana.** — Basin of Rupununi River, Isherton, ca. 2°20′N, 9–15 Nov 1937, *A. C. Smith 2436* (MO); Demerada – Mahaica Region. Vicinity of Kuru Kuru Creek along the Soesdyke-Linden Highway, 7°24′N, 58°13′W, 10–20 m elev., 8 Dec 1989, *L. J. Gillespie 2640* (US); Demerara-Mahaica, 2–3 Km E & W of Linden Highway, within 3 Km of second toll gate, 6°20′N, 58°17′W, 16 Aug 1993, *T. W. Henkel et al. 2577* (MO); Region: U. Takutu-U. Essequibo, Northern Rupununi Savanna; Annai village, 100 meters E of government Guesthouse, 3°56′N, 59°8′W, 88 m elev., 24 Apr 1992, *B. Hoffman 1451* (INPA); Makatui savana, ca. 3.5 Km SW of Aishalton, 2°30′N, 59°15′W, 17 Nov 1982, *A. L. Stoffers et al. 351* (MO); Region U. Takutu – U. Essequibo, South Rupununi savana, Keidik perdana área, 7–8 Km SE of Aishalton, 2°30′N, 59°15′W, 250 m elev., 16 May 1994, *T. W. Henkel & R. James 3827* (MO); Rupununi Savanna, Mora Savanna, near Toroebaroe Creek, 3°23′N, 59°29′W, 145 m elev., 19 Nov 1987, *M. J. Jansen-Jacobs et al. 1036* (MO, US); Takutu, U. Essequibo region, in woods between Lake Surama and Surama Village, 22 Feb 1990, *T. McDowell 1986* (INPA), U. Demerara-Berbice, Essequibo River from Monkey Jump to Persaud timber concession, 6°20′N, 58°33′W, 5 m elev., 22 May 1993, *T. W. Henkel & R. Williams 2098* (MO); Vicinity of Mabura Hill, trail from Mabura Hill-Linden Road to Demerara Landing, 5°25′N, 58°35′W, 26 Aug 1988, *P. J. M. Maas et al. 7147* (MO). — **Honduras.** — EL PARAÍSO: Yuscarán, 13°56′N, 86°51′W, 1200 m elev., 27 Aug 1978, *L. Zelaya 189* (MO). — GRACIAS A DIOS, Puerto Lempira, La Mosquitia, Caserío de Rus-Rus, vaguada del río Rus-Rus, 14°42′N, 84°57'W, 0–5 m elev., 17–21 Jul 1977, *C. H. Nelson & E. Romero 4084* (MO); id., near the Río Patuca, near the town of Ahuas, 15°29′N, 84°22′W, 175 m elev., *A. F. Clewell 4587* (MO). — **Nicaragua.** — ATLÁNTICO NORTE: Alamikamba, ca. 1.3 km NW of Alamikamba, 13°30′N, 84°14′W, 20 m elev., 25 Apr 1978, *W. D. Stevens 8170* (MO); id., 1 km N of Alamikamba, 13°30′N, 84°14′W, 15 m elev., 17 May 1978, *D. A. Neill 4065* (MO); Puerto Cabezas, S del aeropuerto de Puerto Cabezas, 14°2′N, 83°23′W, 12 m elev., 7 Feb 1983, *J. C. Sandino 3999* (MO); id., 3-5 km NO de Puerto Cabezas, 14°1′N, 83°24′W, 10 m elev., 26 Feb 1971, *E. L. Little 25012* (MO); Tamla, Tamla, Septimo Bridge, west of Puerto Cabezas, 14°5′N, 83°25′W, 15 m elev., 16 Jul 1972, *S. B. Robbins 5938* (MO); ca. 5 km S of Bilwascarma on road to Puerto Cabezas, 14°43′30″N, 83°52′00″W, 100 m elev., 11 Jul 1970, *G. Davidse & R. W. Pohl 2314* (MO). — ATLÁNTICO SUR: Laguna de Perlas, along road 2 km S of Laguna de Perlas, 12°18′55″N, 83°40′51″W, 2–5 m elev., 23 Jun 2009, *W. D. Stevens et al. 28668* (MO); 4.2 km SW of Pearl Lagoon along road between El Rama and Pearl Lagoon, 12°18′34″N, 83°41′48″W, 16 m elev., 18 Aug 2015, *W. D. Stevens & O. M. Montiel J. 36716* (MO). — **Panama.** — CANAL AREA: Ancon Hill, 8°57′29″N, 79°32′59″W, 50–100 m elev., 13 Jan 1922, *J. M. Greenman & M. T. Greenman 5131* (MO); Summit Gardens, Ditch bank along Guillard Hwy, 1 mi. N.W. of Summit Gardens, 9°4′27″N, 79°39′36″W, 75 m elev., 19 Mar 1970, *T. B. Croat 8886* (MO); Secondary tropical moist forest along Gaillard Hwy., 2 km NW of Summit Garden, 9°4′58″N, 79°40′13″W, 100 m elev., 17 Oct 1973, *M. H. Nee 7446* (MO). — CHIRIQUÍ: Cerro Punta, 8°51′N, 82°34′W, 1980 m elev., 28 Mar 1965, *R. K. Godfrey 67333* (MO); Dolega, 8°34′N, 82°25′W, 245 m elev., *L. Urriola 35* (MO); Pedregalito, Pedregalito S of David, 8°22′N, 82°26′W, 10 m elev., 26 Oct 1983, *R. J. Schmalzel 1824* (MO); Río Caldera, along Río Caldera, about 10 miles N of David, 8°35′N, 82°20′W, 185 m elev., 25 Apr 1969, *R. L. Lazor & M. D. Correa A. 2818* (MO). — COCLÉ: El Cope, along Continental Divide, along lumber road, ca. 1 [10] km N of El Copé, 8°40′13″N, 80°35′37″W, 850 m elev., 19 Jan 1978, *T. B. Croat 44531* (MO); Río Hato, Río Hato Airstrip, 8°22′N, 80°8′W, 10 Jul 1966, *K. E. Blum & J. D. Dwyer 2473* (MO). — COLÓN: Chagres, colectado en Tres Brazos sawmill, Icacal, which is in between Salud y — Boca de Río Indio, 9°11′33″N, 80°9′2″W, 20 m elev., 25 Jun 1969, *J. H. Howell 49* (MO). HERRERA: Las Minas, 3–7 km W of Las Minas on road to El Toro, 7°47′14″N, 80°47′49″W, 200–600 m elev., 23 Jan 1981, *K. J. Sytsma & W. G. D'Arcy 3205* (MO); Santa Maria, Chupampa, ca. 1 mi S[N] of Chupampa on road to Ocú, 8°3′51″N, 80°46′36″W, 208 f [ca. 63 m] elev., 1 Jun 1970, *R. L. Wilbur et al. 12115* (MO). — LOS SANTOS: along road between Tonosí and Macaracas, 7°24′21″N, 80°26′29″W – 7°44′1″N, 80°33′8″W 46–111 m elev., 6 dec 1967, *R. L. Oliver et al. 3558* (MO); Los Santos, Monagre Beach, 7°58′N, 80°21′W, 29 Jul 1963, *J. D. Dwyer 4142* (MO). — PANAMÁ: Arraijan, on Pan-American highway 4 km E of Arraiján, 8°57′14″N, 79°37′37″W, 100 m elev., 4 May 1984, *N. A. Murray & D. M. Johnson 1475* (MO); Balboa, Isla de Rey, near san Miguel, 8°27′15″N, 78°56′15″W, 40 m elev., 27 Feb 1967, *J. A. Duke 10423* (MO); Capira, Cerro Campana, 8°41′N, 79°54′W, 800 m elev., 13 Feb 1985, *H. van der Werff & C. van Hardeveld 6929* (MO); Chame, along road from Panam Highway to Coronado Beach, 8°32′12″N, 79°54′7″W, 85–176 f [25–53 m] elev., 3 Jun 1967, *J. A. Duke 11791* (MO); Chepo, 7 miles W of Chepo, mostly cleared area near highway, 9°9′6″N, 79°8′42″W, 10 m elev., 1 Sep 1971, *A. H. Gentry 1627* (MO); La Chorrera, road to Areriosa [Arenosa] from Espina [El Espino]; 16 km N of the Panamerican Highway, 8°56′22″N, 79°52′49″W, 132 m elev., 30 May 1977, *J. P. Folsom 3443* (MO); Panamá, Isla Taboga, 8°47′N, 79°33′W, 0–186 m elev., 23–24 Jul 1938 *R. E. Woodson et al. 1447* (MO); id., near Lago Cerro Azul (Goofy Lake), 9°10′00″N, 79°24′59″W, 500–600 m elev., 3 Mar 1983, *C. W. Hamilton & K. Krager 3224* (MO); Tocumen, 9°5′N, 79°23′W, 10–20 m elev., 8 Jan 1963, *J. D. Dwyer 4210* (MO); San Blas, tierra firme de Playón Chico, sendero del Acueducto, 9°17′N, 78°15′W, 11 Sep 1994, *H. Herrera & L. Arosema 1826* (MO). — VERAGUAS: Atalaya, 2 km NW of Atalaya, open weedy roadside and open to brushy "savanna" pasture, 8°2′52″N, 80°56′41″W, 100 m elev., 19 Nov 1973, *M. H. Nee 8217* (MO); Calobre, Región de La Yeguada, alrededores del Río San Juan, 8°26′03″N, 80°51′38″W, 600 m elev., 5 Aug 1976, *M. D. Correa et al. 2219* (MO); Santiago, 12 miles from Santiago toward Divisa on Transisthmian Hwy, 8°5′14″N, 80°50′5″W, 50 m elev., *J. D. Dwyer & J. H. Kirkbride Jr. 7428* (MO). — **Paraguay.** — ALTO PARANÁ, Río Itabó, 15 Apr 1980, *Itaipú Binacional 693* (MO). — AMAMBAY: km 20 N of Ype-hu, 30 Mar 1983, *W. J. Hahn et al. 1351* (INPA, MBM, MO); Parque Nacional Cerro Corá, 22°39′N, 56°3′W, 300 m elev., 15 Feb 1982, *J. C. Solomon et al. 6983* (MO). — CANINDEYÚ, Ruta Ype Ihú, Cordilheiras de Mbaracayú, Km 30, 23°58′S, 55°16′W, 20 Oct 1991, *R. Spichiger & P. A. Loizeau RS5136* (MO). — SAN PEDRO: Laguna Branca, Mar 1992, *N. Soria 5178* (MO). — CONCEPCIÓN: Estancia Lilo, Portrero Loma, 25 Oct 1991, *A. Eliceche 414* (MO). — **Peru.** — JUNÍN: Chanchamayo Province, La Merced-Satipo road, Shankivironi, 10°56′S, 75°15′W, 650 m elev., 14 Apr 1984, *D. N. Smith & W. Brack-Egg 6927* (MO). — LORETO: Balsapuerto, 220 m elev., Jan 1933, *G. Klug 2845* (MO); Maynas, near Iquitos, ca. 100 m elev., Aug 1981, *H. Murphy 274* (MO). — MADRE DE DIOS: Tambopata, mas ahiba del Moho em la quebrada Juliaca e inicio al Oeste de las pampas del río Heath em la frontera com Bolivia, 12°30′N, 68°40′W, 200 m elev., 13 Aug 1988, *P. Nuñez et al. 9750* (MO). — SAN MARTÍN: Outskirts of Tarapoto, 6°30′N, 76°25′W, 15 Feb 1984, *A. Gentry & D. N. Smith 45548* (MO). — **Suriname.** — Kaboerie, arbor n. 703, 11 Aug 1922, *Anonymous collector 5949* (MO); Lucie Rivier, 210 Km below confluence of Oost Rivier, 3°20′N, 56°49′W – 3°32′N, 56°26′W, 225 m elev., 10 Sep 1963, *H. S. Irwin et al. 55566* (MO). — **Trinidad and Tobago.** — Arima, 18 Mar 1921, *N. L. Britton et al. 2408* (US); Botanic Gardens, St. Ann's wild on the Look-out Hill, 28 Feb 1924, *W. E. Broadway 5214* (MO); Erin Sannas, near Buenos Ayres Village, 75 m elev., 26 Mar 1959, *R. S. Cowan & R. Foster 1292* (US). — **Venezuela.** — AMAZONAS: Aripao, Isla Ratón, río Orinoco, 5°9′N, 67°45′W, 80 m elev., Oct 1989, *J. Velazco 585* (MO); Atabapo, vecindad de la comunidade de Culebra, río Cunucunuma, morichal al SE de

Culebra, 3°40′N, 65°45′W, 200–220 m elev., 22–23, 28–29 Mar or 1–4 Apr 1983 *J. A. Steyermark & F. Delascio 12903*9 (MO), id., Santa Bárbara del Orinoco, 3°57′N, 67°06′W, 120 m elev., Nov 1989, *E. Marín 398* (MO); Atures, carretera Pto. Ayacucho-Samariapo, entre el puente sobre el Carinagua y la entrada hacia Raudal Garzita, aprox. 5°37′–5°30′N, 67°36′W, 70–75 m elev., 24 Apr 1989, *G. A. Romero & E. Melgueiro 2016* (MO); San Carlos de Río Negro, 0 to 2 Km N and NE of San Carlos de Río Negro, ca. 20 Km S of confluence of Río Negro and Brazo Casiquiare, 1°56′N, 67°03′W, 120 m elev., 19 May 1979, *R. L. Liesner 7562* (MO); Vicinity of Puerto Ayacucho, on laja (granitic outcrops) and adjacente Sandy savanas near airport and herbarium of Ministerio de Ambiente, 5°39′N, 67°38′W, elevation less than 100 m, 22 Nov 1984, *T. B. Croat 59224* (MO). — ANZOÁTEGUI: Distrito Libertad, road from El Vigia do Buenos Aires, 8–15 airline Km ENE of Bergantín, 10°1′–2′N, 64°13′–17′W, 500 m elev., 27 Nov 1981, *G. Davidse & A. C. González 19492* (MO); Municipio Independencia El Palmar, 17 Sep 1994, *L. Chacon 614* (MO). — APURE: Pedro Camejo, P. N. Santos Luzardo, río Capanaparo, Sector “Los Cerritos”, cerca de la desembocadura del Capanaparo, 7°4′–7°6′N, 67°4′–67°6′W, 40 m elev., 19 May 1990, *R. Duno et al. 243* (MO); San Fernando, ca. 4.5 airline miles ESSE of San Carlos del Meta along the banks of the río Meta, 6°19′N, 67°50′W, 60 m elev., *G. Davidse & A. C. González 13854* (MO). — BARINAS: Carretera Barrancas-Barinas, 14 Jun 1979, *L. Marcano-Berti 222979* (INPA). — BOLÍVAR: Cedeño, Cerro Medano, 22.5 Km, SW of Caicara del Orinoco, just SW of Sauima, 7°36′N, 66°15′W, 60–65 m elev., 2 Sep 1985, *J. A. Steyermark et al. 131201* (MO); Distrito Piar, La Camilera, 40 Km al Oeste de El Manteco, 250–260 m elev., Jul 1978, *F. Delascio & R. Liesner 6976* (MO); Distrito Roccio, selva ribereña, a lo largo del río Uairén, 12 Km (por carretera) al Noroeste de Santa Elena de Uiarén, 3 Km al Este de la carretera principal, Hato Divida Pastora, 4°45′N, 61°03′W, 900 m elev., 1 Dec 1982, *J. A. Steyermark & R. Liesner 127416* (MO); In morichal 2 Km South of Ciudad Piar, 300 m elev., 18 Oct 1953, *B. Maguire et al. 35824* (MO); Municipio Piar, entre El Mamo Y El Palmar, caminhos y carretera asfaltada, 7°40′N, 61°46′W, 240 m elev., May 1986, *E. Sanoja 982* (MO); Municipio Roscio, río Yuruari, norte, 7°16′N, 62°00′W, 265 m elev., May 1986, *E. Sanoja 1262* (MO); Municipio Gran Sabana, Pto. Caribe, médio muy alterado (mineria conucos), 4°16′N, 61°49′W, 450 m elev., Feb 1986, *E. Sanoja 168* (MO); Municipio Raul Leoni, zona minera Aza Karón, Sector Marabá, 6°19′10″N, 63°31′35″W, 270 m elev., 15 May 1992, *W. Diaz & L. Delgado 669* (MO); Sifontes, cuenca alta del río Corumo, a unos 20 Km al NE de Tumeremo, 7°29′27″N, 61°28′42″W, 180–220 m elev., 27 Oct 2003, *W. Diaz et al.*

6641 (MO); Tumeremo to Anacoco, north side of Cuyuni River, 140–200 m elev., 72 Km from Guyana frontier at Anacoco, 18 Mar 1974, *A. Gentry et al. 10635* (MO); Vicinity of Icabarú South side of Río Icabarú along road to Los Caribes, 4°19′N, 61°44′W, 600 m elev., 25 Jul 1982, *T. B. Croat 54064* (MO). — DELTA AMACURO: Tucupita, 5-14 Km ESSE of Los Castillos de Guayana, 8°28–31′N, 62°17–22′W, 50–200 m [elev.], 28 Mar–2 Apr 1979, *G. Davidse & A. C. Gonzaléz 16285* (MO). — GUÁRICO: Estación Biológica de los LLanos de la Sociedad Venezolana de Ciências Naturales, ubicada aproximadamente a 12 Km SE de Calabozo, 8°56′N, 67°25′W, 75 m elev., 15 May 1987, *N. Ramírez 2156* (MO); Morichal El recreo, 3 Km S de la Estación Biológica de Los Llanos Calabozo, 20 Nov 1981, *R. A. Montes 904* (MO). — LARA: 30 Km SW of Barquisimeto near road to Cerrata, 22 Jul 1979, *W. Meijer et al. 32* (MO). — MONAGAS: Uracoa, río Uracoa, 9°0′N, 62°42′W, 50–200 m elev., 14 Jan 2002, *W. Diaz & E. Marin 5924* (MO). — MÉRIDA: Near Puerto Ayacucho, between airport and Rio Catanapo, 25 Jul 1967, *J. G. W. Boher 1889* (INPA, MBM); Puerto Rico, Carretera Santa Cruz de Mora, 24 Mar 1984, *L. Valverde & T. N. Cruz 37* (INPA, MBM). — SUCRE: 7 Km E of Mochima Hwy. Intersection along Hwy. 9 between Cumana and Puerto La Cruz, 250 m elev., 16 Dace 1982, *G. Davidse 5036* (MO). — TÁCHIRA: Dto. Libertador, woodland remnants 4 Km N of Chururu, 1000 ft elev., 19 Oct 1978, *G. L. Webster W. S. Armbruster 23679* (MO); San Cristóbal, cava de caliza cerca del aldeã Pericos, a unos 7 Km al sur-oeste de San Cristóbal, 800 m elev., 22 Aug 1985, *J. Bóno 5181* (MO). — TRUJILLO: from Fundo el Caney ca. 20 Km N of Aqua Viva and about 2 Km W of main road, 4 Apr 1986, *E. Turner & V. Kapos 313* (MO). — ZULIA: Dtto. Baralt, Bosque de Pinos, Programa de Reforestación, Sabana de la Raya, 9°50′N, 70°50′W, 150 m elev., 24 Jun 1989, *O. Zambrano et al. 1955* (MO); Perija district, 5 km W of Machiques, along roado on hacienda El Capitan, 150 m elev., 12 Oct 1966, *M. J. Jansen-Jacobs 1974* (MO).

3.3.5.1.4 XYLOPIA BARBATA Hoffmanns. ex Mart., Fl. Bras.13(1): 43. t. 13, f. 1. 1841. *Xylopicrum barbatum* (Hoffmans. ex Mart.) Kuntze, Rev. Gen. Pl. 1: 8. 1891. TYPE: BRAZIL. [Pará]: Cresci in ripa fluvii Tocantins, locis sabulosis virgultosis, ad Cametá, *Sieber s.n.* [353] (lectotype, designated by Bagstad and Johnson 1999: M-0240128 (digital image!) [photo in: F!, MO!, NY!], isolectotypes: BR-0000023200487 (digital image!), MO-1670643! [fragment and photo].

Xylopia conjungens R.E.Fr., Acta Horti Berg. 10(2): 333. 1931. TYPE: PERU. Ostperu, Dep. Loreto, Mishuyacu bei Iquitos, Feb-Mar 1930, *G. Klug 970* (holotype: B [presumed lost in 1943], lectotype, here designated: NY! [photo in: S] (digital image!), isolectotypes: F 613537!, US-00098774!, S-R-6852 [fragment] (digital image!)).

Shrubs ca. 2.5 m tall to **trees** 6–25 m tall, d.b.h. 10–41 cm. Twigs with golden, grayish, hyaline or rusty hairs. Petioles, abaxial surfaces of leaves, inflorescences, flowers and fruits with golden, hyaline to rusty hairs. **Twigs** brown, dark brown or grayish brown, densely velutinous, becoming glabrate to glabrous when older, lenticellate. **Petioles** 1–2 mm long, canaliculate, densely villous; **leaf blades** (2.2–)3–7.2 × 0.9–2.1 cm, elliptic or oblong, sometimes lanceolate elliptic, chartaceous, smooth, pale brown to golden brown abaxially, dark brown adaxially, densely velutinous to sericeous on abaxial surface, glabrous to glabrate adaxially, apex acute, short acuminate, obtuse or retuse, acumen, when present, 3–12 mm long, base cuneate, midrib raised abaxially, impressed or flat adaxially, secondary veins (6–)7–11 per side, slightly raised on one of the surfaces, abaxial or adaxial. **Inflorescences** axillary, often 1-flowered, sometimes 2–3-flowered; **peduncles** 2–3 mm long; **pedicels** densely sericeous to tomentellous; **buds** extremely narrow triangular to linear; **bracts** 2–3, 1–2 mm long, triangular ovate or ovate, densely velutinous to sericeous abaxially, apex acute, sometimes with a sharp tip. **Calyx** short cup-shaped, smooth, calyx tube 1.4–2.3 mm long, **sepals** connate from ⅓ to close to ½ of their lenght, calyx lobes 2–3.5 × 2–3.7 mm, ovate triangular to ovate, densely long sericeous to velutinous abaxially, apex acute; **petals** yellow, **outer petals** extremely narrowly triangular to linear, slightly lanceolate, 14–21 mm long, 1–2.2 mm wide at midpoint, densely sericeous to velutinous abaxially, puberulent adaxially, apex acute; **inner petals** linear, lanceolate, with triangular cross-section at the midpoint, 10–19 mm long, ca. 1 mm wide at midpoint, puberulent on both surfaces, apex acute to acuminate; **stamens** 50–80, 1–1.2 mm long, narrowly oblong, glabrous, anthers septate at anthesis; apex of connective ca. 0.2 mm long, truncate or slightly hemispheric; filament 0.3–0.4 mm long; innermost stamens staminodial, appressed to the stigmas base; **staminal cone** 1.5–2.5 mm in diameter, ca. 1 mm high, conical, concave in center, glabrous; **carpels** 4–5, 5.2–6.8 mm long, ovary 1–1.2 mm long, long sericeous, **ovules** 2–3(–6), stigmas filiform, 4.2–5.6 mm long, pubescent. **Fruits** of 2–4 monocarps borne on a **pedicel** 4.9–5.9 mm long, 1.4–1.7 mm thick, tomentose to glabrate, with sepals persistent; **torus** 3.2–4.2 mm in diameter. **Monocarps** yellow or green with a red interior or red, 22–40 × 4.6–7.5 mm, oblong, and falcate, slightly constricted between seeds, verrucose, apex acute, with an oblique mucro, 1.2–3 mm long, puberulent to glabrate; **stipes** 4–5.5 mm long, 1.8–2 mm wide. **Seeds** 3–6, ca. 9.8 × 4.2 mm wide, ellipsoid, black or dark brown, smooth, somewhat shining, aril white *in sched.*, lobes ca. 2 × 3.8 mm.

Additional Illustrations— Martius (1841, plate XIII, Fig. I), Bagstad and Johnson (1999: 23, Fig. 1, F–H.).

Distribution and habitat—This species occurs in Brazil and Peru, growing in savanna, lowland forests (*terra firme*), and coastal vegetation on sandy soil, and in secondary forests (*capoeira*). In Brazil, it is distributed in the states of Amazonas, Pará, Rondônia, and Roraima (Figure 2).

Vernacular Names— "*Envireira*" (Brazil).

Phenology— Specimens with flowers have been collected in February, March, May, August, October, November, and December; and specimens with fruits were collected in March, July, November, and December.

Notes— The remarkable characters of *Xylopia barbata* are the densely velutinous young twigs; small leaf blades ((2.2–)3–7.2 × 0.9–2.1 cm), densely velutinous to sericeous on abaxial surface, extremely narrow triangular to linear buds; short cup-shaped calyx, calyx tube 1.4–2.3 mm long, calyx lobes 2–3.5 mm long; 50–80 stamens; 4–5 carpels, 5.2–6.8 mm long; and 2–4 oblong, and falcate, stipitate, slightly constricted between the seeds, verrucose monocarps, with an oblique mucro, 1.2–3 mm long, at the acute apex.

Xylopia barbata is close to *X. orinocensis* Bagstad & D.M.Johnson and *X. rigidiflora* Bagstad & D.M.Johnson. Together they form a group of related species from the Amazon/Orinoco region (Bagstad and Johnson 1999). It can be differentiated from *X. orinocensis* by its leaves densely velutinous to sericeous on the abaxial surface (*vs*. sparsely pubescent, tomentose or velutinous); yellow petals (*vs*. orange), inner petals ca. 1 mm wide at the midpoint (*vs*. 0.5–0.6 mm); carpels 5.2–6.8 mm long (*vs*. ca. 4.2 mm), ovaries 1–1.2 mm long (*vs*. ca. 0.7 mm), and stigmas 4.2–5.6 mm long (*vs*. ca. 3.5 mm).

Xylopia barbata can be distinguished from *X. rigidiflora* by its leaf blades , 0.9–2.1 cm wide (*vs*. 2.3–4.6 cm), densely velutinous to sericeous on the abaxial surface (*vs*. sericeous or puberulent, denser on the midrib), acute, short acuminate, obtuse or retuse apex (*vs*. cuspidate), chartaceous (*vs*. subcoriaceous to coriaceous); outer petals 1–2.2 mm wide at the midpoint (*vs*. 2.5–4 mm), inner petals ca. 1 mm wide at the midpoint (*vs*. 1.5–1.8 mm); 4–5 carpels (*vs*. 9), and ovary 1–1.2 mm long (*vs*. ca. 2 mm).

Xylopia conjungens, the only heterotypic synonym of *X. barbata* known up to now, was described by Fries (1930). In the protologue the author mentioned the holotype was at B, but it was probably destroyed in the Second World War. The lectotype was chosen among the four isotypes available. The specimen from NY was the one in better condition, presenting one flower and some buds, matching the protologue.

***Selected Specimens Examined* — Brazil.** — AMAZONAS: Manaus, Chapada, 7 Nov 1955, *W. A. Rodrigues s.n.* (INPA 2841); id., Enseada Grande, Ponta Negra, 9 Mar 1961, *W. Rodrigues & J. Lima 2205* (INPA, US); Rio Urutú [probably Urubú], 5 Oct 1949, *R. L. Fróes 25487* (IAN, RB, US). PARÁ: Belterra, nas proximidades do igarapé Iruçanga, entre Pindobal e Porto Novo, praia do rio Tapajós, 7 Dec 1978, *R. Vilhena et al. 162* (INPA, NY); Santarém, Alter do Chão, a 69 km a Sul de Santarém, em "ilha" do rio Tapajós, cerca de 200 metros distante da principal rua do município de Alter do Chão, à beira do cerrado, junto à praia do rio Tapajós, 9 Feb 1994, *A. M. Benko-Iseppon 373* (NY, OWU); Santarém, 12 Mar 1909, *A. Ducke s.n.* (INPA 11165); Santarém, Nov 1824–1829, *Riedel 1566* (MO, NY, US); id., Nov-Mar 1849–1850, *R. Spruce s.n.* (F 931086 [frag], F 893865 [frag], NY); id., península em frente a Alter do Chão, 2°29′S, 54°57′W, 1 Jul 1989, *T. M. Sanaiotti s. n.* (INPA 163828); id., perto do Aeroporto de Santarém, *G. Black 55-18756* (IAN); id., Santa Teresinha, margem direira do rio Tapajós, 2 Dec 1978, *U. N. Maciel & M. R. Cordeiro 137* (IAN, NY, OWU); id., Vila de Alter do Chão, praia arenosa da península de Alter, em frente à Vila, 2°31′S, 55°00′W, 27 Dec 1991, *L. V. Ferreira 54* (INPA, NY). — RONDÔNIA: Basin of rio Madeira, vicinity of Mutumparaná, 2 Jul 1968, *G. T. Prance 5543* (MO, NY, US); id., margin of Mutumparaná airstrip, 25 Nov 1968, *G. T. Prance et al. 8851* (INPA, MO, NY, OWU). — RORAIMA: Caracaraí, PARNA do Viruá, Grade do PPBio, parcela L04_2500, 14 Mar 2012, *R. O. Perdiz et al. 1271* (RB, UFRR); id., PARNA do Viruá, parcela L4_2300 e 2350, 9 Jun 2017, *A. F. Pontes-Pires et al. 971* (JPB); id., Parque Nacional Serra da Mocidade, 1°16′56″S, 61°44′33″W, 54 m elev., 23 Mar 2012, *R. C. Forzza et al. 6905* (RB). — **Peru.** — LORETO: Maynas Province, Iquitos, Allpahuayo, Estación Experimental del Instituo de Investigaciones de la Amazonía Peruana (IIAP), Dec 1990, *R. Vásquez & N. Jaramillo 15259* (MO); id., Mishane, transecto 11 y 12, 3°55′S, 73°35′W, 130 m elev., 1 May 1983, *R. Vásquez et al. 4048* (MO).

3.3.5.1.5 XYLOPIA BENTHAMII R.E.Fr., Kongl. Svenska Vetensk.-Akad. Handl. 34(5): 35. t. 5, f. 2-4. 1900 "*benthami*". TYPE: VENEZUELA. Rio Casiquiare [Ad Casiquiarem

> supra Vasiva ostiam, in sylvis excelsis], 1853–4 [Jan 1853], *R. Spruce 3290* (holotype: B [probably destroyed], lectotype, here designated: K-000221102 (digital image!), isolectotypes: BM-000554084 (digital image!), C-10005712 (digital image!), F 932243!, F 870920! [fragment], F 893866! [fragment], G-00226132 (digital image!), G-00226133 (digital image!), GH-00039718 (digital image!), GOET-000134 (digital image!), K-000221103 (digital image!), LE-00012550 (digital image!), MG-019390!, NY-00066751!, P-00734898 (digital image!), P-00734899 (digital image!), TCD-0000865 (digital image!)).

Tree 4–25 m tall, d.b.h. 7–30 cm; **bole** cylindrical; bark usually wrinkled and superficially cracked. Twigs and petioles with golden, ocher, pale rusty, hyaline or pale brown hairs. Abaxial surfaces of leaves, inflorescences, flowers and fruits golden, hyaline, pale rusty, or pale brown hairs. **Twigs** villous, sometimes sparsely, or ocasionally only rare erect hairs, becoming glabrate to glabrous when older. **Petioles** (1–)2–3.5 mm long, canaliculate, dark brown to black, villous to less rarely sericeous (on young leaves), becoming glabrous when older; **leaf blades** (2.5–)3.7–11.7(–14) × 1–2.8(–3.5) cm, elliptic, narrowly elliptic, elliptic lanceolate, oblong elliptic, rarely lanceolate or slightly oblanceolate, pale brown, pale greenish brown or reddish brown abaxially, grayish brown, pale brown or greenish brown adaxially, membranous to chartaceous, usually villous to sericeous abaxially, hairs decreasing with age, glabrous adaxially, sometimes with a tuft of hair at the apex longer than the acumen, apex acuminate, acumen (4–)10–23(–25) mm long, base broad cuneate, or acute, to rarely obtuse, sometimes attenuate, midrib raised abaxially, impressed adaxially, secondary veins (7–)9–14(–19) per side. **Inflorescences** cauliflorous or rarely ramiflorous (*L. W. Chatrou et al. 447*, OWU), 3–6-flowered; **peduncles** 2–4 mm long; **pedicels** (4–)6–15 mm long, sericeous or tomentose to glabrous; **buds** narrowly triangular to triangular; **bracts** 1–2, one at the base and another near the midpoint of the pedicel or nearly above, when there is only one, it is at the base of the pedicel, basal bract often caducous, 4.5–6 × 1.5–4 mm, triangular to triangular ovate, clasping, sericeous abaxially, glabrous adaxially. **Calyx** cup-shaped, smooth, calyx tube 1.5–2 x 7.5–10 mm; **sepals** connate ca. ½ of their length or more, calyx lobes 2.5–3 × (6–)7–10 mm, broad triangular ovate to broad ovate, yellowish beige, yellowish, green or greenish, sparsely short villous, hairs concentrated at the apex and the base of the sepals abaxially, glabrous adaxially, apex obtuse, with a small sharp point, to acuminate; **petals** yellowish beige, cream, yellowish, or yellow *in vivo,* or yellow-orange, orange or pinkish *in* *sched.*, with a triangular brown spot at the base of inner petals *in sched.*; **outer petals** 28–50(–60) mm long, 3.5–6 mm wide at midpoint, triangular to narrowly triangular, base enlarged and slightly concave, slightly lanceolate, fleshy, rarely puberulent to glabrous, or densely sericeous abaxially, glabrate to glabrous adaxially, apex acute; **inner petals** 23–40(–50) mm long, 2–3(–4) mm wide at midpoint, extremely narrowly triangular or linear, base slightly enlarged and concave, nearly lanceolate, rhombic in cross section at midpoint, longitudinally keeled at midpoint abaxially, fleshy, glabrate to glabrous, or sparsely short sericeous at base and margins abaxially, glabrous with base glabrate adaxially, apex acute to acuminate; **stamens** 325–350; **fertile stamens** 260–275, 1.4–2 × 0.25–0.6 mm, narrowly oblong, apex of the connective papillate, anthers 10–12-locellate; **outer staminodes** 30–45, (1–)1.2–1.6 × 0.35–0.6 mm, narrowly oblong, glabrous, apex of connective finely papillate; **inner staminodes** 20–45, (1–)1.2–1.7 × 0.4–0.7 mm; **staminal cone** 2.5–3.8 mm in diameter, 2–2.5 mm high, conical or flattened, higher only at the central part; **carpels** 25–30(–40), 4.6–7.5 mm long, ovary 1.8–2.5 × 0.2 mm, densely golden to rusty sericeous; **ovules** 6–8; stigmas 2.8–5 × ca. 0.4 mm, entirely glabrous or glabrous at the region close to ovary and with rare (2–4) erect and hyaline hairs distally. **Fruit** of (14–)25–40 monocarps borne on **pedicels** (6–)16–20 mm long, glabrate to glabrous; **torus** ca. 14 mm in diameter, 9–10 mm high, depressed globose or semi-globose. **Monocarps** 15–48 × 9–21 mm, 7–9 mm thick, flattened oblong, generally falcate, slightly constricted between seeds, apex acute, sometimes very tiny apiculate, apiculus 0.6–0.8 mm long, reddish, or reddish green, reddish dark brown *in vivo*, finely warty surface, strongly obliquely wrinkled when dried, rarely wrinkled in all directions, often glabrous to glabrate, sometimes pubescent; **stipes** (3–)4–12 mm long, slightly wrinkled, glabrous or glabrate, to rarely pubescent; **seeds** 1–6, 8–10 × 4.7–7 mm, obovoid or flattened ellipsoid, yellowish brown to dark brown, smooth, aril pale brown to dark brown, lobes 1.5–2 × 1.5–2 mm. Figures 4C, 7A-C and G, 7D-F.

Key to the varieties of *Xylopia benthamii*

1. Indument on the abaxial surface of the leaf blades dense; outer petals 30–45(–50) mm long, glabrous to glabrate, rarely puberulent abaxially; inner petals glabrate to glabrous abaxially; staminal cone conical; fruit pedicels 6–10 mm long……………………………………………………………………………………………………5a.*Xylopia benthamii* var. *benthamii*

1’. Indument on the abaxial surface of the leaf blades sparse; outer petals 24–28 mm long, densely sericeous abaxially; inner petals sparsely short sericeous at the base and margins abaxially; staminal cone flattened; fruit pedicels 16–20 mm long……………………..……… ……………………..………………………..…………………..…5b. *Xylopia benthamii* var. *ulei*

3.3.5.1.5a XYLOPIA BENTHAMII R.E.Fr. VAR. BENTHAMII

Xylopia benthamii R.E.Fr. var. *subnuda* R.E.Fr., Acta Horti Berg. 10(2): 333. 1931 ‘‘benthami’’. TYPE: PERU. Ostperu, Dept. Loreto, Mishuyacu bei Iquitos, 100 m. ü. d. M., im Wald, Oct-Nov 1929 (1928, in the protologue) [probably a mistake], *G. Klug 557* (holotype: B [destroyed], lectotype, here designated: F 613441!, isolectotypes: NY-00066752!, S-R-6848 [fragment] (digital image!), US-00078769!).

Xylopia benthamii R.E.Fr. var. *dolichopetala* R.E.Fr., Ark. Bot. 33A(9): 8. 1947 ‘‘benthami’’. TYPE: PERU. Dep. Loreto, vicinity of Iquitos, Quistococha, edge of forest, *E. Asplund 14679* (lectotype, here designated: S-R-6847 [leaves branch] (digital image!), S-13-2952 [longitudinal bark sections of the trunk with remain of cauliflorous inflorescences and parts of the flowers] (digital image!) [2 sheets], isolectotype: S-13-2957 (digital image!)).

Additional Illustration— Fries (1900: tab. V, Figs. 2–4).

Distribution and habitat— *Xylopia benthamii* var. *benthamii* occurs in the Amazon Basin in Bolivia, Brazil, French Guiana, Guyana, Peru, Suriname, and Venezuela, In Brazil, this variety is distributed in the states of Acre, Amazonas, Mato Grosso, Pará, and Rondônia (Figure 8).

Vernacular names — “*Espintana Negra*” (Peru, *C. H. Dodson & J. Torres 2948*, MO), “*Palo de viudo*” (Venezuela, *E. Foldats & J. Velazco 9243*, MO), “*Pinsha callo*” (*R. Vásquez et al. 5967*, MO), “*Tsaru yais*” (Peru, *W. H. Lewis et al. 13367*, MO), “*Uwinim yais*” (Peru, *W. H. Lewis et al. 13463*, MO), “*Weshiraure*” (Guyana, *N. Y. Sandwith 353,* NY), “*Weshirowli*” (Guyana, *T. G. Tutin 204*, US).

Uses — “*Wood used in house construction, hard, excellent*” (*W. H. Lewis et al. 13463*, MO).

Phenology— Specimens with flowers have been collected in all months of the year, except in August and December, and specimens with fruits have been collected from February to November.

Notes— *Xylopia benthamii* is characterized by its villous young twigs, sometimes sparsely, or occasionally only rare erect hairs; cauliflorous or rarely ramiflorous inflorescences, 3–6-flowered; narrowly triangular to triangular buds; cup-shaped calyx, calyx tube 1.5–2 mm long; outer petals 28–50(–60) mm long, 3.5–6 mm wide at midpoint, inner petals 23–40(–50) mm long, 2–3(–4) mm wide at midpoint; 325–350 stamens, fertile stamens 1.4–2 mm long; (14–)25–40 monocarps, 15–48 × 9–21 mm, strongly obliquely wrinkled when dried; and seeds 8–10 mm long.

Xylopia benthamii resembles *X. aromatica* and *X. cayennensis* Maas. *Xylopia benthamii* differs from *X. aromatica* by its villous young twigs, sometimes only with sparse or rare erect hairs (*vs.* densely to sparsely tomentose); cauliflorous or rarely ramiflorous inflorescences (*vs.* axillary); flower pedicels (4–)6–15 mm long (*vs.* 2–3(–4) mm); 230–290 stamens (*vs.* 325–350), fertile stamens 1.4–2 mm long (*vs.* 0.8–1.1 mm); carpels 4.6–7.5 mm long (*vs.* 1.3–1.8 mm); monocarps 9–21 mm wide (*vs.* 5–8 mm), slightly constricted between seeds, apex acute, sometimes very tiny apiculate, strongly obliquely wrinkled when dried (*vs.* not constricted between seeds, apex rounded to rarely acute or slightly acute, smooth when dried); and seeds 8–10 mm long (*vs.* 5–6 mm).

Xylopia benthamii can be distinguished from *X. cayennensis* by its villous young twigs, sometimes only with sparse or rare erect hairs (*vs.* glabrate to glabrous, rarely pubescent to puberulent); cauliflorous or rarely ramiflorous inflorescences (*vs.* axillary); flower pedicels (4–)6–15 mm long (*vs.* 2–4 mm); calyx tube 1.5–2 mm long (*vs.* 3.5– mm); calyx lobes 2.5–3 mm long (*vs.* 1–2 mm); fertile stamens 1.4–2 mm long (*vs.* (0.5–)0.7–1 mm); and carpels 4.6–7.5 mm long (*vs.* 2.5–3 mm).

Xylopia benthamii is slightly similar to *X. crinita* R.E.Fr.*, X. excellens* R.E.Fr.*,* and *X. xylantha* R.E.Fr., for sharing the cup-shaped calyx with these species, but it can be easily distinguished from these by other characters. *Xylopia benthamii* is distinguished from *X. crinita* by its villous young twigs, sometimes only with sparse or rare erect hairs (*vs.* tomentose to velutinous, often densely); villous to sericeous leaf blades on the abaxial surface (*vs.* tomentose to velutinous), cuneate to acute, sometimes attenuate base (*vs.* obtuse, cordate or slightly asymmetric); calyx tube 1.5–2 mm long (*vs.* 5–10 mm); outer petals 28–50(–60) mm long (*vs*. (17–)20–22 mm), inner petals 23–40(–50) mm long (*vs*. 15–20 mm); glabrous to glabrate monocarps (*vs*. densely rusty tomentose).

Xylopia benthamii differs from *X. excellens* by its leaf blades (2.5–)3.7–11.7(–14) cm (*vs*. (11.5–)13–26.5(–30.5) cm), villous to sericeous abaxial surface of the leaf blades (*vs*. tomentose to velutinous), with acuminate apex (*vs*. cuspidate, rarely acute), cuneate to acute, sometimes attenuate base (*vs*. rounded or obtuse, sometimes slightly asymmetric or cordate); cauliflorous or rarely ramiflorous inflorescences (*vs*. axillary); calyx tube 1.5–2 mm long (*vs*. (3–)5–7 mm); outer petals 28–50(–60) mm long (*vs*. (21–)24–26 mm), inner petals 23–40(–50) mm long (*vs*. 19–21 mm); and glabrous to glabrate, sometimes pubescent monocarps (*vs*. densely tomentose).

Xylopia benthamii is distinguished from *X. xylantha* by its villous young twigs, sometimes only with sparse or rare erect hairs (*vs*. densely to sparsely sericeous to tomentose); leaf blades 1–2.8(–3.5) cm wide (*vs*. (3–)3.6–5.5 cm); 3–6-flowered, cauliflorous or rarely ramiflorous inflorescences (*vs*. flowers solitary, axillary); calyx tube 1.5–2 mm long (*vs*. 6–8.5 mm); and outer petals 3.5–6 mm long (*vs*. 11–12 mm).

The remarkable characters of the typical variety of *X. benthamii* are: the denser indument on the abaxial surface of the leaf blades; outer petals 30–45(–50) mm long, glabrous to glabrate, rarely puberulent abaxially; inner petals glabrate to glabrous abaxially; conical staminal cone; and fruit pedicels 6–10 mm long.

In the protologue of *X. benthamii*, Fries (1900) mentioned that the holotype of this species, Spruce 3290, was at B. Nowadays this type is no more extant at B. Dr. Robert Vogt, from B, informed that the specimen was probably lost in the fire of the Botanical Museum, during the Second World War. The specimen from K (K-000221102) was chosen among the broad list of isotypes of the species, because it matches the protologue, has small portions of the trunk with flowers, demonstrating the cauliflory, an important feature of this species, and also bears a small label with Fries' handwriting identifying the specimen as *X. benthamii.*

In the protologue of *X. benthamii* var. *subnuda*, Fries (1931) also mentioned the holotype was at B, but, as the former, it was probably lost during the Second World War. We chose here the isotype at F (F 613441) as the lectotype, because it fits the protologue, is a well preserved material with parts of flowers and a monocarp in the packet, and it also has an identification label with Fries handwriting. The labels of all of the specimens list 1929 as the year of the collection, and not 1928 as in the protologue, so, we believe that was a typing error in the protologue.

Fries (1947) cited in the protologue of *X. benthamii* var. *dolichopetala* two examined collections, *E. Asplund 14753* and *14679*, from Herbarium Regnellianum, both stored at S. We couldn't find the first collection at S, but we found there three sheets of *E. Asplund 14679*. We did not find the specimen *E. Asplund 14753* at none herbarium indicated by Stafleu and Cowan (1976) where collections of E. Asplund could be. We chose here the sheets S-13-2952 and S-R-6847 as the lectotype, because they are clearly complementary and part of the same collection, although they have different access numbers (Turland et al. 2018, ICN Art. 8.3). The first sheet has only a branch with leaves and the second one has longitudinal bark sections of the trunk with remains of cauliflorous inflorescences and several parts of flowers. Both have identification labels with Fries's handwriting.

Selected Specimens Examined— **Bolivia.** — SANTA CRUZ: Velasco, a 30 km de Piso, camino a Porvernir, al borde del camino, 13°44′37″S, 61°61′4″W, 180 m elev., 27 Oct 2000, *I. G. Vargas & C. Jordan 6196* (MO); Ichilo, 6 km SW of Villa San Germán, south side of Río Moile, opposite Campamento Moile of Park Nacional Amboró, 17°24′S, 64°08′W, 275 m elev., 21 Nov 2000, *M. Nee & E. Chávez 51619* (NY). — **Brazil.** — ACRE: Cruzeiro do Sul, BR-364, near airport, 7°37′4″S, 72°47′52″W, 21 Oct 2001, *P. J. M. Maas et al. 9133* (MO, NY). — AMAZONAS: Humaitá, near Tres Casas, 14 Sep - 11 Oct 1934, *B. A. Krukoff 6426* (MO); Itapiranga, rio Uatumã, margem esquerda subindo o rio, 18 Jul 1979, *C. A. Cid Ferreira et al. 483* (NY, RB); Manaus, Distrito Agropecuário, ZF3, 90 km NNE de Manaus, Reserva 1501 (km 41), 2 Oct 1991, *A. A. Oliveira et al. 136* (INPA, NY); Entre Manaus e Itacoatiara, Reserva Ducke, trilha da Torre, próxima à beira da trilha, 2°56′0.6″S, 59°57′0.753″W, 92 m elev., 18 Sep 2015, *A. F. Pontes-Pires et al. 919* (JPB); Manaus – Porto Velho Road, BR-319, km 378, on bank of rio Jutaí, black-water flooded margin, 15 Oct 1974, *G. T. Prance et al. 22936* (MO); Presidente Figueiredo, canteiro de obras da Hidrelétrica Balbina, 8 km da Vila Residencial Atroari, margem esquerda do rio Uatumã, 2°00′S, 60°00′W, 11 Mar 1986, *C. A. Cid Ferreira 6733* (INPA, NY, UB); Rio Curuquetê, vicinity of Cachoeira Santo Antonio, 14 Jul 1971, *G. T. Prance et al. 14195* (NY); Tapauá, Floresta Estadual Tapauá, 6°40′5″S, 62°58′43″W, 11 Sep 2010, *E. M. B. Prata et al. 461* (RB). MATO GROSSO: Aripuanã, forest on West side of rio Aripuanã, below Salto dos Dardanelos, 15 Oct 1978, *C. C. Berg et al. P18553* (MO); Cláudia, Fazenda Continental, Módulo do PPBio I, na beira do riozinho próximo ao acampamento, *A. F. Pontes-Pires et al. 826* (CNMT); Itaúba, Resgate de Flora da Linha de Transmissão da UHE Colíder, 281 m elev., 1 Aug 2017, *M. E. Engels et al. 5814* (RB); Juruena, ca. 27 km WSW (em linha reta) de Juruena, 10°22′S, 58°47′W,10 Jul 1997, *V. C. Souza et al. 18683* (ESA, RB); Paranaíta, Fazenda Palmital, em direção a Blasa Apiacás, margem do rio Teles Pires, 22 Jul 2008, *V. Maioli et al. 777* (RB). PARÁ: Belterra, Floresta Nacional do Tapajós, trilha partindo da BR-163, logo após o igarapé do km 84, próximo ao alojamento do LBA, 100 m elev., 3°3′3″S, 54°55′46″W, 18 Nov 2016, *L. L. Giacomin et al. 2983* (RB); Borba, Bacia do rio Amazonas, rio Canumã afluente do rio Madeira, igarapé das Onças, 3 km ao Norte da Vila de Canumã, 30 Jun 1983, *C. A. Cid ferreira 3963* (INPA, NY); Faro, mata de Terra Firme atrás da cidade, 6 Jan 1920, *A. Ducke s.n.* (RB); Ilha de marajó, rio Jipurú, afluente do rio Anajás, 00–01°S, 50–51°W, 23 Oct 1987, *A. S. Tavares 255* (MO, NY); Itaituba, estrada Santarém-Cuiabá, BR-163, 7°40′S, 55°15′W, 11 May 1983, *I. L. do Amaral et al. 1214* (NY); Jari, estrada entre Planalto A e Braço, 14 Apr 1969, *N. T. Silva 1861* (NY); Marituba, CEPLAC, 1°23′6.1″S, 48°17′26.6″W, 37 m elev., *A. F. Pontes-Pires et al. 930* (JPB); Oriximiná, rio Trombetas, margem esquerda, lago Erepecu, ao Norte do lago, 18 Jul 1980, *C. A. Cid Ferreira et al. 1617* (MO, RB); Rio Tapajós, 30 Mar 1922, *A. Ducke s.n.* (RB 17871). — RONDÔNIA: estrada que vai para a Fazenda Estrela de Rondônia, localidade Guaporé, 12°45′S, 60°10′W, 8 Nov 1979, *M. G. Vieira et al. 1016* (MO, RB); Guaporé, 90 km of Vilhena on BR-364, 8 Nov 1979, *B. W. Nelson 390* (MO, NY); Itapuã do Oeste, Floresta Nacional do Jamari, Concessão MADEFLONA, 28.7 km from km 602 of BR-364 in Itapuã do Oeste, 18.7 km on Estrada Principal, then 10 km to left on Eixo Leste road, 30 Nov 2011, *W. Castro et al. 3* (RB); Mineração Jacundá, ca. 40 km E of km 106 of Porto Velho – Cuiabá Road, BR-364, 9°7′S, 62°54′W, 7 Oct 1979, *J. L. Zarucchi et al. 2614* (MO, RB); Porto Velho, ao longo da BR-364, 9 km E de Jaci Paraná, ramal 1 km ao sul, linha de transmissão Jirau-Porto Velho, 9°13′59″S, 64°19′43″W, 96 m elev., 16 Jul 2011, *M. F. Simon et al. 1347* (NY); Vale do Arari, REBIO Jaru, Trilha da LBA, 10°4′71″S, 61°19′97″W, 97 m elev., 9 Jun 2015, *N. C. Bigio et al. 1847* (RB). — **French Guiana.** — Road Régina – St. Georges (RN2), forest South of road, 8 Aug 2005, *P. J. M. Maas et al. 9635* (OWU). — **Guyana.** — Barima River, Northwest District, 8°20′N, 59°50′W, 19–22 Mar 1923, *J. S. de La Cruz 3412* (F, MO, NY); Bartica-Potaro Road, ca. 83 milles, clump Wallaba bush, 21 Jun 1935, *T. G. Tutin 204* (RB, US); Basin of Essequibo River, Itanine Falls, 30 Sep 1937, *A. C. Smith 2150* (F, NY); ca. 3 km from Mabura Hill, in clearing for logging road, 5°19′N, 58°38′W, 28 Oct 1982, *A. L. Stoffers et al. 77* (F, MO, NY, RB); Demerara-Mahaica Region, along Soesdyke-Linden Hwy from Timehri Airport to Kuru-Kuru Creek, 6°25′N, 58°15′W, 10–30 m elev., 18 Mar 1988, *W. J. Hahn et al. 3886* (NY); E. Berbice-Corentyne Region, left bank Canje River, ± 0.75 km N or Ekwarun River, 5°20′N, 57°38′W, 10 Apr 1987, *J. J. Pipoly et al. 11369* (NY, US); Kaieteur Plateau, Savanna and savana-forest from vicinity of Kaieteur Falls to Mure-Mure Savanna, 2 Mar 1962, *R. S. Cowan & T. R. Soderstrom 2135* (F); Region Potaro-Siparuni, Iwokrama Rainforest Reserve, N of Surama, 4°10′N, 59°03′W, 200 m elev., 21 May 1995, *C. Ehringhaus 127* (NY); Region Potaro-Siparuni, Kaieteur National Park, Plot Study nº 1 NE from end of airstrip at headwaters of Korume Creek, 5°10′N, 59°29′W, 300 and 350 m elev., 11–19 Mar 1997, *C. Kelloff 1292* (MO); Upper Mazaruni River Basin, Partang River, Merume Mountain, 15 Jun 1960, *B. Maguire et al. 43861* (MO, NY). — **Peru.** — LORETO: Alto Amazonas Prov., Puranchim, río Sinchiyacu, 2°30′N, 76°55′W, 200 m elev., 30 Mar - 1 Apr 1987, *W. H. Lewis et al. 13463* (MO); Maynas, Alpahuayo (Estación IIAP), 14 Nov 1984, *R. Vásquez et al. 5967* (MO); Maynas, Dtto. Iquitos, Río Nanay, Nina Rumi, just above Puerto Almendro, 4 Oct 1975, *S. McDaniel & M. Rimachi Y. 20292* (MO); Prov. Maynas, Nauta, carretera a Iquitos, 4°29′S, 73°35′W, 150 m elev., 9 Dec 1986, *R. Vásquez & N. Jaramillo 8504* (MO); Prov. Maynas, Puerto Almendras, 3°48′S, 73°25′W, 122 m elev., 29 Sep 1986, *R. Vásquez & N. Jaramillo 8020* (MO); Ucayalli Province, Distrito Puinahua, Reserva Nacional Pacaya-Samiria, trocha ancho para salir carretera, 5°00′S, 74°00′W, 120 m elev., 18 Nov 1986, *C. Grández & N. Jaramillo 709* (MO). — MADRE DE DIOS: Manu Province, Manú National Park, Cocha Cashu Biological Station, 11°50′S, 71°25′W, 400 m elev., 18 Aug-Sep 1989, *P. Núñes et al. 11349* (MO); Tambopata Province, Santuario Nacional Pampas del Heath, Río Heath, 12°39′23″S, 68°44′13″E, 210 m elev., 16 May 1996, *M. Aguilar & D. Castro 693* (MO). — PUNO: Puno, Río Candano, fila at mouth of Río Guacamayo, 13°30′S, 69°50′W, 800 m elev., 25 May 1992, *A. Gentry et al. 77153* (MO). — **Suriname.** — Distr. Nickerie, area of Kalebo Dam Project, savana forest near 3000 m in line from road km 80 eastward, 30–130 m elev., 13 Nov 1981, *J. C. Lindeman & A. C. de Roon 826* (MO, NY, US). — **Venezuela**. — AMAZONAS: Dpto. Atures, Río Guayapo, unos 110 km sobre su boca en el Río Sisapo, 4°18′N, 67°28′W, May 1989, *E. Foldats & J. Velazco 9243* (MO); Depto. Atabapo, Caño Iguapo (Aguas Negras), Alto Río Orinoco, igapó 15 km al SE de La Esmeralda, 3°7′N, 65°28′W, 150 m elev., 24 Feb 1990, *G. Aymard & L. Delgado 8201* (MO, NY); Capihuara, Casiquiare, 118 m elev., 4 Jun 1942, *L. Williams 15796* (F, US); Município Río Negro, Parcelas del IVIC, Carretera San Carlos de Río Negro - Solano, 1°55′N, 67°2′W, 11 Mar 2006, *G. Aymard et al. 12654* (MO); Río Pacimoni-Yatua, on Piedra Arauicaua, 500 m elev., 15 Jul 1959, *J. J. Wurdack & L. S. Adderley 43456* (NY). — BOLÍVAR: Aripao, El cacaro, Helipuerto 7, 5°9′N, 64°27′W, 300 m elev., May 1989, *E. Marín 317* (NY); Municipio

Foráneo Aripao, Alto Río Caura, 15 km aguas arriba de la comunidade Y'ekuana "Araguaha", 4°74′N, 64°12′W, 300 m elev., 4–5 May 1988, *G. Aymard & L. Delgado 6889* (MO, NY); Mncpio Sucre, Río Erebato com Kakara. Sítio AC03, margem izquierda del Kakara, 5°29.864′N, 64°34.764′W, 200–300 m elev., 25 Nov 2000, *W. Diaz et al. 4633* (NY).

3.3.5.1.5b ***Xylopia benthamii*** R.E.Fr. var. ***ulei*** (Diels) Pontes-Pires & D.M.Johnson, comb. et stat. nov. *Xylopia ulei* Diels., Verh. Bot. Vereins Prov. Brandenburg 47: 133. 1905. – TYPE: [BRAZIL]. Hab in Brasiliae. Prov. Amazonas: pr. Juruá-Miry, flor. m., Aug 1901, *Ule 5629* (lectotype, designated by Fries 1930: B-10 0242278 (digital image!) [photo in: F!], isolectotypes: CORD-00002688 (digital image!), G-00226131 (digital image!), K-000221082 (digital image!), L-0038225 (digital image!), MG-005563!, S-R-7054 [fragment] (digital image!)).

Distribution and habitat— *Xylopia benthamii* var. *ulei* occurs in the Amazon Basin, in Bolivia, Brazil, and Peru. In Brazil it is distributed in Acre and Amazonas (Figure 8).

Vernacular names— "*Cuchicito*" (Bolivia, *M. Nee 38093*, MO), "*Envira da folha miúda*" (Brasil, Acre, *C. Ehringhaus et al. 718*, NY), "*Piraquinina*" (Bolivia, *M. Alexiades 1195*, NY).

Phenology— Specimens with flowers have been collected from July to October, and also in May and December, and specimens with fruits have been collected in September, October, and May.

Notes— *Xylopia benthamii* var. *ulei* can be recognized by its sparse indument on the abaxial surface of the leaf blades; outer petals 24–28 mm long, densely sericeous on the abaxial surface; inner petals sparsely short sericeous abaxially at the base and margins; flattened staminal cone; and fruit pedicels 16–20 mm long.

Xylopia ulei was listed as a synonym of *X. benthamii* by Maas et al. (2011). All the specimens of *Xylopia ulei* and *X. benthamii* analyzed are very similar on the habit, and in many vegetative and reproductive characteristics, so there is no justification to leave *X. ulei* as a distinct species from *X. benthamii*. However, we recognize here *X. ulei* as a distinct variety of *X. benthamii*. Because *X. benthamii* var. *ulei* can be distinguished from *X. benthamii* var. *benthamii* by its indument on the abaxial surface of the leaf blades and petals, the shape of the staminal cone and the length of the fruit pedicels.

In the protologue of *Xylopia ulei*, Diels (1905) did not quote the herbarium where the holotype was stored. Fries (1930) mentioned the "*typus speciei*" was at B. So, we considered that Fries chose the lectotype.

Selected Specimens Examined— **Bolivia.** — BENI: Province of Vaca Diez, Hamburgo, ca. 5 km SW of Riberalta, 220 m elev., 11°2′S, 66°7′W, 03 Jun 1982, *J. C. Solomon 7901* (MO); Vaca Diez, along road between Riberalta and Cojija, 22 km W of Riberalta then N ca. 2 km to Lago Tumichucua, Isla Tumichucua, middle of Lago Tumichucua, 10°8′25″S, 66°10′8″W, 14 Aug 2000, *T. B. Croat et al. 84505* (MO). — LA PAZ: Abel Iturralde Province, Río Enlatagua, ridge top ca. 5 km NW of Río Madidi junction, 400 m elev., 20 May 1990, *A. Gentry et al. 70213* (MO); Franz Tamayo, Parque Nacional Madidi, Laguna Chalalan, Sendero Wuichi, 14°25′39″S, 67°54′57″W, 350 m elev., 28 May 2010, *S. E. Hoyos-Gomez et al. 1040* (MO). — PANDO: Prov. Madre de Dios, Rio Beni, Ese exa Community of Portachuelo Bajo, ca. 30 km southwest of Riberalta, 11°15′S, 66°18′W, 200 m elev., 18 Sep 1994, *M. Alexiades 1195* (NY); Prov. Manuripi, ca. 40 km al S del río manuripi, Carretera entre Cobija y Chivé, 12°6′S, 68°36′W, 200 m elev., 5 Oct 1991, *A. Perry et al. 474* (MO). — SANTA CRUZ: Prov. Andres Ibañes, Reserva Privada de Patrimonio Natural Arubaí, trayecto de entre la casa de la propiedad y el arroyo que desemboca al río Huendá, 17°41.44′S, 63°2.68′W, 200 m elev. 10 Set 2006, *D. Villarroel et al. 786* (MO); Prov. Ichilo, Parque Nacional Amboro, slopes above Quebrada Yapoje, upstream from confluence with the Río Saguayo, 17°34′S, 63°44′W, 400 m elev., 12 Dec 1989, *M. H. Nee 38093* (MO). — **Brazil.** — ACRE: Cruzeiro do Sul, Rio Juruá, margem esquerda, entrada do Igarapé Viseu, 03 Nov 1991, *C. A. Cid Ferreira et al. 10538* (INPA, NY, OWU); Rio Branco, Zoobotanical Garden of Federal Univ. of Acre, 26 Sep 1980, *S. R. Lorie et al. 204* (MO, NY, RB, US); 9 km from Rio Branco, on Rio Branco-Porto Acre road at cut-off for the Colonia Cinco Mil, 26 Oct 1980, *S. R. Lorie et al. 647* (MO, NY, US); Xapuri, Reserva Extrativista Chico Mendes, Seringal Dois Irmãos, Colocação Já Começa, 10°33′57″S, 68°17′48″W, 22 Sep 1998, *C. Ehringhaus et al. 718* (NY). — **Peru.** — MADRE DE DIOS: Tambopata Province, Zona reservada de Tambopata, 12°49′S, 89°18′W, 280 m elev., 10 Aug 1990, *C. Reynel & E. Meneses 5026* (MO); Tambopata, Distrito Las Piedras, Fundo Concepción, 12°36′23″S, 69°3′23″W, 280 m elev., 18 Jul 2007, *L. Valenzuela & J. Farfán 9945*(MO). — MANU: Parque Nacional Manu, Río Manu, Pakitsa Station behind camp, 11°56′S, 71°16′W, 350 m elev., 18 Dec 1988, *R. B. Foster & S. Baldeon 12620* (NY).

3.3.5.1.6 XYLOPIA CAYENNENSIS Maas, Bot. Jahrb. Syst. 115: 93. 1993. *Xylopia nitida* Dunal var. *longifolia* Sagot, Ann. Sci. Nat., Bot. sér. 6. 11: 137. 1881 [1880]. *Xylopia longifolia* (Sagot) R.E.Fr., Acta Horti Berg. 10: 111. 1930, non A.DC. TYPE: FRENCH GUIANA. Karouany [Acarouany], 1856 (fl, fr), *Sagot 940* (first-step lectotype, designated by Fries 1930, second-step lectotype, here designated: P-00202585 (digital image!); isotypes: B-100249563 (digital image!), BM-000554085 (digital image!), BR-0000006955670 (digital image!), BR-0000006956325 (digital image!), GOET-000135 (digital image!), K-000221083 (digital image!), P-00202581 (digital image!), P-00202582 (digital image!), P-00202583 (digital image!), P-00202584 (digital image!), S-R-7419 (digital image!), U-0000439 (digital image!), U-0000440 (digital image!)).

Trees 5–20 m tall, d.b.h.15–23 cm; **bole** with buttresses up to 80 cm high *in sched.*, bark longitudinally wrinkled in young twigs and slightly fissured when older. Twigs with golden to rarely pale rusty hairs. Petioles, abaxial surfaces of leaves, inflorescences, and flowers with golden hairs. **Twigs** glabrate to glabrous, or rarely pubescent to puberulent, dark brown to black, with beige lenticels. **Petioles** 2.5–7 mm long, canaliculate, dark brown to black, glabrate to glabrous, sometimes pubescent in the groove; **leaf blades** (6–)9–18.5(–20) × (1.6–)2.2–3.5(–4.5) cm, narrowly elliptic or elliptic, chartaceous, brown or rarely green grayish, mostly glabrate to glabrous, sometimes pubescent, puberulent or sparsely short sericeous abaxially, brown to dark brown, glabrate to glabrous on adaxial surface, apex acuminate, acumen 5–15 mm long, base acute to less frequent cuneate, midrib raised abaxially, impressed adaxially, secondary veins (11–)15–22 pairs. **Inflorescences** axillary, sometimes in the leafless portion of older twigs, (1–)2–6-flowered; **pedicels** 2–4 mm long, glabrate to glabrous; **buds** narrowly triangular; **bracts** 1–2, ca. 2.5 x 3 mm, triangular ovate, clasping, apex shape acute, sericeous abaxially, glabrous adaxially. **Calyx** cup-shaped, short, smooth, calyx tube ca. 3.5–4 mm long, **sepals** connate from ½ of their length to almost completely, calyx lobes 1–2 × (3.5–)5–7 mm, triangular ovate, sericeous abaxially, glabrous adaxially, apex acute; **outer petals** 15–22 mm long, ca. 2 mm wide at midpoint, narrowly triangular, slightly fleshy, rusty or reddish abaxially and white adaxially *in vivo*, densely sericeous abaxially, tomentellous with base glabrous adaxially, apex acute; **inner petals** 11–16 mm long, 1.5–2 mm wide at midpoint, linear to narrowly triangular, nearly lanceolate, fleshy, white *in vivo*, tomentellous on both surfaces, apex acute; **stamens** 200–230, **fertile stamens** 170–200, (0.5–)0.7–1.2 mm long, apex of connective ca. 0.2 mm long, discoid, short, papillate, anthers 13–17-locellate, nearly club-shaped, glabrous, filament 0.1–0.2 mm long; **outer staminodes** ca. 15, 0.5–1.4 mm long, nearly flattened club-shaped, or flattened oblong, glabrous, apex of connective 0.3–0.5 mm long, flattened discoid, or flattened rounded, short, papillate, anthers shorter than in fertile stamens, without locelli or with less locelli than in fertile stamen, filament 0.3–0.5 mm long; **inner staminodes** ca. 15, 0.5–1 mm long, flattened oblong, glabrous; **staminal cone** nearly conical; **carpels** 20–25, (1.8–)3–3.3 mm long, ovary (0.8–)1–1.3 mm long, narrowly obclavate, tomentellous to glabrate, **ovules** 4–8, stigmas (1.0–)2 mm long, filiform, sparsely tomentellous, 2–5 hairs longer and erect at apex. **Fruits** of 9–17 monocarps borne on a **pedicel** 6–10 mm long; **Monocarps** (6–)10–21 × 5–11 mm wide, falcate or slightly falcate to oblong, not constricted between seeds, woody, green to reddish *in vivo*, apex rounded to rarely acute or slightly acute, smooth when dried, glabrous to glabrate; **stipes** (2–)3–7 mm long, glabrate to glabrous. **Seeds** 1–4, 5–6 × 4–5 mm, ellipsoid, dark brown to black, aril white *in sched.,* lobes ca. 1.5 × 2 mm. Figures 1A and E, 5I-P.

Distribution and habitat— *Xylopia cayennensis* occurs in Brazil, French Guiana, Guyana, and Suriname. In Brazil it is present in the states of Amapá and Pará, in lowland forest (*terra firme*), on clay soil.

Vernacular Names— "*Black Maho*" (French Guiana), "*Envira-branca*, *Envira cana*" (Brazil, Amapá, *N. A. Rosa 985*, MO), "*Envira-de-macaco*" (Brazil, Pará, *A. F. Pontes-Pires et al. 929*, JPB), "*Envireira*" (Brazil, Pará, *J. Oliveira et al. 192*, MG), "*Imbiriba*" (Brazil, Pará, *J. M. Pires 51917*, NY, RB).

Uses— "*Construction (wood)*" (French Guiana, *T. van Andel et al. 2209*, NY).

Phenology— Specimens with flowers have been collected in February, April, May, and November, and specimens with fruits have been collected from September to December, and also in July.

Notes— *Xylopia cayennensis* is characterized by its glabrate to glabrous, rarely pubescent to puberulent young twigs; mostly glabrate to glabrous, sometimes pubescent, puberulent or sparsely short sericeous on the abaxial of the leaf blades; narrowly triangular buds; short cup-shaped calyx, sepals connate from ½ of their length to almost completely; outer petals 15–22 mm long, ca. 2 mm wide at midpoint, inner petals 11–16 mm long, 1.5–2 mm wide at midpoint; 200–230 stamens, fertile stamens (0.5–)0.7–1.2 mm long, 13–17-locellate anthers, 20–25 carpels, (1.8–)3–3.3 mm long, sparsely tomentelous stigmas, with 2–5 hairs longer and erect at apex; and 9–17 monocarps.

Xylopia cayennensis is morphologically very close to *X. aromatica*, but it can be distinguished by its glabrate to glabrous, rarely pubescent to puberulent young twigs (*vs.* densely tomentose to tomentose); mostly glabrate to glabrous, sometimes pubescent, puberulent or sparsely short sericeous leaf blades on the abaxial surface (*vs.* sericeous to tomentose); with acute to cuneate leaf base (*vs.* obtuse, rounded, slightly asymmetric, or slightly truncate); outer petals 15–22 mm long (*vs.* 25–35(–48) mm long), inner petals 11–16 mm long (*vs.* 20–35(–40) mm long); and monocarps not constricted between the seeds, and smooth when dried (*vs.* moniliform or torulose in general, and wrinkled when dried).

Xylopia cayennensis also resembles *X. surinamensis*, but we can distinguish it from *X. surinamensis* by its glabrate to glabrous, or rarely pubescent to puberulent young twigs (*vs.* densely tomentose); smooth leaf blades (*vs.* verruculose); 9–17 monocarps (*vs.* 20–25), fruit pedicels 6–10 mm long (*vs.* ca. 20 mm); and stipes (2–)3–7 mm long (*vs.* 9–10 mm).

The species currently known as *X. cayennensis* was initially described as *X. nitida* Dunal var. *longifolia* Sagot (1881). Fries (1930), treated it as a species, *X. longifolia* (Sagot) R.E.Fr., but there was already an existing *X. longifolia* A.DC., described in 1832, currently a synonym of *X. aromatica*. Therefore, Maas (Maas et al. 1993) realized the name of Fries is illegitimate, being a later homonym, and proposed *X. cayennensis*, as a new name for *X. longifolia* (Sagot) R.E.Fr.

It was necessary to establish a second-step (Turland et al. 2018, ICN Art. 9.17) of lectotypification for *X. cayennensis*. In 1881, Sagot mentioned he distributed his collections to the principal European herbaria after he carefully determined the material and did not mentioned a specific herbarium where he deposited the holotype, which was not required at that time. Much later, Fries (1930) mentioned that the type collection for *Xylopia longifolia* (Sagot) R.E.Fr., *Sagot 940*, is at P, and we considered this as the first-step of lectotypification, because we found five sheets of this collection stored at P. Maas (Maas et al. 1993), when proposing the new combination of *X. cayennensis,* also cited the holotype as being at P, but he also did not indicate a particular specimen in the publication. Besides that, the specimens at P did not bear identification labels from Maas indicating the holotype. So, after studying the specimens digital images, we chose the specimen P-00202585 as the second-step lectotype because it matches the protologue of the new combination, and it is the most complete material, possessing some buds and two monocarps in the same sheet.

***Selected Specimens Examined*— Brazil.** — AMAPÁ: Colônia do Torrão, 2°25′N, 51°15′W, 29 Aug 1962, *J. M. Pires & P. B. Cavalcante 52683* (MG); Laranjal do Jari, estrada de terra em direção à Vila Padaria, vila a beira do rio Jari, 0°43′20.4″S, 52°27′22.0″W, 10 Nov 2016, *A. F. Pontes-Pires & R. A. Pontes 950* (JPB); Macapá, Porto Platon, margem da estrada de ferro, 12 Oct 1976, *N. A. Rosa 985* (MG, MO); Mazagão, BR-156, a beira da BR, após a Comunidade Maracá, no sentido Laranjal do Jari a Macapá, 00°09′02,7″S, 51°44′42,6″W, 11 Nov 2016, *A. F. Pontes-Pires & R. A. Pontes 952* (JPB); Oiapoque, BR-156, 50 km SSE of Oiapoque, ca. 3°21′N, 51°41′W, 1 Dec 1984, *B. V. Rabelo et al. 2857* (MG); Road to Amapá, km 48, 7 Jul 1962, *J. M. Pires & P. B. Cavalcante 52003* (MG). — PARÁ: Almeirim, Monte Dourado, Estrada MTD-Munguba, 10 Feb 1986, *M. C. A. Conceição 786* (INPA); Belém, Sep-Oct 1961, *J. M. Pires 51917* (NY, RB); Belém – Abaetetuba, 36 m elev., 1°37′10,5″S, 48°34′29,3″W, 30 Sep 2015, *A. F. Pontes-Pires et al. 934* (JPB); Marituba, área da CEPLAC, 38 m elev., 1°22′44,6″S, 48°17′44,1″W, 29 Sep 2015, *A. F. Pontes-Pires et al. 929* (JPB); Melgaço, área para a implantação da futura sede da Estação Científica Ferreira Penna, 18 May 1991, *J. Oliveira et al. 63* (MG); Moju, Campo Experimental da Embrapa Amazônia Oriental, 27 Mar 2003, *J. C. Freitas et al. 133* (IAN); Paragominas, Itinga, Fazenda Cabore, 4 Dec 1979, *U. N. Maciel et al. 428* (INPA, MG, NY), Peixe-boi, vila do Ananim, Fazenda Sra. Catarina, 21 NOv 1999, *J. Oliveira et al. 192* (MG). — **French Guiana.** — Piste de Saint-Ellie, Interfluve Snnamary/Counamama, 5°20′N, 53°0′W, 10 Dec 1993, *D. Sabatier & M. F. Prevost 4202* (NY); SAÜL: La Funée Mountain, Antenne Nord., 3°37′N, 53°12′W, ca. 400 m elev., *S. A. Mori & T. D. Pennington 17985* (MO, NY); Vicinity of Eaux Claires, Sentier Botanique, on gentle slope to plateau ca. 500 m. above *Huberodendron* trees, near first large gap along ridge Guyana, 2 Nov 1992. *S. A. Mori 22755* (INPA, NY, US). — **Guyana.** — Koko backdam, Moruca, North-West District, 8 Sep 1997, *T. van Andel et al. 2209* (NY). — **Suriname.** — Sipaliwini, 3.13 km SW from Kwamalasamutu village center, access trail begins at confl. Peritu Eeku (creek) & Sipaliwini R. (1.0 há research plot "KW3", 2°20′4″N, 56°48′21″W, 200 m elev., 26 Apr 2005, *B. Hoffman 6198* (NY, US).

3.3.5.1.7 XYLOPIA CRINITA R.E.Fr., Ark. Bot. n. s. 1(11): 447. f. 1 a-e. 1950. TYPE: BRAZIL. Amazonas: Rio Negro, Ilha das Flores, foz do rio Uaupés, 20 Oct 1947, *J. M. Pires 683* (holotype: K-000221085 (digital image!), isotypes: COL-000216185 (digital image!), IAN-030157!, INPA 3654!, NY-00066757!, NY-00066758!, S-08-15626 [fragment] (digital image!)).

Trees 4–12(–35) m tall, d.b.h. 10–18(–32) cm; **bole** with buttresses extending 50–100 cm up from the base *in sched.*, bark slightly wrinkled and peeling in minute pieces. Twigs, petioles, abaxial surfaces of leaves, inflorescences, flowers and fruits with rusty, brownish, pale rusty, golden, or hyaline hairs. **Twigs** tomentose to velutinous, often densely, glabrate when older, dark brown with paler brown lenticels. **Petioles** 1.5–2.5 mm long, canaliculate, tomentose to velutinous; **leaf blades** (3.8–)5.2–10.8 × (1.2–)2–3 cm, lanceolate elliptic to lanceolate, chartaceous to more rarely membranous, translucent glands present, greenish pale brown to grayish pale brown, tomentose to velutinous abaxially, densely at midrib, greenish pale brown, grayish brown and dark brown to blackish, glabrous to glabrate adaxially, sometimes with a tuft of hairs longer than the acumen, apex acuminate to less frequent cuspidate, acumen (8–)10–17 mm long, base obtuse, cordate or slightly asymmetric, midrib raised abaxially, impressed adaxially, secondary veins (12–)14–17 per side. **Inflorescences** cauliflorous, or axillary, sometimes born in older twigs, 1–3-flowered; **pedicels** 5–6 mm long, densely tomentose or densely velutinous; **buds** oblong ellipsoid to oblong; **bracts** 2, one larger at midpoint of pedicel, other smaller closer to the base of pedicel, 5–11 × 7.5–10 mm, triangular ovate, clasping, sparsely tomentose to velutinous abaxially, glabrous adaxially, apex acute. **Calyx** cup-shaped, smooth, calyx tube 5–10 × ca. 8 mm, **sepals** connate ½ of their length or more, calyx lobes 3–5 mm long, triangular, densely tomentose to velutinous abaxially, densely pubescent to tomentellous adaxially; **petals** yellow *in sched.*; **outer petals** (17–)20–22 mm long, 5–6 mm wide at midpoint, oblong elliptic to oblong, sometimes slightly constricted above the base, slightly fleshy, densely sericeous to tomentose abaxially, tomentellous to pubescent adaxially, apex acute; **inner petals** 15–20 mm long, 2.5–4 mm wide at midpoint, narrowly oblong, nearly narrowly lanceolate, fleshy, densely tomentellous to pubescent abaxially, densely puberulent adaxially, apex acute; **fertile stamens** 1.5–2 mm long; **outer staminodes** 1.5–2 mm long, often broader than the fertile stamens; **carpels** not observed**. Fruits** of ca. 25 monocarps. **Monocarps** (14–)21–45 × (6–)11–25 mm, flattened oblong to reniform, falcate, red to reddish *in sched.*, densely tomentose when young, pubescent to glabrate when older, apex slightly acute; **stipes** 2–5 mm long, tomentose. **Seeds** 3–5, 10–12 × 5–8 mm, oblong ellipsoid, dark brown. Figure 7O-S.

Distribution and habitat— This species is distributed in Brazil, Colombia, French Guiana, Guyana, Peru, and Venezuela. In Brazil, it grows in lowland Amazonian forests (*terra firme*), riverine forest on sandy-stony soil, open high savanna vegetation (*campina*) on white sandy soil, in the states of Acre, Amapá, and Amazonas (Figure 3).

Vernacular Names— "*Envira-preta*" (Brazil), "*Golondrino*" (Colombia, *A. Rudas et al. 3799,* MO).

Phenology— Specimens with flowers have been collected in February, May, October and November, and specimens with fruits have been collected from September to November, and also in June.

Notes— *Xylopia crinita* is characterized by its lanceolate-elliptic to lanceolate leaf blades, with an obtuse, cordate or slightly asymmetrical base; flowers with a cup-shaped calyx, densely rusty tomentose to velutinous abaxially and oblong-elliptic to oblong outer petals. It resembles *X. excellens* R.E.Fr., *X. macrantha* Triana & Planch. (a species from the coastal region of Colombia, Costa Rica, and Panama, not treated in this revision), and *X. xylantha*, because the cup-shaped calyx, an important character shared by them. Fries (1950) mentioned that these species form a well defined group within the genus, "*characterized by relatively large flowers, with thick, ligneous petals…*".

Xylopia crinita can be distinguished from *X. excellens* by its petioles 1.5–2.5 mm long (*vs*. (3–)4–6(–9) mm); leaf blades (3.8–)5.2–10.8 × (1.2–)2–3 mm (*vs*. (11.5–)13–26.5 × (4.8–)6–7.5(–9) mm), lanceolate elliptic to lanceolate (*vs*. oblong), chartaceous to more rarely membranous (*vs*. coriaceous); densely tomentose to velutinous calyx (*vs*. densely sericeous); and flattened oblong to reniform, falcate monocarps (*vs*. oblong to nearly globose, clavate).

It is possible to differentiate *Xylopia crinita* from *X. xylantha* by its petioles 1.5–2.5 mm long (*vs*. 3–6.5 mm long), leaf blades (1.2–)2–3 mm wide (*vs*. (3–)3.6–5.5 mm), lanceolate elliptic to lanceolate (*vs*. elliptic); densely tomentose to velutinous calyx (*vs*. sericeous); outer petals (17–)20–22 mm long (*vs*. 25–31 mm long), and 5–6 mm wide (*vs*. 11–12 mm wide).

Xylopia crinita also resembles *X. benthamii*, but it can be distinguished from this latter by its tomentose to velutinous young twigs (*vs*. villous, or sometimes only with sparse or rare erect hairs); tomentose to velutinous on the abaxial surface of the leaf blades (*vs*. villous to sericeous), with obtuse, cordate or slightly asymmetric base (*vs*. cuneate to acute, sometimes attenuate); calyx tube 5–10 mm long (*vs*. 1.5–2 mm); outer petals (17–)20–22 mm long (*vs*. 28–50(–60) mm), inner petals 15–20 mm long (*vs*. 23–40(–50) mm); monocarps densely rusty tomentose when young (*vs*. glabrous to glabrate, sometimes pale rusty pubescent); and seeds 10–12 mm long (*vs*. 8–9 mm).

Selected Specimens Examined— **Brazil.** — ACRE: Cruzeiro do Sul, km 6 of Cruzeiro do Sul-Boa Fé road (BR-307), then km 23 on Ramal dos carobas, Ponte do Igarapé Prêto, 7°30′5″S, 72°49′24″W, 17 Oct 2001, *P. J. M. Maas et al. 9026* (NY); Feijó, rio Jurupari, 25 Oct 2009, *H. medeiros et al. 205* (RB); Mâncio Lima, Pé da Serra do Divisor, entre o lugar Pedernal e Fazenda Boa Vista, 14 Oct 1989, *C. A. Cid Ferreira 10073* (INPA); ibid., Ramal do banho, a 5 km da Sede do município, 8 Nov 1991, *C. A. Cid Ferreira 10660* (INPA). — AMAPÁ: Parque Nacional Montanhas do Tumucumaque, rio Anotaié, Acampamento base, trilha 1, A7-38, 3°12′48.15″N, 52°2′17.62″W, 7 Sep 2005, *A. Lobão et al. 858* (RB). — AMAZONAS: Distrito Agropecuário, 90 km NNE de Manaus, Reserva 1501 (km 41), Projeto Dinâmica Biológica de Fragmentos Florestais, 2°20′26″–2°25′31″S, 59°43′40″–59°45′50″W, 50–125 m elev., 24 May 1992, *A. A. Oliveira et al. 449* (SPF); Estrada Manaus-Caracaraí, Km 45, Reserva Experimental de Silvicultura Tropical, 16 Jan 1972, *A. A. Loureiro 36* (INPA); Estrada Manaus-Itacoatiara, km 64, árvore nº 1–95 do Inventário Florestal, 25 Aug 1965, *W. A. Rodrigues 7933* (INPA, NY); Estrada Manaus-Itacoatiara, Reserva Forestal Ducke, km 26, 12 Nov 1966, *G. T. Prance et al. 3100* (INPA, NY); Estrada Manaus-Itacoatiara, Reserva Florestal Ducke, trilha da Torre, ca. de 500 m da Cantina (cozinha), perto da marca 0800, 16 Sep 2015, *A. F. Pontes-Pires & L. S. Mergulhão 916* (JPB); Estrada Manaus-Porto Velho, trecho compreendido entre os rios Castanho e Araçá, 12 Jul 1972, *M. F. da Silva 495* (INPA); Ilha das Flores, Alto Rio Negro, Inventário Florestal da Ilha das Flores, Fev 1959, *W. A. Rodrigues 1011* (INPA); Manaus, ZF2, Vicinal de origem no km 50 da Rodovia BR-174, Jun 2012, *T. D. Gaui 46* (INPA); São Gabriel da cachoeira, região N Amazonas, Alto Rio negro, Fazenda do Rio Içana, acima da Comunidade Boa Vista, Lugar Grilo, 80–150 m elev., 12 Nov 1987, *H. C. de Lima et al. 3167* (INPA, NY, RB). — **Colombia.** — Municipio de Leticia, Parque Nacional Natural Amacayacu, arredores de la quebrada Agua Pudre, Parcela E, n. 25, 3°42′S, 70°15′W, 120 m elev., 26 Mar 1992, *A. Rudas et al. 3799* (MO). — **French Guiana.** — Piste de Saint-Elie, Interfluve Sinnamary/Counamama, 5°20′N, 53°00′W, 19 Sep 1996, *D. Sabatier & M. F. Prevost 4359* (NY). — **Guyana.** — S Rupununi Savanna, Wakadanawa Savanna, 1°60′N, 59°34′W, 290 m elev., 12 Sep 1997, *M. J. Jansen-Jacobs et al. 5496* (NY). — **Peru.** — LORETO: Rio Tigre, San Jacinto, Campamento de Occidental Petroleum, ~30 km arriba de Bartra, ~20 km arriba de Marsella, y ~27 abajo del frontera com Ecuador, 0.5 km al este del campamento, 2°28′S, 75°47′W, 175–205 m elev., 10 Jun 1993, *H. Beltran & R. Foster 502* (F). — **Venezuela.** — AMAZONAS: Dpto. Casiquiare, Rio Casiquiare, Capihuara, 2°35′N, 66°18′W, 1 Feb 1991, *M. Colella & E. Guayamare 1741* (NY).

3.3.5.1.8 XYLOPIA CUSPIDATA Diels, Notizbl. Bot. Gart. Berlin-Dahlem 10: 175. 1927. TYPE: [PERU]. Ostperu, Unterer Itaya, Soledad, im flutfreien Hochwald, ca. 110 m ü. d. M., blühend 5 June 1925, *G. Tessmann 5323* (holotype: B-10 0242291 (digital image!) [photo in: F!, MO!]; isotypes: F 642530! [fragment], NY-00066759!).

Xylopia poeppigii R.E.Fr., Acta Horti Berg. 10 (1): 121. 1930. TYPE: PERU. Maynas, in silvis obscuris ad Yurimaguas, blühend Jan 1831, *E. F. Poeppig 2219* (holotype: W [destroyed in 1945], lectotype, here designated: BR-0000006960179 (digital image!); isolectotypes: B-10 0242284 (digital image!) [Photo in: F!, NY!], F 875398!, US-00098784!).

Trees 3–10 m tall, d.b.h. ca. 10 cm. Twigs, petioles, abaxial surfaces of leaves, inflorescences, flowers and fruits with golden, golden hyaline, pale brown to pale rusty hairs. **Twigs** sericeous to tomentose, glabrous to glabrate when older. **Petioles** canaliculate, (2.5–)3–6 mm long, dark brown, sericeous to tomentose; **leaf blades** 10.5–21 × (3.4–)4.5–7.8 cm, elliptic or oblong elliptic, less frequently oblanceolate, membranous to subchartaceous, pale brown to grayish pale brown and short sericeous abaxially, denser and longer at midrib, pale brown to brown and glabrous adaxially; midrib raised abaxially, flat adaxially, secondary veins 10–12(–17) pairs, apex cuspidate, cusp (10–)15–33(–50) mm long, base cuneate to acute. **Inflorescences** axillary, sometimes borne in older twigs, or cauliflorous *in sched.*, 1–4-flowered; **peduncles** (4–)6–7 mm long, **buds** ovoid; **bracts** 2, one at the base and another close to the midpoint of the pedicel, ca. 2.5 × 4 mm, triangular ovate, clasping, sericeous abaxially, apex acute. **Calyx** cup-shaped, smooth, calyx tube short and spreading, ca. 3 x 10 mm, **sepals** connate around ⅓ of their length, less frequent from ⅓ up to close to ½ of their lenght, calyx tube 2–3 mm long, calyx lobes ca. 3 mm long, ovate, sericeous abaxially, glabrate to glabrous adaxially, apex acute; **outer petals** ca. 15 mm long, 6–8 mm wide at midpoint, triangular ovate, glabrous at base, short sericeous abaxially, tomentelous adaxially, apex acute; **inner petals** 8–12 mm long, ca. 5 mm wide at midpoint, nearly rhombic, longitudinally keeled at midpoint abaxially, short tomentellous abaxially, pubescent to glabrate adaxially, apex acute to acuminate; **fertile stamens** (2–)2.9–3 × 0.3 mm, nearly club-shaped, glabrous, apex of connective 0.2 mm long, capitate, discoid, sometimes mushroom-shaped, papillate, anthers 12–14-locellate, filament 0.35–0.45 mm long; **outer staminodes** nearly club-shaped; **inner staminodes** ca. 3.2 × 0.7 mm, glabrous; **staminal cone** ca. 3.2 mm in diameter, ca. 3.2 mm high, cupuliform, cylindrical; **carpels** numerous, ovary densely sericeous, **ovules** 4, stigma filiform, not geniculate, clavate, 4–6 mm long, glabrous. **Fruits** of 10–16 monocarps. **Monocarps** 20–25 × 15 mm, flattened oblong, nearly falcate, slightly constricted between seeds, becoming red when ripe, obliquely rugose when dried, apex acute or nearly truncate, often apiculate, apiculus generally curved, densely tomentellous; **stipes** 8–9 mm long, pubescent to tomentellous. **Seeds** 1–5, 9–10 × 4–5 mm, ellipsoid.

Distribution and habitat— *Xylopia cuspidata* occurs in Bolivia, Brazil, Colombia, Ecuador, and Peru. In Brazil it occurs in the states of Acre and Amazonas, growing in lowland moist Amazonian forests (*terra firme*) on sandy soil mixed with clay, or in riverine forests on white sandy soil.

Vernacular Names— "*Sahimat*" (Peru).

Phenology— Specimens with flowers have been collected from May to November, and also in February and March, and specimens with fruits have been collected from January to April, from July to October, and also in December.

Notes— *Xylopia cuspidata* is characterized by its larger leaves, with a cuspidate apex, the cusp (10–)15–33(–50) mm long; axillary or cauliflorous (*in sched.*) inflorescences, 1–4-flowered; fertile stamens 2–3 mm long, anthers 12–14-locellate, staminal cone 3.2 mm in diameter, 3.2 mm high; monocarps densely golden or pale brown tomentellous with an acute or nearly truncate apex, often apiculate, and with the apiculus usually curved.

Diels (1927) described *X. cuspidata* in the "*Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem*" (Notes of the Berlin Botanic Garden and Herbarium), and mentioned *Tessmann 5323* as the type material. There is a specimen of *Tessmann 5323* at B, with an identification label from Diels and drawings of parts of the flower, so, we accepted it as the holotype.

The type material of *Xylopia cuspidata* consists of only three specimens (the holotype at B, the isotype at NY, and a leaf fragment at F), including a few floral fragments and no fruits. The lack of fertile material in the type collection is a difficulty to the delimitation and identification of this species and also to compare and distinguish it from close species, as *X. annoniflora, X. longicuspis* R.E.Fr. and *X. platypetala* R.E.Fr.

However, *Xylopia cuspidata* can be distinguished from *X. annoniflora* by its sericeous to tomentose young twigs (*vs.* velutinous to villous), without cataphylls (*vs.* cataphylls present); leaf blades with a cuspidate apex (*vs.* acuminate), and the cuneate to acute base (*vs.* rounded and asymmetric), sericeous abaxially (*vs.* sparsely to rarely velutinous); fertile stamens with anthers 12–14-locellate (*vs*. 8–10-locellate); and filiform stigmas (*vs*. falciform), glabrous (*vs*. with simple hairs).

Xylopia cuspidata differs from *X. longicuspis* by its elliptic, oblong elliptic, or oblanceolate leaf blades (*vs*. oblong), with the cuneate to acute apex (*vs*. obtuse to broad cuneate); outer petals ca. 15 mm long, 6–8 mm wide at midpoint (*vs*. 28–30 mm long, 10–12 mm wide), inner petals 8–12 mm long, ca. 5 mm wide at midpoint (*vs*. 18–23 mm long, 6–10 mm wide), and fertile stamens (2–)3 mm long (*vs*. ca. 3.5 mm).

Xylopia cuspidata can be distinguished from *X. platypetala* by its calyx lobes ca. 3 mm long (*vs*. 7–10 mm), outer petals ca. 15 mm long, 6–8 mm wide at midpoint (*vs*. 20–23 mm long, 10–15 mm wide), and inner petals 8–12 mm long (*vs*. ca. 18 mm).

The holotype of *Xylopia poeppigii* at W was destroyed during the Second World War, so, the isotype at BR (BR-0000006960179), which is the unique isotype that has an entire flower bud, and it also has an identification label from Fries, therefore, it was chosen as the lectotype.

Selected Specimens Examined— **Bolivia.** — BENI: Prov. Vaca Diez, Santa Maria, 5 km southeast of Riberalta, 10°59′S, 66°6′W, 220 m elev., 8 Nov 2001, *L. W. Chatrou et al. 410* (NY). — LA PAZ: Franz Tamayo, Parque Nacional Madidi, río Hondo, Arroyo Negro, 14°38′51″S, 67°47′40″W, 230 m elev., 23 Mar 2002, *A. Araujo et al. 9* (MO). — **Brazil.** — ACRE: Brasiléia, 02/11/1991. Serringal Porongaba. Colocação São José, 25 km of km 4 Brasiléia-Assis Brasil road, *D. C. Daly et al. 7113* (INPA); Rio Branco, estrada Rio Branco - Porto Acre km 20, a 30 km da estrada, 11 Oct 1980, *C. A. Cid Ferreira & B. W. Nelson 2841* (NY); Rodrigues Alves, BR-364, km 6, Ramal do Alexandre, Vila São Pedro, Fazenda of Sr. Paul Ferreira de Amorim, 7°45′49″S, 72°44′58″W, 25 Oct 2001, *P. J. M. Maas et al. 9218* (NY); Santa Rosa, rio Purus, left bank, "Volta Grande", ca. 9°20′7″S, 70°25′13.6″W, 22 Mar 1999, *D. C. Daly et al. 9936* (NY); Sena Madureira, Rio Macauã, Seringal Capital, 7 Oct 1978, *J. Lima* [*J. L. dos Santos*] *& S. Souza 216* (INPA). — AMAZONAS: Basin of rio Jurua, near mouth of rio Embira, tributary of rio Tarauaca, 7°30′S, 70°15′W, *B. A. Krukoff 4638* (NY); BR-230, Rod. Transamazônica, a 300 km de Humaitá, 7°35'S, 60°40'W, 27 Apr 1985, *C. A. Cid Ferreira et al. 5853* (NY). — **Ecuador.** — NAPO: Anangu, NW corner of the "Parque Nacional Yasuní", 0°33′S, 76°22′W, 260–360 m elev., 1–15 Feb 1986, *J. Korning & K. Thomsen 47461* (AAU). — PASTAZA: Pastaza Canton, Pozo petrolero "Moretecocha" de ARCO, 75 km al este de Puyo, 1°34′S, 77°25′W, 580 m elev., 4–21 Oct 1990, *E. Gudiño et al. 998* (MO). — **Peru.** — AMAZONAS: Condorcanqui Province, Distrito El Cenepa, 4°37′9″S, 78°12′23″W, 289 m elev., *R. Vásquez et al. 22685* (MO); Quebrada Basusinuk, tributary of Huampami alt. 700-800 ft., 2 Nov 1972, *R. Kayap 32* (F, MO). LORETO: Along Quebrada Aucaya, upstream from its mouth on the Río Amazonas S of Aucaya and 1520 km upstream from Iquitos, Trail from Quebrada Aucaya toward site of old Cooperativo, 18 Jul 1984, *N. A. Murray & D. M. Johnson 1559* (NY); Balsapuerto, lower Río Huallaga basin, 150–350 m elev., 28–30 Aug 1929, *E. C. Killip & A. C. Smith 28612* (US); Balsapuerto, altitude about 122 meters, May 1933, *G. Klug 3048* (F, NY); Maynas Province, Carretera Nauta-Iquitos, 150 m elev., 4°29′S, 73°35′W, 22 Nov 1990, *C. Grandéz & J. Ruíz 2088* (MO, OWU); id., Iquitos, Asociación Agraria Paujil, 94°10′S, 73°20′W, 150 m elev., 1 Jul 1988, *R. Vásquez & N. Jaramillo 10800* (F); id., Indiana, Reserva explorama (Yanamono), 25 km al NE de Iquitos a lo largo del Río Amazonas, 3°30′S, 72°50′W, 90 m elev., 26 Sep 1990, *J. J. Pipoly et al. 12470* (MO); id., Puerto Almendrez, Río Nanay, 20 km W of Iquitos, 26 May 1978, *A. Gentry et al. 22250* (MO); id., Río Nanay, Caserio Mishana, 1–2 hr. walk from river, 4–6 Sep 1974, *R. B. Foster & W. A. Foster 4047* (F); id., Sargento Lores, Esperanza, Río Tahuayo, 4°10′S, 73°15′W, 120 m elev., 14 Dec 1989, *R. Vásquez & N. Jaramillo 13263* (MO); id., Sucusari, 3°15′S, 72°54′W, 120–140 m elev., 21 Jan 1992, *C. Grandéz 3050* (MO); Río Ampiyacu, Pucuarquillo, Bora central forest, 25 Aug 1981, *R. Hahn & R. Tredwell 78* (MO). — MADRE DE DIOS: Prov. Manu, Parque Nacional Manu, Río Manu, Río Cumerjali, 11°40′S, 71°32′W, 350-400 m elev., 21 Oct 1986, *R. B. Foster & B. d´Achille 11950* (US); Prov. Tambopata, Río Tambopata, Comunidad Nativa de Infierno, 12°50′S, 69°17′W, 260 m elev., 16 Feb 1991, *V. P. Baca & W. Inuma 88* (NY). SAN MARTÍN: Mariscal Cáceres Prov., Dtto. Tocache Nuevo, Fundo Geroglífico de Sr. Luís Ludeña, Quebrada de Ishichimi, 400 m elev., 19 Nov 1974, *J. S. Vigo 8121* (NY).

3.3.5.1.9 XYLOPIA DISCRETA (L.) Sprague & Hutch., Bull. Misc. Inform. Kew 6: 160. 1916. *Annona discreta* L. Plantae Surinamenses 11. 1775. *Unona discreta* (L.) L.f., Suppl. Pl. 270. 1782 [“1781”]. *Habzelia discreta* (L.) A. DC., Mém. Anon. 208. 1832. TYPE: SURINAME. Loco haud indicato, *Anonymous* [*C. G. Dahlberg*] *61* (lectotype, designated by Moraes 2012: LINN 709.1, right hand specimen (digital image!)).

Xylopia salicifolia Humb. & Bonpl. ex Dunal, Monogr. Anonac. 121. t. 17. 1817. TYPE: [COLOMBIA]. El Espinal, am Rio Magdalena, *A. von Humboldt and A. J. A. Bonpland*

1800 (lectotype, here designated: P-00322484 (digital image!), isolectotypes: B-10 0242290 (digital image!), P-00734918 (digital image!), P-00734919 (digital image!), MPU-026893 [fragment] (digital image!)).

Trees 4–9 m tall. Twigs with golden, pale brown or pale rusty hairs. Leaves abaxially with silver or pearly hairs. Petioles, inflorescences, flowers and fruits with golden hairs. **Twigs** densely sericeous or densely tomentose, glabrous, glabrate or sparsely pubescent when older. **Petioles** 1–2 mm long, canaliculate, dark brown, glabrous, pubescent only at the groove margins; **leaf blades** (1.9–)3.2–5.4 × (0.4–)0.6–1.1 cm, narrowly elliptic, sometimes slightly curved and nearly asymmetric, chartaceous, rarely membranous, densely sericeous on abaxial surface, grayish green to greenish brown, and glabrous on adaxial surface, with a tuft of hair at the apex longer than the acumen, apex acuminate, acumen ca. 7 mm long, base cuneate and obliquely truncate in both sides of base, sometimes asymmetric, midrib raised abaxially, midrib impressed adaxially, secondary veins 12–15 per side. **Inflorescences** axillary, 1–3-flowered; **pedicels** 1–2 mm long, tomentose; **buds** narrowly triangular or narrowly oblong, slightly panduriform; **bracts** 2, one larger at the midpoint of the pedicel, and another smaller at the base, 0.5–1.2 × 0.8–2 mm, triangular ovate to ovate, clasping, tomentose abaxially, glabrous adaxially, apex acute. **Sepals** slightly connate at the base, 1.5–2 × 1.7–2 mm, triangular to triangular ovate, smooth, tomentose to pubescent abaxially, glabrous adaxially, apex acute; **petals** white, pale yellow or cream; **outer petals** 7–8 mm long, narrowly triangular, slightly panduriform, or nearly narrowly lanceolate, obliquely cut on both sides of the base, slightly fleshy, densely sericeous abaxially, pubescent adaxially, apex acute to slightly rounded; **inner petals** 5–6 mm long, linear to narrowly lanceolate, obliquely cut at both sides of the base, slightly fleshy, pubescent to tomentellous on both surfaces, apex acute; **stamens** 70–85, **fertile stamens** 0.5–1 mm long, nearly club-shaped, glabrous, apex of the connective papillate; **outer staminodes** ca. 18, ca. 0.5 mm long, nearly club-shaped, glabrous; **inner staminodes** 15–18, ca. 0.5 mm long; **staminal cone** 0.7–1 mm in diameter, 0.5–0.7 mm high; **carpels** 5–6, 2.5–3 mm long, ovary 0.5–0.7 mm long, densely sericeous; **ovules** 1–2; stigmas 2–2.5 mm long, glabrous. **Fruits** of 2–5 monocarps. **Monocarps** 12–14 × 7–11 mm, ovoid, clavate, reddish green *in vivo*, wrinkled when dried, apex rounded, glabrate to glabrous; **stipes** ca. 2.5 mm long, glabrate. **Seeds** 1–2, ca. 6 × 3.5–4 mm, obovoid. Figure 9A.
Additional Illustration— Steyermark et al. (1995: 468, Fig 395).

Distribution and habitat— *Xylopia discreta* is distributed in Brazil, Colombia, French Guiana, Guyana, Suriname, and Venezuela, occurring in riparian forests, sometimes on black water flooded islands, and on sandy soil. In Brazil, the species occurs in Acre, Amazonas, and Roraima.

Vernacular Names— "*Pegrekoe*" (Suriname), "*Pepo de burro*" (Colombia, *E. Rentería et al. 1993,* MO).

Phenology— Specimens with flowers have been collected in February, May, June, and from September to December, and specimens with fruits have been collected from February to April, and also in June, August, October and November.

Notes— The remarkable characters of *Xylopia discreta* are its small leaf blades ((1.9–)3.2–5.4 × (0.4–)0.6–1.1 cm), narrowly elliptic, sometimes slightly curved and nearly asymmetric, densely silver or pearly sericeous abaxially; buds narrowly triangular or narrowly oblong, slightly panduriform, petals white, pale yellow or cream; outer petals 7–8 mm long; inner petals 5–6 mm long; stamens 70–85, fertile stamens 0.5–1 mm long; monocarps 2–5, 12–14 × 7–11 mm, ovoid, clavate, wrinkled when dried, apex rounded, glabrate to glabrous; stipes ca. 2.5 mm long.

This species is morphologically similar to *X. frutescens* Aubl., *X. brasiliensis* Spreng. (an extra-Amazonian species, not included in this Taxonomic Treatment), and *X. parviflora* Spruce. *Xylopia discreta* differs from *X. frutescens* by its leaf blades with densely silver or pearly sericeous indument abaxially (vs. golden or hyaline sericeous or densely pale rusty or rusty sericeous to tomentose); outer petals 7–8 mm long (*vs*. ca. 12 mm long), inner petals 5–6 mm long (*vs*. ca. 10 mm long); stamens 70–85 (*vs*. 90–110); staminal cone concealing completely the ovaries (*vs*. exceeding the staminal cone); carpels 2.5–3 mm long (*vs*. 3.5–4 mm), ovary 0.5–0.7 mm long (*vs*. ca. 0.8 mm); ovoid, clavate monocarps (*vs*. ellipsoid or obovoid or globose, not clavate); and stipes ca. 2.5 mm long (*vs*. ca. 1 mm).

Xylopia discreta can be distinguished from *X. brasiliensis* by its densely silver or pearly sericeous indument on the abaxial surface of the leaf blades (*vs*.golden or golden hyaline sericeous to sparsely sericeous indument); petals white, pale yellow or cream (*vs*. pinkish to reddish), outer petals 7–8 mm long (*vs*. 10–14 mm); 5–6 carpels (vs. 8–10) and ovoid, clavate monocarps (*vs*. oblong, falcate).

Xylopia discreta is distinguished from *X. parviflora* by its leaf blades with silver or pearly hairs abaxially (*vs*. golden to pale brown hairs, in *X. parviflora*), acumen ca. 7 mm long (*vs*. ca. 3 mm); outer petals 7–8 mm long (*vs*. ca. 5 mm); carpels 5–6 (*vs*. 4); and monocarp stipes ca. 2.5 mm long (ca. 6 mm).

Dunal (1817) stated "*v. s. h. Humb. et Bonpl.*" in the protologue *Xylopia salicifolia*, so, the type collection is clearly from this herbarium, which is currently stored at P. At P we found three specimens of *Humboldt and Bonpland 1800*. The specimen P-00322484 has a label typed "*Herbier Humboldt & Bonpland. Amérique Équatoriale*.", and the other two (P-00734918 and P-00734919) have labels from the Paris Herbarium with the following information typed at the botton corner: "*Herbier de l'Amérique équatoriale, donné par M. A. Bonpland*" (Herbarium from Equatorial America, donated by M. A. Bonpland). The specimen P-00322484 is also in the Historical Collection in P, and it is a well preserved specimen and matches the protologue, thus, it was chosen as the lectotype.

Selected Specimens Examined— **Brazil.** — ACRE: Brasiléia, 15 Oct 1994, *M. N. Silva 171* (RB); Rio Branco, Jarú, 19 Dec 1912, *J. G. Kuhlmann 56* (MO). — AMAZONAS: Maués, Igarapé do Palhal, 4 Feb 1979, *D. F. Coêlho & J. L. dos Santos 422* (INPA); Parintins, 23 Sep 1932, *A. Ducke s.n.* (MO, RB 23905); Rio Negro, Ilha Providência to Ilha Arara, 10 Nov 1971, *G. T. Prance 16221* (INPA). — RORAIMA: Alto Alegre, Ilha de Maracá, SEMA, estação, Furo Paraná do Firmino of Rio Uraricoera on S side of island, 13°24′S, 61°26′W, 10 Jun 1986, *M. J. G. Hopkins 637* (INPA, MO); Caracaraí, PARNA do Viruá, margem alagada do rio Baruana, 1°25′391″N, 60°50′492″W, 11 Jun 2017, *A. F. Pontes-Pires et al. 977* (JPB); Rio Uraricoera, Cachoeira Curaça (ou Cura-ci-há), 63°31′W, 11 Mar 1979, *J. M. Pires et al. 16932* (MO). — **Colombia.** — SANTANDER: Pto. De Sogamoso, 80 m elev., Nov 1979, *E. Rentería et al. 1993* (MO). — **Guiana.** — Basin of Kuyuwini River (Essequibo tributary), about 150 miles from mouth, 21–26 Nov 1937, *A. C. Smith 2596* (MO); Rupununi District, Kuyuwini Landing, Kuyuwini River, 27 Oct 1992, *M. J. Jansen-Jacobs et al. 3117* (MO); Savanna between Takutu River and Kanuku Mountains, 12–22 Marc 1938, *A. C. Smith 3271* (MO). — **French Guiana.** — Region de Pikin Tabiki, Rives du Marouini, SW de Marouini, 20 Sep 1961, *R. Schnell 12236* (MO, NY). — **Suriname.** — Paramaribo, Nov 1944, *Stahel 138a* (MO) — **Venezuela.** — AMAZONAS: Dpto. Atabapo, Alto Río Orinoco, bosques ribereños em la planície aluvial, 30 km al SE de la Esmeralda, trayecto de la boca del Caño "Iguapo" hasta la boca del Río Padamo, 19 Feb 1990, *G. Aymard 8005* (MO). — BOLÍVAR: Expedicion Proyecto I.R.N.R.G., 6°21′36″N, 63°45′27″W, 13 May - 13 Jun 1987, *B. Stergios 10787* (MO); Municipio Cedeño, Río Caura, Boca del Río Nichare, 6°35′N, 64°45′W, 20 Jun 1995, *C. Knab-Vispo & G. Rodriguez 424* (MO); Municipio Raul Leoni, bosques alrededor de la desembocadura de Río Karúh em el Paragua, Campamento de EDELCA, 5°18′N, 63°22′W, 330 m elev., May 1988, *A. Fernandez 4571* (MO); Río Caura, between Boca Nichare and Salto Pará, approx. 6°25′N, 64°48′W, altura approx. 160 m, Apr 1995, *C. Knab-Vispo & G. Rodriguez 321* (INPA).

3.3.5.1.10 XYLOPIA EGLERIANA Aristeg. ex Maas, Bot. Jahrb. Syst. 115(1): 91, f. 4. 1993. TYPE: BRAZIL. Amapá: Rio Jari, Cachoeira das Guaribas, 0°24′N, 53°7′W, 16 Aug 1961, *W. A. Egler and H. S. Irwin 46462* (holotype: IAN-113330!, isotypes: MG-027679!, NY-00066761!, US-00170027!, VEN-62027 (digital image!)).

Shrubs up to 3 m tall. Twigs and petioles with golden, pale brown or grayish hairs. Abaxial surfaces of leaves, inflorescences, flowers and fruits with golden, hyaline, pale rusty, or rusty hairs. **Twigs** densely or sparsely, to rarely, tomentose to sericeous, glabrate to glabrous when older, brown to grayish with beige lenticels, sometimes longitudinally fissured. **Petioles** 4–7(–9) mm long, canaliculate, dark brown to black, with rare hairs; **leaf blades** (5.2–)6.4–9.8 × (2.4–)3.5–4.5 cm, ovate to rarely broad elliptic, chartaceous, grayish green to pale brown, and short sericeous, sparse or few at the blade, denser and longer at the midrib on abaxial surface, becoming glabrate to glabrous when older, grayish-green to grayish-brown, and glabrous on adaxial surface, apex short acuminate to sometimes cuspidate, rarely acute, acumen 5–13 mm long, base obtuse, large cuneate or less frequently asymmetric midrib and secondary veins raised abaxially, midrib and secondary veins strongly impressed adaxially, secondary veins 6–9 pairs, tertiary and quaternary veins raised abaxially and slightly raised adaxially. **Inflorescences** axillary, 1-flowered; **pedicels** 3–5 mm long, ca. 1 mm in diameter; **buds** ovoid to triangular ovoid; **bracts** 2, close to the pedicel base, ca. 4 × 5 mm, broadly triangular ovate, clasping, sericeous abaxially, glabrous adaxially, apex acute. **Calyx** cup-shaped, verruculose abaxially and adaxially, warts more conspicuous in the calyx tube, calyx tube ca. 3.5 mm long, **sepals** connate around ½ of their length, a calyx tube rim is persistent (when calyx lobes apparently appear to be detached from part of the calyx tube) 2–2.5 mm long, 5–7 mm in diameter, calyx lobes 3–4 × 5–6 mm, triangular-ovate, sericeous abaxially, glabrous adaxially, apex acute; **petals** greenish white *in vivo*; **outer petals** ca. 10 mm long, 3–4 mm wide at midpoint, triangular to narrowly triangular, densely sericeous to tomentose abaxially, tomentellous adaxially, apex acute; **inner petals** ca. 8 mm long, ca. 1.2 mm wide at midpoint, narrowly triangular, tomentellous abaxially and adaxially, apex acute; **stamens** numerous, ca. 1.5 mm long, filament and connective swollen, apex of the connective broadly ovoid, densely papillate, 0.3 mm long; **carpels** only a few ones fallen seen densely covered with appressed long silky hairs. **Fruits** of ca. 10 monocarps. **Monocarps** 7–8 × 4–5 mm, flattened falcate, sparsely covered with appressed hairs; **stipes** ca. 5 mm long. **Seeds** 2 or more.

Additional Illustration— Maas et al. (1993: 92, Fig. 4 a–c.).

Distribution and habitat— Known only by the type collection, from Brazil, in the state of Amapá (Figure 10).

Phenology— Specimens with flowers and immature fruit were collected in August.

Notes— *Xylopia egleriana* has a cup-shaped calyx and because of that is close to *X. crinita*, *X. excellens* R.E.Fr.*,* *X. macrantha* Triana & Planch. (from the coastal region of Colombia, not included in this treatment) and *X. xylantha* R.E.Fr. *Xylopia egleriana* is also similar to *X. annoniflora, X. cuspidata, X. platypetala* and *X. longicuspis,* by the ovoid flower buds. It also resembles *X. bocatorena* Schery (a species from Central America, not included in this treatment), *X. laevigata* (Mart.) R.E.Fr., *X. langsdorffiana* A. St-Hil. & Tul., and *X. ochrantha* Mart., regarding the large (3–7 mm wide at midpoint) and triangular to triangular ovate petals.

Xylopia egleriana can be easily distinguished from all the species mentioned above because it is one of the most particular species within *Xylopia*, for gathering two unique characters present in no other Neotropical species of the genus up to now: verruculose calyx (*vs*. smooth in all the similar species mentioned above), and with a persistent calyx tube rim (*vs*. calyx tube rim absent in all the similar species mentioned above).

The type collection of *Xylopia egleriana* presents only young flower buds, two flowers glued on the voucher, a remnant of flower with loose stamens, calyx and parts of petals, and remnants of the fruit stipes. In the protologue (Maas et al. 1993), there is a picture of the fruit with some monocarps from the holotype, but we couldn’t find them in the holotype, probably it was lost. We only saw a fruit pedicel with remnant stipes and without the portion of monocarps in the isotype stored at MG. Since this species is only known from the type collection, its description here was based on the information of the holotype and the isotypes analyzed, and on the original description of Maas et al. (1993).

Maas (Maas et al. 1993) in the original description of *X. egleriana* mentioned an isotype at BR, but we did not find this specimen. We consulted the herbarium staff and they replied they also found nothing.

3.3.5.1.11 XYLOPIA EMARGINATA Mart., Fl. bras. 13(1): 42. 1841. – *Xylopicrum emarginatum* (Mart.) Kuntze, Rev. Gen. Pl. 1: 8. 1891. TYPE: [BRAZIL]. [Minas Gerais]. In silvis, quae Caa-apoam dicuntur, et udis locis camporum, quae Vargens dicunt, in deserto occidentali prov. Minarum, versus Vâo do Paranan et ad fluvium S. Francisci, Sep., *C. F. P. von Martius s.n.* (lectotype, designated by Fries 1930: M-0240132 (digital image!) [photo in: F!, MO!, NY!, US!]).

Xylopia emarginata Mart. var. *duckei* R.E.Fr., Acta Horti Berg. 12(1): 209. 1934. TYPE: [BRAZIL] BRASILIEN. Prov. Amazonas: [Manaus] Manáos, silvula paludosa ad rivulum loco Estrada da raiz, blühend und fruchtend 10 Dez 1907, *A. Ducke RB 19629* (holotype: S-R-6855 (digital image!), isotypes: K-000221075 (digital image!), RB-00042830!, US-00074235!); syn. nov.

Xylopia venezuelana R.E.Fr., Kongl. Svenska Vetenskapsakad. Handl. Ser. 3. 24(10): 12. 1948. TYPE: VENEZUELA. Bolivar, Parynosa, 13 Apr 1946. *I. Vélez 2382* (holotype: US-00036959!, isotypes: S-R-6874 (digital image!), VEN-170241 (digital image!)); syn. nov.

Trees 3–20 m tall, d.b.h. 10–30 cm. Twigs, petioles, inflorescences, flowers and fruits with rusty, pale rusty, golden, or golden hyaline hairs; leaves with golden or pale brown hairs abaxially. **Twigs** densely sericeous to tomentellous, indument without oblique line mark, becoming sparsely sericeous to tomentellous when older. **Petioles** 1–2 mm long, canaliculate, dark brown to black, sparsely to rarely tomentellous at the margins of the groove, other parts glabrous; **leaf blades** (2.8–)4.2–6.8 × (0.6–)0.8–1.4(–1.9) cm, elliptic to narrowly elliptic, oblong to oblong elliptic, or narrowly obovate, chartaceous, smooth, margin sometimes slightly revolute, abaxially pubescent to short sericeous on young leaves, hairs more concentrated on the midrib and close to it, glabrate to glabrous in older leaves, pale brown grayish to dark brown, and glabrous adaxially, apex retuse to emarginate, often with a tuft of hairs longer than the midrib abaxially, exceeding the apex, base acute, cuneate or asymmetric, with oblique angles slightly marked at both sides of the base; midrib raised abaxially, impressed adaxially, secondary veins 11–13 per side. **Inflorescences** axillary, (1–)2–3(–6)-flowered; **peduncles** ca. 1 mm long, sparsely tomentellous; **pedicels** ca. 2.5 mm long, sparsely tomentellous; **buds** narrowly triangular; **bracts** 2, one at midpoint and other at the base of the pedicel, 0.8–1.5 × 1.5–3 mm, ovate, often bilobed and irregularly splitted at midpoint, clasping, margin ciliate, glabrous on both surfaces. **Sepals** connate at the base up to ⅓ of their length, connate ca. 0.5 mm long, 2–3 × 2–3 mm, ovate, smooth, sparsely short sericeous at apex abaxially, glabrous adaxially, apex acute; **petals** beige or orange; **outer petals** 14–15 mm long, 2–3 wide at base, ca. 1.5 mm wide at midpoint, narrowly triangular to narrowly lanceolate, slightly fleshy, densely short sericeous abaxially, tomentellous with the base glabrous adaxially, apex acute; **inner petals** 13–14 mm long, ca. 1.5 mm wide at base, ca. 1 mm wide at midpoint, narrowly triangular or narrowly lanceolate, nearly linear above base up to the apex, triangular in cross section at the midpoint, slightly fleshy, tomentellous with the base glabrous on both surfaces, sometimes the base papillate adaxially, apex acute; **stamens** ca. 150, **fertile stamens** ca. 110, 0.7–1.5 mm long, narrowly oblong, glabrous, apex of the connective 0.1–0.2 mm long, capitate to mushroom-shaped, papillate, anthers (4–)6–9-locellate, filament 0.3–0.4 mm long; **outer staminodes** ca. 17–22, 0.8–1 mm long, narrowly oblong, glabrous, apex of the connective slightly enlarged, 0.1–0.2 mm long, papillate; **inner staminodes** ca. 18–28, 0.5–0.6 mm long, glabrous, apex of connective slightly differentiated, slightly papillate; **staminal cone** ca. 1.5 mm in diameter, ca. 1 mm high; **carpels** 8–12, 3.3–4.2 mm long, ovary 0.8–1 mm long, obclavate to slightly falcate, densely sericeous, **ovules** 3–4; stigmas filiform, slightly curved above the base, 2.5–3.2 mm long, slightly verruculose, hairs sparse distally and with a tuft of hairs at the apex. **Fruits** of (2–)4–11 monocarps. **Monocarps** 10–22 × 7–15 mm, ovoid to oblong, slightly falcate, clavate, occasionally moniliform, sometimes more woody and not constricted between seeds, yellowish green or reddish, sometimes wrinkled when dried, apex rounded, sometimes obliquely apiculate, pubescent, becoming less dense in older monocarps; **stipes** (3–)4.5–10 mm long. **Seeds** 1–4, ca. 6 × 4 mm, ellipsoid to obovoid, brown to dark brown. Figure 1B and 1F.

Additional Illustration— Fries (1948: Pl. VII, a–b).

Distribution and habitat— This species occurs in Brazil, Bolivia, Colombia, Guyana, Peru, and Venezuela (Figure 11). In Brazil, it is broadly distributed in the states of Amapá, Amazonas, Bahia, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Piauí, Rondônia, and São Paulo, and in the Federal Disctrict. It is present in the savanna vegetation (cerrado), lowland Amazonian forest (*terra firme* and *várzea*), and in riverine forest, flooded or not.

Vernacular Names— "*Envira-cana-da-várzea*" (Brazil, Pará), "*Envira-chichi*" (Brazil, Pará, *J. M. Pires 51820*, US), "*Envira-folha-fina*" (Brazil, Amazonas and Mato Grosso), "*Imbereba*" (Brazil, Pará, *G. T. Prance et al. 1439*, US).

Phenology— Specimens with flowers have been collected in April, May, July, and from September to December, and specimens with fruits have been collected em May, July, August, and from September to February.

Notes— *Xylopia emarginata* has as remarkable characters: the small chartaceous leaf blades, with retuse to emarginate apex, often midrib abaxially with hairs exceeding the apex; narrowly triangular buds; sepals connate at the base up to ⅓ of their length, connate ca. 0.5 mm long, sepals ovate, with an acute apex; with ca. 150 stamens, 8–12 carpels, 3.3–4.2 mm long; and fruits of (2–)4–11 monocarps.

This species belongs to a group of species with retuse/emarginate apex, mentioned by Berry and Johnson (1993), which comprises *X. plowmanii* P.E. Berry & D.M. Johnson and *X. spruceana* Benth. ex. Spruce. *Xylopia parviflora* Spruce is also related to this group, but it presents an attenuate to acuminate apex with only the tip retuse, often adaxially with a tuft of hairs on the midrib exceeding the apex of the leaves.

Xylopia emarginata is distinguished from *X. plowmanii* by its young twigs densely sericeous to tomentellous (*vs.* pubescent to puberulent); leaf blades (0.6–)0.8–1.4(–1.9) cm wide (*vs.* 2.2–2.9 cm), with the retuse to emarginate apex, with a tuft of hairs exceeding the apex abaxially (*vs.* conspicuously emarginate, without a tuft of hairs), the acute, cuneate or asymmetric base, with oblique angles slightly marked at both sides of the base (*vs.* acute, with oblique angles strongly marked, sometimes asymmetric); sepals sparsely short sericeous abaxially (*vs.* glabrous); and carpels 3.3.–4.2 mm long (*vs.* 4.3–4.8(–5.8) mm).

Xylopia emarginata differs from *X. spruceana* by its twigs with an uniform indument (*vs.* with an striking oblique line mark on the indument, connecting one node to the subsequent one, more visible up to the midpoint of the twigs); leaf blades with margins slightly revolute (*vs.* strongly revolute), pubescent to short sericeous abaxially on young leaves, (*vs.* mostly glabrate to glabrous); sepals 2–2.5 × 2–3 mm (*vs.* 3.5–4 × 3–3.5 mm), and glabrous abaxially (*vs.* tomentose to sericeous), with ciliate margins (*vs.* glabrous); ca. 150 stamens (*vs.* 110–125), inner staminodes 0.5–0.6 mm long (*vs.* 0.8–1 mm); carpels 3.3–4.2 mm long (*vs.* 4.8–5.3 mm), and stigmas 2.5–3.2 mm long (*vs.* 4–4.5 mm).

Xylopia emarginata can be distinguished from *X. parviflora* by its chartaceous leaf blades (*vs.* membranous), pubescent to short sericeous abaxially on young leaves (*vs.*

sericeous only at the margins and midrib), retuse to emarginate apex (*vs.* attenuate to acuminate with a retuse tip); sepals 2–2.5 × 2–3 mm (*vs.* ca. 1.5 × 2 mm); outer petals 14–15 mm long (*vs.* ca. 5 mm); fertile stamens 0.7–1.5 mm long (*vs.* ca. 0.5 mm); and with 8–12 carpels (*vs.* 4).

When Martius (1841) described *Xylopia emarginata*, he mentioned two collections, one of himself from Minas Gerais (stored at M), and another of Riedel from Rio Pardo (probably Minas Gerais, stored at LE). Fries (1930) listed the syntype at M (M-0240132) as the "*typus speciei*", and we considered this as his choice of the lectotype.

Xylopia emarginata var. *duckei* was distinguished by Fries (1934) only by the wider leaves than the ones in the typical variety. We observed that the width and shape of the leaves are broadly variable within this species and included this variety as a synonym of *X. emarginata*.

Fries (1948) also differentiated *X. venezuelana* from *X. emarginata* with these statement "*In X. venezuelana the leaves are broadest below the centre, tapering slowly from there into a narrower, but nevertheless distinctly emarginate point. Inflorescence axes, bracts, and the outer side of the sepals are covered by a dense silky coat of adpressed hairs, while the same parts of X. emarginata are glabrous, black; its flowers are also shorter, its monocarps smooth and glossy black"*. According to the material we analyzed, from different countries where *X. emarginata* and *X. venezuelana* occur, we noticed that these characters are broadly variable. In both species, for example, the sepals can be almost glabrous with ciliate margins; or with appressed hairs concentrated at apex; or pubescent (sparsely or densely), and sometimes with variations at the same specimen. So, here we included *X. venezuelana* as a synonym of *X. emarginata*.

Selected Specimens Examined**—** **Bolivia.** — PANDO: Frederico Roman, Las Piedritas, 9°57′3″S, 65°23′48″W, 119 m elev., 8 Nov 2006, *S. Altamirano & H. Ramos 4104* (MO). — SANTA CRUZ: Velasco, Parque Noel Kempf M., campamento La Torre, 13°39′20″S, 60°49′8″W, 19 May 1994, *R. Quevedo et al. 2610* (MO). — **Brazil.** — AMAPÁ: Beira da BR-156, área alagada, lado esquerdo, sentido Laranjal do Jari à Macapá, 0°4′40.9″S, 51°38′0.3″W, 11 Nov 2016, *A. F. Pontes-Pires & R. A. Pontes 954* (JPB); Calçoene, Parque Nacional do Cabo Orange, a 2 km da Base do Cunani, 02°52′10.7″S, 51°07′00.9″W, 14 Nov 2016, *A. F. Pontes-Pires et al. 962* (JPB). — AMAZONAS: Limoeiro, Est. Ecológica Juamí-Japurpa, rio Juamí, afluente da margem esquerda do rio Japurá, a 40 km do rio Japurá, 1–2°S, 67–68°W, 22 Apr 1986, *C. A. Cid Ferreira et al. 7133* (MO, US); Manaus-Itacoatiara, Reserva Florestal Duque, 2°53′S, 59°58′W, 30 Aug 1994, *C. A. Sothers & P. Stumpe 155* (INPA, MO); Rio Cauaburí, along margin of Rio Cauaburí, 5 Feb 1966, *N. T. Silva & U. Brasão 60977* (US). Rio Cuieiras, above mouth of Rio Brancinho, 11 Sep 1973, *G. T. Prance et al. P17726* (US). — MATO GROSSO: BR-070, entre Tesouro e Barra do Garças, 603 m elev., 15°38′42.1″S, 53°04′37.7″W, 14 Apr 2014, *A. F. Pontes-Pires & F. R. Borges 895* (JPB); BR-163, de Sorriso a Sinop, lado esquerdo, mata beirando a lagoa, no alagado, 375 m elev., 12°02′43.3″S, 55°31′02.7″W, 18 Apr 2014, *A. F. Pontes-Pires & F. R. Borges 905* (JPB), Rio Juruena, beira do rio, 5 Jul 1977, *M. G. da Silva & J. Maria 3282* (MG, MO). — PARÁ: Belém, distrito de Mosqueiro, perto do Trevo de Mosqueiro, lado direito, sentido Mosqueiro-Belém, 28 Sep 2015, *A. F. Pontes-Pires et al. 925* (JPB); Juruti, 1 Jun 2014, *R. P. Salomão et al. 1343* (MG); Melgaço, Floresta Nacional de Caxiuanã, Área pertencente à Estação Científica Ferreira Penna, próximo ao Igarapé Puraquequara, 15 Oct 1991, *A. S. L. da Silva & M. C. da Silva 2416* (MO); Região do Anapú, rio Cariatuba, Portel, 22 May 1956, *R. L. Fróes 33005* (US); Rio Pacaja and Muirapiranga, km 1.5-3.5 line SW of Ilha de Breu, 2°33′N - 2°50′N, 50°38′W - 50°50′W, 21 Sep 1965, *G. T. Prance et al. 1439* (US); Serra do Cachimbo, BR-163, Cuiabá-Santarém Highway, Cachoeira Curuá, north slope of Serra Cachimbo, 300 m elev., 5 Nov 1977, *G. T. Prance et al. 24871* (US). — RONDÔNIA: Basin of rio Madeira, N. Bank of rio Abunã, 10 km above Fortaleza, 17 Nov 1968, *G. T. Prance et al. 8548* (INPA, MO, NY). — **Colombia.** — CAQUETÁ: Serra de Chiribiquete, Campamento Norte, Noroccidente del campamento, 1°7′N, 72°50′W, 500–550 m elev., 7 Dec 1990, *J. M. Cardiel et al. 1049* (NY). — SANTANDER: Magdalena Valley, Campo Capote, 30 km E of Carare, 300 m elev., 28 Sep 1977, *A. Gentry et al. 19963* (MO). — **Guayana.** — Potaro-Siparuni Region, Mt. Wokomung, plateau above first of four escarpments, 5°6′36,3″N, 59°49′14.1″W, 1135 m elev., 14 Jul 2003, *H. D. Clarke et al. 10858* (US). — **Peru.** — LORETO: Maynas, Distrito Iquitos, Puerto Almendras, 3°48′S, 73°25′W, 122 m elev., 16 Jan 1993, *C. Grandéz & N. Jaramillo 4986* (US). — PASCO: Oxapampa, Distrito Palcazu, Parque Nacional Yanachaga Chemillén, Estación Biológica Paujil, 10°19′S, 75°15′W, 400 m elev., 19 Oct 2002, *A. Monteagudo et al. 4157* (NY). — **Venezuela.** — AMAZONAS: Dpto. Atabapo, Pica 1, Frente n. 1, Piedra Sapo, Río Atacavi, 3°5′N, 67°2′W, 140 m elev., Nov 1987, *J. Velazco 976* (MO). Dpto. Atures, Puerto Ayacucho, bosque húmedo del río Cataniapo, entre comunidade de las Pavas y raudal Rabipelado, 6°25′N, 67°25′W, 90-100 m elev., 11 Apr 1987, *A. Castillo 2308* (MO), Municipio Autana, Ríos Sipapo – Cuao via Isla Ratón, 4°54′–5°3′N, 67°34′–67°46′W, *A. Castillo 3893* (MO). —APURE: Distrito Pedro

Camejo, 7.5 km WNW of Paso de Cinaruco, chalana along the South bank of the Río Cinaruco, 6°33′N, 67°35′W, 60 m elev., 3 May 1977, *G. Davidse & A. C. González 12604* (NY). — GUÁRICO: Dtto. Infante, Parque Nacional Aguaro-Guaraquito, Caño Carnestolendo, 100 m elev., Dec 198, *F. Delascio et al. 11199* (MO).

3.3.5.1.12 XYLOPIA EXCELLENS R.E.Fr., Acta Horti Berg. 12(1): 210. 1934. TYPE: [BRAZIL]. BRASILIEN. Amazonas: [Manaus] Manáos, Estrada do Aleixo, kilom. 5 [igapó do riachinho] silva paludosa non inundabili ad rivulum, blühend und frutchend 26 Nov 1932, *A. Ducke n. 23902* [*s.n.*, RB 23902] (holotype: S-R-6856 (digital image!), isotypes: B-10 0242289 (digital image!), K-000221086 (digital image!), MO-1920902!, RB-00534170!, RB-00774058 (digital image!), US-00074231!).

Trees (2–)3–18 m tall, d.b.h. 10–16 cm; Twigs, petioles, abaxial surfaces of leaves, inflorescences, flowers and fruits mostly with rusty, or pale rusty hairs, or also with golden, pale brown, or brown hairs. **Twigs** densely tomentose to velutinous, becoming sparse to glabrous when older. **Petioles** (3–)4–6(–9) mm long, canaliculate, dark brown or brown, tomentose; **leaf blades** (11.5–)13–26.5(–30.5) × (4.8–)6–7.5(–9) cm, oblong, coriaceous, tomentose to velutinous abaxially, denser on the midrib, glabrous adaxially, apex cuspidate, rarely acute, cusp (4–)8–15(–25) mm long, base rounded or obtuse, sometimes slightly asymmetrical or cordate; midrib strongly raised abaxially, impressed adaxially, secondary veins 10–14(–16) per side, raised on both surfaces, more conspicuously abaxially. **Inflorescences** axillary, sometimes born on older twigs, 1–3-flowered; **pedicels** 5–6 mm long, densely sericeous and tomentose; **buds** oblong; **bracts** 2, at the base of the calyx, larger, on young buds they enclose the bud, soon caducous, triangular ovate, clasping, tomentose abaxially. **Calyx** cup-shaped, smooth, calyx tube (3–)5–7 × (8.5–)10–13 mm, on buds the length of the calyx tube is longer than in flowers, **sepals** connate at ½ or more of their lentgh, calyx lobes (3–)5–7(–9) x 9–12 mm, ovate to triangular ovate, densely sericeous abaxially, glabrous adaxially, apex acute; **petals** white, yellow or pale yellow; **outer petals** (20–)24–26 mm long, 6–9 wide at midpoint, oblong elliptic to elliptic, sometimes slightly constricted above base, slightly fleshy, densely short sericeous abaxially, tomentelous with the base glabrous adaxially, apex acute; **inner petals** 19–21 mm long, 3–3.5 mm wide at midpoint, narrowly oblong elliptic to nearly lanceolate, nearly rhombic in cross section at midpoint, fleshy, short sericeous to tomentellous abaxially near the midpoint, puberulent at the other parts, puberulent with the base glabrous adaxially, apex acute to acuminate; **stamens** 315–330; **fertile stamens** 1.7–2.4 × 0.3–0.5 mm, glabrous, apex of the connective 0.2–0.5 mm long, discoid, sometimes mushroom-shaped, or triangular, papillate, anthers 10–14-locellate, filament 0.3–0.4 mm long; **outer staminodes** ca. 2 × 0.8–1 mm, broader than the fertile stamens, glabrous; **inner staminodes** 1.5–1.7 mm long, glabrous, **staminal cone** ca. 6 mm in diameter, ca. 3 mm high, conical; **carpels** ca. 30, 6.8–7.7 mm long, ovary 2.8–3.2 mm long, lanate and sericeous; **ovules** 3–5, stigmas 4–4.5 mm long, filiform, geniculate above the base, pubescent at the base, puberulent at the apex. **Fruits** of 11–34 monocarps borne on a **pedicel** ca. 6 mm long; **torus** ca. 12 mm in diameter, ca. 4 mm high, depressed ovoid or depressed globose. **Monocarps** (10–)20–32 × (8–)13–22 mm, oblong to nearly globose, clavate, sometimes slightly falcate, woody, not constricted between seeds, or seeds slightly raised on the surface, brown *in sched.*, slightly rugose or rugulose when dried, densely tomentose, apex often acute, sometimes rounded, apiculate, apiculus 1.4–1.7 mm long; **stipes** 3–6 mm long, densely tomentose. **Seeds** 1–3, 9–13 × 6–8 mm, ellipsoid to obovoid, often slightly flattened, black, shiny, aril yellowish or yellowish beige, mat to translucent, lobes 1.5–2 × 2.0 mm, smooth. Figure 7H-N.

Distribution and habitat— *Xylopia excellens* occurs in Brazil, French Guiana, Peru, and Venezuela. In Brazil, it is distributed only in the Northern region, in the states of Amapá, Amazonas and Rondônia, in lowland Amazonian forests (*terra firme*), and on margin of flooded riverine vegetation on clay-sandy and clayey soil (*igarapé* forests), and on white sandy soil.

Vernacular Names— "*Espintana negra*" (Peru, *J. Ruíz & H. Murphy 219*, F, MO).

Phenology— Specimens with flowers have been collected in April, June, September, and November, and specimens with fruits have been collected in March, September, November, and December.

Notes— *Xylopia excellens* is characterized by its oblong leaf blades, with (11.5–)13–26.5(–30.5) × (4.8–)6–7.5(–9) cm, coriaceous, golden to pale rusty tomentose to velutinous abaxially; two larger bracts, enclosing the bud; the long cup-shaped calyx (10–14 mm long), densely rusty sericeous; the woody monocarps, not constricted between the seeds, densely rusty or brown tomentose; and with 1–3 seeds, 9–13 × 6–8 mm.

The collections of *X. excellens* at the herbaria are not very extense, and it was difficult to find mature flowers available to be dissecated and described. So the description presented here has some flower characters based on the original description from Fries (1934).

This species is morphologically close to *X. crinita, X. macrantha* Triana & Planch. (a species from the costal region of Colombia, not treated in this study) and *X. xylantha* R.E.Fr., which share a long cup-shaped calyx. *Xylopia egleriana* also has a cup-shaped calyx, but it is very peculiar because it presents a verruculose calyx, and the persistent calyx tube rim (*vs.* smooth calyx and calyx tube rim absent in all the similar species mentioned above, including *X. excellens*), which are characters present in no other Neotropical species of the genus.

Xylopia excellens can be distinguished from *X. crinita* by its petioles with (3–)4–6(–9) mm long (*vs.* 1.5–2.5 mm); leaf blades with (11.5–)13–26.5 mm long (*vs.* (3.8–)5.2–10.8 mm), and with (4.8–)6–7.5(–9) mm wide (*vs.* (1.2–)2–3 mm), oblong (*vs.* lanceolate elliptic to lanceolate), chartaceous to more rarely membranous (*vs.* coriaceous); calyx densely sericeous (*vs.* densely tomentose to velutinous); and monocarps oblong to nearly globose, clavate (*vs.* flattened oblong to reniform, falcate).

Xylopia excellens can be differentiated from *X. xylantha* by its oblong leaf blades (*vs.* elliptic), slightly lustrous adaxially (*vs.* opaque); oblong buds (*vs.* ellipsoid to slightly obovoid); and outer petals 6–9 mm wide at midpoint (*vs.* 11–12 mm).

***Selected Specimens Examined*— Brazil.** — AMAPÁ: Macapá, rio Falsino, approx. 10 km upstream of confluence with rio Araguari, West Bank, approx. 0°50′S, 51°45′W, 13 Dec 1984, *D. C. Daly et al. 3872* (MG). — AMAZONAS: km 500 on Manaus-Humaitá road 17 Sep 1980, *S. R. Lorie et al. 60* (MG, MO, NY, RB, US); Perto do acampamento a 150 km de Humaitá, 27 Sep 1979, *M. G. Vieira et al. 208* (INPA, MG, NY, RB, US); Coari, projeto RADAM, ponto 17, SB 20 VD, 20 Sep 1976, *T. R. Bahia 107* (INPA, MG, NY); Estrada do Japihy, arredores de Manaus, Mar 1945, *R. L. Fróes 20550* (IAN); Novo Aripuanã, BR-230, Rod. Transamazônica a 300 km de Humaitá, 24 Apr 1985, *C. A. Cid Ferreira 5739* (F, MG, MO, NY, US). — RONDÔNIA: Porto Velho, BR-319, km 1, Linha 20, Gleba Cumã, 27 Jul 1997, *L. C. B. Lobato et al. 1837* (MG); id., Parque Municipal, 21 Jul 1997, *J. Oliveira et al. 503* (MG); id., UHE Samuel, pedreira do dique da margem direita, 6 Aug 1987, *F. D. de A. Mattos* [*F. Dionizia*] *& J. Guedes 55* (INPA, NY, US). — **French Guiana.** — Sauts em amont de Touinké sur l'Itany, Haut Maroni, 26 Nov 1977, *Cremers 5127* (U). — **Peru.** — AMAZONAS: Bagua Province, Distrito Imaza, Cerros de Putuim, 5°3′20″S, 78°20′23″W, 350 m elev., 12 Jun 1996, *R. Vásquez et al. 21113* (MO); Bagua Province, Yamayakat, 4°55′S, 78°19′W, 320 m elev., 7 Oct 1995, *N. Jaramillo & N. Katip 798* (MO). — LORETO: Prov. Maynas, Estacíon Biológica Callicebus Río Nanay-Mishana, 3°55′S, 73°35′W, 130 m elev., 31 Dec 1981, *R. Vásquez et al. 2791* (MO, NY); id., Carretera Nauta-Iquitos, 150 m elev., 22 Nov 1990, *C. Grandéz & J. Ruíz 2096* (MO, OWU); id., Santa Maria de Nanay, Mishana, 3°55′S, 73°35′W, 90 m elev.,1 Oct 1990, *J. J. Pipoly et al. 12697* (MO, OWU). — **Venezuela.** — AMAZONAS: 0–3 km southeast of San Carlos de Río Negro, 1°51′S, 67°3′W, 120 m elev., 21 Jan 1980, *R. Liesner 8539* (MO, NY).

3.3.5.1.13 XYLOPIA FRUTESCENS Aubl., Hist. Pl. Guiane 1: 602. t. 242. 1775. *Xylopicrum frutescens* (Aubl.) Kuntze, Rev. Gen. Pl. 1: 8. 1891. TYPE: FRENCH GUIANA. [Locality unknown], [date unknown], *J. B. C. F. Aublet s.n.* (lectotype, here designated: P-00202541 (digital image!) [photo in: F!, MO!]), isolectotype: BM-000554087 (digital image!) [branch on the right]).

Trees 3–10(–30) m tall, d.b.h. 5–20 cm. Twigs, petioles, abaxial surfaces of leaves with golden to hyaline hairs, or with rusty to pale rusty hairs. Inflorescences and flowers with golden to hyaline hairs. **Twigs** densely sericeous, or extremely densely tomentose to velutinous, becoming less denser when older. **Petioles** (1–)2–3(–4) mm long, canaliculate, dark brown, mostly sparsely sericeous to tomentose; **leaf blades** (2.3–)3.5–8.9(–10) × (0.7–)1–1.8 cm, narrowly elliptic, elliptic or lanceolate, chartaceous to subchartaceous, brown, sericeous to sparsely sericeous or densely sericeous to tomentose abaxially, grayish green to pale brown and glabrous adaxially, apex acuminate, acumen 5–8 mm long, base cuneate; midrib raised abaxially, impressed adaxially. **Inflorescences** axillary, 2–5-flowered; **buds** narrowly oblong to narrowly triangular, slightly panduriform; **bracts** 2, ca. 2 × 2.5 mm, clasping. **Sepals** slightly connate at the base, ca. 3 × 2 mm, triangular ovate, smooth; **petals** white, beige to pale yellow; **outer petals** ca. 12 mm long, ca. 3 mm wide at midpoint, narrowly oblong to narrowly triangular, slightly panduriform, nearly lanceolate, slightly fleshy, densely sericeous abaxially, tomentellous adaxially, apex acute, base enlarged; **inner petals** ca. 10 mm long, ca. 2 mm wide at midpoint, extremely narrowly triangular to linear from the midpoint to the apex, nearly lanceolate, fleshy, tomentellous abaxially and adaxially, apex acute, base enlarged; **stamens** 90–110, **fertile stamens** 0.6–0.9 mm long, club-shaped, glabrous, apex of connective rounded or angular, discoid, ca. 0.1 mm long, papillate, anthers (5–)6–7-locellate, locelli discrete, filament 0.2–0.3 mm long; **outer staminodes** 0.6–0.9 mm long, often hard to differentiate from fertile stamens, flattened club-shaped, longer than the fertile stamens, glabrous, apex of connective flattened and elongate, 0.2–0.3 mm long, papillate, locelli discrete, filament 0.2–0.3 mm long; **inner staminodes** 10–22, obovate to obtriangular, 0.5–0.6 × 0.4–0.6 mm, glabrous, apex of connective slightly differentiated, slightly papillate, without locellate anthers and filament; **staminal cone** 1–1.2 mm in diameter, ca. 0.5 mm high, not concealing completely the ovaries, the apex of ovaries and stigmas outward; **carpels** 4–7, 3.5–4 mm long, ovary ca. 0.8 mm long, obclavate, densely sericeous, **ovules** 1–3, stigmas ca. 3 mm long, filiform, geniculate above the base, glabrous. **Fruits** of (1–)2–6 monocarps. **Monocarps** 6–10 × 5–8 mm, ellipsoid, obovoid, or globose, never falcate, not constricted between the seeds, apex rounded, almost sessile, reddish yellow to reddish green, wrinkled or smooth when dried, glabrous; **stipes** ca. 1 mm long. **Seeds** 1-3, 5–6.5 × 4 mm, ovoid or ellipsoid; aril white or beige *in vivo*. Figures 4E-F, 9B and C-D.

Key to the varieties of *Xylopia frutescens*

1. Abaxial surface of the leaves sericeous, with golden or hyaline hairs, sometimes sparse or rare; monocarps ellipsoid or obovoid, wrinkled when dried……………………………..……… ……………………..……..…………………..……13a. *Xylopia frutescens* var. *frutescens*

1. Abaxial surface of the leaves densely sericeous to tomentose, with rusty to pale rusty hairs; monocarps globose, smooth when dried, sometimes sunken in some parts…..13b. *Xylopia frutescens* var. *ferruginea*

3.3.5.1.13a XYLOPIA FRUTESCENS Aubl. VAR. FRUTESCENS

Xylopia setosa Poir., Encycl. 8: 812. 1808. TYPE: [FRENCH GUIANA]. [Cayenne]. Amérique, [date unknown], *Anonymous collector s.n.* (lectotype, here designated: P-00202516 (digital image!), isolectotype: FI-005607 [ex Herb. Desf.] (digital image!)).

Xylopia meridensis Pittier, Bol. Minist. Relac. Exter. (Venezuela) 3: 79. 1927. TYPE: [VENEZUELA]. Mérida, El Vigía, 200 m., 18 Sep 1921, *A. Jahn 843* [643 *in sched.*] (holotype: VEN-1503 (digital image!), isotypes: NY-00066764!, US-00098778!).

Distribution and habitat— This species has a broad geographic distribution in the Neotropics, occuring all over the Amazon Basin, in Brazil, Bolivia, Colombia, Guyana, French Guiana, Suriname, and Venezuela (Figure 12). It is also present in Belize, Costa Rica, El Salvador, Guatemala, Honduras, México, Nicarágua and Panama. In Brazil this species occurs in forests in the states of Bahia, Mato Grosso, Pará, Paraíba, Pernambuco, Rondônia, and Roraima. It is common in disturbed forests along the roads in Mato Grosso, and in the Northeastern and Nothern regions of the country.

Vernacular names— **"***Pindaibinha*" (Brazil, Pará, *E. A. Santos 1063*, RB), "*Pimientillo*" and "*fruta de burrillo*" (Venezuela, *C. Blanco 758*, US).

Phenology— Specimens with flowers have been collected in March, April, September, November, December, and specimens with fruits have been collected in February, June, and September.

Notes— *Xylopia frutescens* is characterized by its small to medium sized sericeous to tomentose leaf blades ((2.3–)3.5–8.9(–10) × (0.7–)1–1.8 cm), with golden to hyaline, or rusty to pale rusty hairs, abaxially; narrowly oblong to narrowly triangular buds; sepals slightly connate at the base; 90–110 stamens, fertile stamens 0.6–0.9 mm long, anthers (5–)6–7-locellate; 4–7 carpels, 3.5–4 mm long, stigmas ca. 3 mm long; (1–)2–6 monocarps per fruit, monocarps 6–10 × 5–8 mm, ellipsoid, obovoid, or globose, never falcate, not constricted between the seeds, almost sessile, glabrous.

Xylopia frutescens is often confused with *X. sericea* A.St.-Hil., since they are very similar, but it can be differentiated from the latter by its ovary ca. 0.8 mm long (*vs*. 1–1.5 mm); monocaps never falcate (*vs*. slightly falcate), almost sessile (*vs*. stipitate); and stipes ca. 1 mm long (*vs*. 3–3.5 mm).

Xylopia frutescens also resembles *X. amazonica*, *X. discreta*, and *X. polyantha* R.E.Fr. But *X. frutescens* differs from *X. amazonica* by its sepals ca. 3 × 2 mm long (*vs*. ca. 1.5 × 1.5 mm); ovary ca. 0.8 mm long (*vs*. ca. 0.5 mm); fruit pedicels ca. 2 mm long (*vs*. ca. 5 mm); ellipsoid, obovoid or globose, not apiculate, almost sessile monocarps (*vs*. ovoid, clavate, apiculate, stipitate); and stipes ca. 1 mm long (*vs*. (2–)3–5 mm).

Xylopia frutescens is distinguished from *X. discreta* by its leaf blades with golden or hyaline, or or rusty hairs abaxially (*vs*. silver or pearly); outer petals ca. 12 mm long (*vs*. 7–8 mm), inner petals ca. 10 mm long (*vs*. 5–6 mm); 90–110 stamens (*vs*. 70–85); staminal cone with apex of ovaries exceeding it (*vs*. concealing completely the ovaries); carpels 3.5–4 mm long (*vs*. 2.5–3 mm), ovary 0.5–0.7 mm long (*vs*. ca. 0.8 mm); monocarps ovoid, clavate (*vs*. ellipsoid or obovoid or globose, not clavate); and stipes ca. 1 mm long (*vs*. ca. 2.5 mm).

Xylopia frutescens is different from *X. polyantha* by its sepals ca. 3 mm long (*vs*. 1.5–2.5 mm); never falcate, almost sessile, monocarps (*vs*. slightly falcate, stipitate), not constricted between the seeds (*vs*. constricted between the seeds); and stipes ca. 1 mm long (*vs*. 2–3.5 mm).

Aublet (1775) in the protologue of *Xylopia frutescens* mentioned the habitat "*Caïennæ & Guianæ*", and in the preface the author cited he collected and made drawings from the material of French Guiana that he brought to Paris. He also mentioned the drawings complement the descriptions. According to Stafleu and Cowan (1976), today, the main fragments of Aublet's Herbarium are in BM and P. We found two specimens of Aublet's collections of *X. frutescens* from French Guiana, one at BM (BM-000554087), and another at P (P-00202541). The specimen at P was chosen as the lectotype, because it matches the protologue, and it has two buds. And this choice was also made in order to avoid confusion, since the specimen BM-000554087 is together at the same voucher with the specimen BM-000601166, another specimen of *X. frutescens* of Martin, from Guiana.

Poiret (1808) when described *Xylopia setosa* mentioned "*V. S. in herb. Desfont*.". We found two specimens of this species, one specimen at P, P-00202516, with handwritten label stating "*Xylopia setosa* Poiret Encycl", in the top, and "Cayenne" in the bottom corner of the label, and another specimen at FI, FI-005607, which has a label from Herbarium Webbianum ex Herb. Desfontaines. According to Stafleu and Cowan (1983), "*the general herbarium of Desfontaines was acquired by Webb and is now at FI*". However, we chose here the specimen P-00202516, as the lectotype, because it matches the protologue and it is the best preserved material.

Selected Specimens Examined— **Bolivia.** — BENI: Iténez, Canton Mareguá, Campamento móvil Cerro Azul ubicado a 30 km de la Comunidad de Tiquin, 13°38′37.0″S, 62°32′43.4″W, 697 m elev., 7 Nov 2006, *N. R. Ledezma et al. 1005* (NY). — **Brazil.** — MATO GROSSO: MT-320, próximo ao km 186, sentido Carlinda a Nova Canaã do Norte, 30 Jul 2016, *A. F. Pontes-Pires et al. 946* (JPB). — PARÁ: Abaetetuba, Vila do Beja, 1°38′15.8″S, 48°48′35.2″W, 1 Oct 2015, *A. F. Pontes-Pires et al. 938* (JPB); Acará, Conglomerado PA_1000, Subunidade 1, Subparcela 7, árvore n. 32, 1°98′S, 48°6′W, 5 Nov 2015, *E. A. Santos 1063* (RB); Vitória do Xingu, 3°13′44″S, 51°47′30″W, 8 Jun 2015, *C. Faveri PSACF_EX5869* (RB). — RONDÔNIA: Cacoal, BR-364, rodovia Cuiabá-Porto Velho, km

234, ao Norte da cidade, morro da Torre da EMBRATEL, 11°12′N, 61°62′W, 23 Jun 1984, *C. A. Cid Ferreira et al. 4730* (MO, US). — RORAIMA: PARNA do Viruá, estrada que dá acesso à Sede do Parque, mais ou menos 1 km da Sede, próximo a uma clareira perto do depósito, 10 Jun 2017, *A. F. Pontes-Pires et al. 975* (JPB). — **Colombia.** — Without locality, without date, *J. C. Mutis 3980* (US). — **French Guiana.** — Cayenne, Matoury, 4°50′N, 52°20′W, 13 Jul 2004, *L. Barrabé & F. Crozier 80* (NY); Crique Canceler, région littorale, 5°26′N, 53°2′W, 2 m elev., 4 Jun 1992, *D. Toriola-Marbot & M. Hoff 250* (US); Saül, on route de Belizon south of Eaux Claires, 3°37′N, 53°W, 200–300 m elev., 10 Nov 1990, *S. Mori et al. 21599* (NY, US). — **Guyana.** — Iramaipang, Kanuku Mts, Dec 1948, *Forest Department of British Guiana WB 554* (US); Region: U. Takutu-U. Essequibo, South Rupununi Savanna, Ikirap Creek along Marudi road, 2°25′N, 59°15′W, 250 m elev., 23 Dec 1993, *T. W. Henkel & R. James 3567* (NY, US). — **Suriname.** — Prope Jodensavanne (fluv. Suriname), 12 Sep 1956, *P. C. Heyligers 186* (US). — **Venezuela.** — AZOÁTEGUI, Cerro La Danta, bordering tributary of Río León, northeast of Bergantín, 800–1100 m elev., 22 Feb 1945, *J. A. Steyermark 61113* (MO). — BOLÍVAR: a lo largo de la pica maderera entre el Caño Maracapra y el Campamento La Esperanza, Reserva Florestal La Paragua, Feb 1970, *C. Blanco 758* (US). — DELTA AMACURO: Departamento Tucupita, 5–14 km ESE of Los Castillos de Guayana, 8°28–31′N, 62°17–22′W, 50-200 m elev., 28 Mar - 2 Apr 1979, *G. Davidse & A. C. González 16313* (MO). — ZULIA: ca. 55 km Southwest of Machiques by air, 1 to 4 km West of Pacella, 34 to 37 km West of main road by road, 9°36′N, 72°52′W, 26 mar 1982, *R. Liesner & A. González 13193* (MO).

Aditional Specimens Examined— **Brazil.** — PARAÍBA: João Pessoa, mata beirando a avenida que passa pelo Hospital Universitário da UFPB, próximo aos fundos da Geografia e Centro de Tecnologia, 8 Sep 2015, *A. F. Pontes-Pires & J. R. Lima 913* (JPB).

3.3.5.1.13b XYLOPIA FRUTESCENS Aubl. VAR. FERRUGINEA R.E.Fr., Kongl. Svenska Vetenskapsakad. Handl. n. s. 34(5): 30. 1900. TYPE: BRAZIL. Rio Para und Amaz. River, *Poeppig 3024* (holotype: B [destroyed] [photo in: F!, MO!], lectotype, here designated: W-1889-0298058 (digital image!), isolectotypes: F 875258!, GOET-000136 (digital image!), HAL-0076451 (digital image!), LE-00001859 (digital image!), M-0240135 (digital image!), P-00430049 (digital image!)).

Distribution and habitat**—** This variety occurs in Bolivia, Brazil, Colombia, French Guiana, Suriname, and Venezuela (Figure 12). In Brazil, it occurs only in Amazon in the states of Amapá, Amazonas, Mato Grosso, Pará, and Rondônia.

Vernacular names**—** "*Envirira*" (Brazil, Pará, *G. T. Prance & T. D. Pennington 2072*, US), "*Pegrekoe-pisi (Sranang)*" (Suriname, *J. van Donselaar 2810*, U).

Phenology**—** Specimens with flowers have been collected in January, October, and November, and specimens with fruits have been collected in June, July, August, November, and December.

Notes**—** Fries (1900) in the diagnosis of *X. frutescens* var. *ferruginea* pointed the rusty hirsute indument of the branches, petioles and leaves, and the rounded leaf base as the characters that distinguish the variety. We agree with Fries and add the globose monocarps, not wrinkled when dried as another distinguishing character of this variety.

In the protologue of *Xylopia frutescens* var. *ferruginea*, Fries (1900) cited only the material at B, but this specimen was lost. Therefore, here we chose the isotype at W (W-1889-0298058) as its lectotype, because it matches the original description, and it presents the rusty indument at the abaxial surface of the leaves and twigs, the most remarkable character of this variety.

Selected Specimens Examined**— Bolivia.** — BENI: Itenez Province, Serranía de San Simón, 14°25′S, 62°W, 165 m elev., 24 Jul 1993, *R. Quevedo et al. 1059* (NY). — **Brazil.** — AMAPÁ: BR-156, ca. 70 km de Macapá, no sentido de Oiapoque para Macapá, capoeira na beira da estrada, 0°38′10.1″N, 51°17′46.3″W, 16 Nov 2016, *A. F. Pontes-Pires & R. A. Pontes 964* (JPB); Coastal region, road to Amapá, vic. Km 108, rio Pedreira, 13 Jul 1962, *J. M. Pires & P. B. Cavalcante 52154* (US). — AMAZONAS: Rio Negro, rio Içana, 10 minutes by motorboat upstream from mouth of rio Cubate, hill at left bank, 0°33′S, 67°38′W, 150 m elev., 4 Nov 1987, *P. J. M. Maas et al. 6913* (MO, US). — MATO GROSSO: Barra do Bugres, Rod. BR-246, próximo do km 12 de Barra do Bugres, 23 Oct 1995, *G. Hatschbach et al. 63762* (MO); Sorriso, BR-163, cerca de 20 km de Sinop, na altura do km 814, 21 Sep 2014, *A. F. Pontes-Pires et al. 884* (JPB); Vila Bela da Santíssima Trindade, 58 km S of Rondônia state line on BR-364 from Vilhena to Cáceres, 13°22′S, 59°56′W, *W. W. Thomas et al. 4776* (MO, US). — PARÁ: Acará, 0°38′10.1″N, 51°17′46.3″W, 38 m elev., 29 Sep 2015, *A. F. Pontes-Pires et al. 931* (JPB); Belém, Embrapa, em frente ao herbário, 1°24′51″S, 48°27′37″W, 13 May 2008, *V. F. Mansano 602* (IAN, RB); Benevides, Distrito Benfica, 0°19′54.4″N, 48°16′16.2″W, 29 m elev., 1 Oct 2015, *A. F. Pontes-Pires et al. 939* (JPB);

Itaituba, estrada Santarém-Cuiabá, BR-163, km 842 a 850, Serra do Cachimbo, 9°00′S, 54°58′W, 5 May 1983, *M. N. Silva 246* (MO, US); road Bragança to Viseu, 10 km east of rio Piria and Guarapari, 11 Nov 1965, *G. T. Prance & T. D. Pennington 2072* (US); Oriximiná, rio Mapuera margem esquerda, a 1 km da margem, acima do acampamento Mapium, 1°9′S, 57°13′W, 19 Aug 1986, C. *A. Cid Ferreira et al. 7853* (US). — RONDÔNIA: Porto Velho, BR-364, sentido Jaci-Paraná-Abunã, km 846, 112 m elev. 9°26′43″S, 64°43′31″W, 02 Sep 2011, *A. A. Santos et al. 3509* (CEN, RB); A 29 km de Vilhena, 12°45′S, 60°10′W, 27 Oct 1979, *M. G. Vieira et al. 703* (MO, US); Vilhena, BR-364, rodovia Porto Velho-Cuiabá, km 18, 12°13′S, 60°61′W, 10 Jun 1984, *C. A. Cid Ferreira et al. 4495* (US). — **Colombia.** — CAQUETÁ: Extremo Norte de Chiribiquete, em escarpes altos, 810 m elev., 29 Nov 1992, *C. Barbosa et al. 8167* (NY). — **French Guiana.** — Camp n. 1 Ouman fou Langa Soula – Bassin du Haut-Marouini 2 km em aval, rive gauche, 2°53′S, 54°00′W, 150 m elev., 23 Aug 1987, *J. J. de Granville et al. 9585* (MO, NY, US). — **Suriname.** — Boschreserve (Forest Reserve), Brownsberg, tree number 1248, 7 Jul 1925, *without collector coll. number 6887* (U); Distr. Brokopondo, SW od vilage brokopondo, 18 Dec 1965, *J. van Donselaar 2810* (F, NY, U); Hab. Sectie O, arbor no. 623, 29 Jul 1919, *B. W. 4378* (MO, U); Suriname R., forest on schist hills W of Remoncourt, 27 May 1957, *J. P. Schulz 7993* (U). — **Venezuela.** — AMAZONAS: Dpto. Atures, Serranía Batata, 2 km al NE de Salto Colorado, caño Colorado, 55 km SE Puerto Ayacucho, 550 m elev., Sep 1989, *A. Fernández e al. 6308* (NY, US).

3.3.5.1.14 ***Xylopia glomerulosa*** D.M.Johnson, N.A.Murray & Pontes-Pires, sp. nov. ined. TYPE: PERU. Loreto, Maynas Province, Distrito Iquitos, C.I. Puerto Almendras (UNAP) Arboretum, 3°48′S, 73°25′W, 122 m elev., 24 Sep 1991, *C. Grández & N. Jaramillo 2873* (holotype: MO 5950784!, isotype: OWU!).

Xylopia glomerulosa can be distinguished from *X. sericea* by its leaf blades (12.3–)14.5–18.4 × 3.8–4.8(–5.3) cm (*vs*. 4.7–13 (0.8–)1–3 cm in *X. sericea*), extremely densely sericeous abaxially (*vs*. densely sericeous abaxially), the acuminate apex with an acumen (15–)18–23 mm long (*vs*. 5–10 mm); inflorescences glomerular, generally congested (*vs*. fasciculate, not congested), (5–)9–22-flowered (*vs*. 2–8(–13)-flowered); and seeds 9–9.5 × 6 mm (*vs*. ca. 6 × 4 mm).

Trees 13–25 m tall, d.b.h. about 30 cm. Twigs, petioles, abaxial surfaces of leaves and fruits with golden, yellowish, pale rusty, or yellowish pale brown hairs. Inflorescences and flowers golden to golden-hyaline hairs. **Twigs** densely tomentose becoming glabrate when older. **Petioles** (4–)4.5–7(–7.5) mm long, canaliculate, dark brown to brown, densely tomentose; **leaf blades** (12.3–)14.5–18.4 × 3.8–4.8(–5.3) cm, elliptic to narrowly elliptic, chartaceous to subcoriaceous, extremely densely sericeous abaxially, glabrous adaxially, except for some hairs in the end of the midrib closest the petiole, apex acuminate, acumen (15–)18–23 mm long, base cuneate to large cuneate, or truncate, or sometimes obtuse, or with oblique angles at both side of the base, frequently revolute in this region, midrib raised abaxially, keeled, impressed adaxially, secondary veins 9–13 per side, raised on both surfaces, less visible abaxially because of the dense indument. **Inflorescences** axillary, sometimes borning in older twigs, (5–)9–22-flowered, glomerular, generally congested,; **peduncles** 2–3 mm long, sericeous; **pedicels** 1.5–3 mm long, sericeous; **buds** narrowly oblong, slightly panduriform; **bracts** 2, one at the base of the pedicel, one at the midpoint, clasping, basal bract caducous, middle bract persistent, (2.2–)3.5–4 × 3–6.5 mm, ovate, often bilobed because it is splitted at midpoint, apex acute, the middle bract seems an aditional calyx, densely sericeous to tomentose abaxially, glabrous adaxially. **Sepals** connate at the base, 0.8–1(–1.5) mm long connate, ca. (⅓–)⅕ connate, 3.7–4.5 × 3.5 mm wide, ovate, smooth, densely sericeous abaxially, glabrous adaxially, apex acute; **petals** white; **outer petals** (13–)15–17 mm long, 2–2.5 mm wide at base, 1.3–2.2 mm wide at constriction, 2.2–2.5 mm wide at midpoint, narrowly oblong, slightly panduriform, or nearly lanceolate, slightly fleshy, apex acute to slightly rounded, densely sericeous abaxially, tomentellous with base glabrous adaxially; **inner petals** 11–13 mm long, 1.5–2.5 mm wide at base, 1 mm wide at constriction, 1–1.5 mm wide at midpoint, linear from apex to midpoint, base enlarged and concave, nearly lanceolate, fleshy, tomentellous with base short sericeous abaxially, tomentellous with base up to midpoint glabrous adaxially, apex acute; **stamens** 155–190, **fertile stamens** 100–120, 0.7–1 × 0.1–0.2 mm, nearly club-shaped, apex of the connective capitate, discoid, sometimes mushroom-shaped, 0.1–0.2 mm long, papillate, anthers (4–)5–8-locellate, filament 0.15–0.3 mm long; **outer staminodes** ca. 35, 0.7–0.8(–1.0) mm long, nearly club-shaped, glabrous, apex of connective irregular-shaped, or triangular to capitate, 0.2–0.3 mm long, papillate, anthers (4–)5–8–locellate, filament 0.15–0.2 mm long; **inner staminodes** 20–35, (0.4–)0.5–0.7 × 0.3–0.4(–0.5) mm, obtriangular to obovate, glabrous, apex of connective slightly differentiated, papillate, without locellate anthers and filaments; **staminal cone** 1.2–1.5 mm in diameter, 1–1.2 mm high, urceolate to globose; **carpels** 4–6, 3.9–5 mm long, ovary 0.9–1 mm long, obclavate, densely sericeous; **ovules** 2–4, stigmas 3–4 mm long, obclavate, geniculate above base, finely verruculose, glabrous. **Fruits** of 4–5 monocarps borne on a pedicel 3–6 mm long, tomentellous to tomentose; **torus** 3.7–5.5 mm in diameter, 2.5–3 mm high, nearly globose. **Monocarps** 14–22 × 12–16 mm, reniform, or oblong, slightly curved, obliquely clavate, not constricted between seeds, woody, red to reddish, slightly verruculose, pubescent, becoming less dense when older, apex rounded; **stipes** (1.5–)3–4.5 mm long, 2–2.5 mm thick, densely pubescent to tomentellous, slightly rugose longitudinally. **Seeds** ca. 4, 9–9.5 × 6 mm, ellipsoid to obovoid, smooth, dark brown to black, aril pale brown to amber-colored, translucent, lobes 1.8–2.8 × 2–2.7 mm, ovoid to slightly truncate, smooth surface. Figure 13A-O.

Distribution and Habitat— *Xylopia glomerulosa* is only known from collections from the Loreto region (department), in the municipalities of Iquitos (in the Maynas Province) and Nauta (in the Loreto Province), in Peru (Figure 14). Therefore, for now, this new species is endemic to this region of the Peruvian Amazon. It occurs in non-flooded or seasonally flooded forests, on sandy (with a predominance of white sands), sandy-clay or clayey soils.

Etymology— The specific epithet refers to the densely congested inflorescence, bearing a large number of flowers, resembling a glomerule, the most conspicuous character distinguishing it from its congener *X. sericea*.

Phenology— Specimens with flowers have been collected in February, March, September and October, and with fruits from December to March, and also in November.

Notes— *Xylopia glomerulosa* is close to *X. sericea*, but can be distinguished by its longer and larger leaf blades, (12.3–)14.5–18.4 × 3.8–4.8(–5.3) cm (*vs.* 4.7–13 × (0.8–)1–3 cm, in *X. sericea*), abaxially with golden to yellowish brown hairs, always dense and compact (*vs.* hyaline to golden hairs, becoming less dense when older); glomerular, generally congested inflorescences (*vs.* fasciculate, not congested), (5–)9–22-flowered (*vs.* 2–8(–13)); sepals 3.7–4.5 × ca. 3.5 mm (*vs.* 3–3.5 × ca. 2 mm); outer petals (13–)15–17 mm long (*vs.* 11.5–12.5 mm); monocarps 12–16 mm wide (*vs.* 6–9 mm); and seeds 9–9.5 × ca. 6 mm (*vs.* ca. 6 × 4 mm).

Additional Specimens* (*Paratypes*) *Examined— **Peru.** — LORETO: Loreto Province, Nauta, carretera a Iquitos, 4°29′S, 73°35′W, 150 m elev., 12 Dec 1986, *R. Vásquez & N. Jaramillo 8598* (F, MO, NY); ibid., Dist. Nauta, Caserio Miraflores em la boca del Río Tigre, 4°27′37″S, 74°04′51″W, 106 m elev., 8 Nov 2008, *R. Vásquez et al. 34673* (MO, OWU).

Maynas Province, Distrito Iquitos, Allpahuayo (Centro de Esperimentos del IIAP), a 20 km de la ciudad, Carretera Iquitos-Nauta, 4°10′S, 73°30′W, 150 m elev., 22 Nov 1984, *J. Ruan & J. Mendoza 520* (F, MO, NY); ibid., Iquitos, Allpahuayo, Carretera Iquitos-Nauta, km 20, 15 Feb 1985, *J. Ruíz 513* (NY); ibid., Iquitos, Allpahuayo, Estación Experimetal del Instituto de Investigaciones de la Amazonía Peruana (IIAP), 12 Sep 1990, *R. Vásquez et al. 14382* (MO, OWU); ibid., Iquitos, Allpahuayo, Estación Experimetal del Instituto de Investigaciones de la Amazonía Peruana (IIAP), 11 Oct 1990, *R. Vásquez & N. Jaramillo 14514* (MO, OWU); ibid., Iquitos, Allpahuayo, Estación Experimetal del Instituto de Investigaciones de la Amazonía Peruana (IIAP), Dec 1990, *R. Vásquez & N. Jaramillo 15799* (MO); ibid., [Iquitos], Carretera Iquitos-Nauta, entre Quistococha y Moralillo, ca. 130 elev., 5 Sep 1979, *C. Diaz & N. Jaramillo 1336* (MO); ibid., Dtto. Iquitos, Carretera Iquitos-Nauta, km 5, trocha del caserio de “San Fernando”, ca. 130-150 m elev., 30 Jan 1989, *M. Rimachi Y. 9067* (MO [2 sheets], NY, US); ibid., Distrito Iquitos, Cuyana, Río Nanay, 3°44′49″S, 73°14′31″W, 122 m elev., 14 Mar 1997, *R. Vásquez & R. Rojas 22716* (MO [2 sheets], NY [2 sheets]); ibid., Pto Almendras, (Río Nanay), 3°45′S, 73°25′W, 122 m elev., 25 Oct 1984, *R. Vásquez & N. Jaramillo 5851* (MO, NY); ibid., [Iquitos], Rio Mamón [Rio Momón], 4 Sep 1972, *T. B. Croat 19970* (AAU, F, L, MO, NY, RSA, WAG); ibid., Dtto. Iquitos, Rio Nanay, Carretera de Picuruyacu, below Bellavista, ca. 150-180 m elev., 22 Sep 1975, *S. McDaniel & M. Rimachi Y 20177* (MO, OWU); ibid., Dtto. Iquitos, Río Nanay, Carretera de Picuruyacu, below Bellavista, ca. 160 m elev., 10 Sep 1979, *M. Rimachi Y 4592* (MO, RSA).

3.3.5.1.15 XYLOPIA LIGUSTRIFOLIA Dunal, Monogr. Anonac. 121. t. 18. 1817. *Xylopicrum ligustrifolium* (Dunal) Kuntze, Rev. Gen. Pl. 1: 8. 1891. TYPE: [COLOMBIA]. Hab. in Buga. Am. Mer., *F. W. H. A. von Humboldt and A. J. A. Bonpland s.n.* (holotype: P-00322485 (digital image!), isotypes: MPU-026896 [fragment] (digital image!), P-00734908 (digital image!), P-00734907 (digital image!)).

Xylopia usitata Diels, Notizbl. Bot. Gart. Berlin-Dahlem 9: 140. 1924. TYPE: PERU. East Peru, middle Yucayali, Yarina Cocha, jungle, about 155 m above sea level, “Jacobara”, 26 Sep 1823, *G. Tessmann 3217* (holotype: B-100242288 [photo in: F!, NY!] (digital image!), isotypes: F 642539! [fragment], F 931107! [fragment], NY-00066778! [The voucher has a note from NY explaning the mixing up of labels between the numbers

3215 and 3217], S-R-6873 (digital image!), S-13-3062 (digital image!), US 2223536! [collector number 3215 error, mixed up label with the correct number 3217]).

Trees (6–)9–24(–30) m tall, d.b.h. 12–60(–100) cm. Twigs and petioles with golden, rusty, or pale brown hairs. Abaxial surfaces of leaves, inflorescences and flowers and fruits with golden, whitish hyaline, hyaline, or pale rusty hairs. **Twigs** brown to grayish brown with beige or cream lenticels, tomentellous to villous, becoming glabrate or glabrous when older. **Petioles** 1.5–3.8 mm long, canaliculate, dark brown, tomentellous or pubescent at groove margins, sometimes also in a line abaxially, glabrous at other parts; **leaf blades** 3.2–6.3(–7.7) × (1–)1.5–2.3 cm, elliptic, narrowly elliptic, or rarely oblanceolate or oblong, subchartaceous to chartaceous, margin mostly undulate, sometimes just slightly, pale brown, sericeous to pubescent abaxially, sometimes sparsely, grayish brown to greenish brown and glabrous adaxially, sometimes with a tuft of hairs at the apex, apex acute to slightly acuminate, rarely retuse at the tip, acumen 3–6 mm long, base acute, or sometimes attenuate or asymmetric, with oblique angles on both sides of the base; midrib raised abaxially, keeled, midrib impressed adaxially, secondary veins (9–)11–15 per side, raised abaxially, just slightly visible adaxially. **Inflorescences** axillary, in the middle of the twigs, or cauliflorous *in sched.* (C. A. Cid Ferreira & J. Lima 3594), mostly 2–flowered, ocasionaly 1–flowered; **peduncles** (0.5–)1–1.5 mm long, rarely pale rusty tomentellous, or pubescent, or glabrate; **pedicels** 2–3.5(–5) mm long, indument as in the peduncles; **buds** narrowly oblong to narrowly triangular, slightly constricted above the base; **bracts** 2, one at base of the pedicel and other at the midpoint, persistent, 0.5–1.2 × 0.8–2 mm, ovate, sometimes bilobed when splitted at midpoint, clasping, tomentellous to pubescent only at apex abaxially, glabrous adaxially. **Sepals** connate at the base, connate 0.4–0.6 mm long, ca. ⅓ connate, 1.3–1.7 × 1.4–1.6 mm, triangular to triangular ovate, smooth, coriaceous, pubescent abaxially at the apex, glabrous adaxially, margin sometimes ciliate, apex acute; **petals** white, cream, whitish cream, yellowish white or yellow *in sched.*; **outer petals** 11–16 mm long, 1.7–2 wide at base, 1.4–1.6 mm wide at constriction, 1.5–2.5 mm wide at midpoint, narrowly oblong, obliquely splitted at both sides of the base, the splitted bases of adjacent petals form a space in the buds where the inner petals can be seen, slightly fleshy, densely sericeous abaxially, tomentellous with the base papillate to verruculose adaxially, apex acute; **inner petals** 9.5–14 mm long, 1.2–1.4 mm wide at base, 0.7–0.8 mm wide at constriction, 1–1.7 mm wide at midpoint, narrowly oblong, slightly fleshy, short sericeous up to midpoint and tomentellous towards the apex abaxially, tomentellous with the base glabrous and papillate to verruculose adaxially, apex acute; **stamens** 38–50, **fertile stamens** 27–42, 0.5–0.8 × 0.2–0.3 mm, nearly club-shaped, glabrous, apex of the connective ca. 0.1 mm long, discoid, or pentagonal, papillate, anthers (1–)4–6(–7)-locellate, filament 0.1–0.15 mm long; **outer staminodes** hard to differentiate from the fertile stamens; **inner staminodes** 8–12, 0.5–0.7 × 0.2–0.3 mm, obtriangular, glabrous, apex of the connective slightly differentiated without locellate anthers, and filament; **staminal cone** 1.1–1.2 mm in diameter, ca. 0.8 mm high, urceolate or globose to conical, sometimes not concealing completely the ovaries, apex of ovaries and stigmas outward; **carpels** 7–10, 4.4–6 mm long, ovary 0.7–0.9 mm long, obclavate to slightly falcate, fusion line visible sometimes, densely sericeous, **ovules** 2–3, stigmas 3.7–5 mm long, filiform up to midpoint, slightly enlargerd or geniculate close the base, triangular in cross section at the midpoint, sericeous to tomentose from apex to midpoint, hairs straight and adpressed, less denser from midpoint to base. **Fruits** of 3–8 monocarps borne on a **pedicel** 5–5.5 mm long, bracts persistent, sparsely pubescent or glabrate to glabrous; **torus** 2.5–3 mm in diameter, 1.2–2.5 mm high, flattened discoid. **Monocarps** 9–15 × 5–7 mm, ellipsoid, or oblong, clavate, pinkish green, pinkish red or red, slightly wrinkled when dried, rarely pubescent to glabrate, apex obtuse, apiculate, apiculus 1–1.5 mm long; **stipes** 3.5–5 mm long, slightly wrinkled, rarely pubescent. **Seeds** 1–3, 5.5–7 × 3.7–4.7 mm, obovoid to flattened obovoid, dark brown to black, aril graysh beige or witish beige or yellowish, sometimes translucent, lobes 1.5–3 × 1.5–2.5 mm, nearly circular, rugulose.

Illustration— Dunal (1817: tab. 18).

Distribution and habitat— *Xylopia ligustrifolia* occurs in the Amazon Basin: Bolivia, Brazil, Colombia, Ecuador, Peru, and Venezuela. It grows frequently in seasonaly flooded forests (*várzea*), or in riverine, swampy, or non flooded lowland forests, on clayey or white sandy soils. In Brazil, it is present in the states of Acre, Amazonas, and Rondônia.

Vernacular Names— "*Burilico*" (Colombia, *J. Cuatrecasas et al. 27533,* US), "*Espintana*" (Peru), "*Espintana blanco*" (Peru), "*Iara*" (Peru), "*Piraquina*" (Bolivia, *M. Moraes R. 799*, MO).

Phenology— Specimens with flowers have been collected in from August to November, and in March and July, and specimens with fruits have been collected from January to March, and also in November.

Notes— *Xylopia ligustrifolia* is distinct by its leaf blades with an acute to slightly acuminate apex, an acute, or attenuate, or asymmetrical base that is always obliquely angled on both sides, a slightly undulate margins, and its (1–)2-flowered inflorescences.

Xylopia ligustrifolia is morphologically close to *X. pittieri* Diels *sensu lato*, but can be distinguished by the tomentellous to villous young twigs (*vs.* densely tomentose to rarely sericeous, in *X. pittieri*); leaf blades with undulate margins (*vs.* flat margins), acute, or sometimes attenuate or asymmetrical base, with oblique angles on both sides of the base (*vs.* cuneate, to less frequently obtuse or asymmetrical, often with oblique angles close the petiole); (1–)2 flowers per inflorescence (*vs.* 2–5(–10) flowers); and entirely sericeous to tomentose stigmas (*vs.* villous to tomentellous from apex to the midpoint, and glabrous from the midpoint to the base).

Selected Specimens Examined— **Bolivia.** — BENI: Provincia Yacuma, Estación Biológica Beni, río Curiraba, 4 Apr 1986, *M. Moraes R. 799* (MO, NY). — LA PAZ: Prov. Iturralde, Alto Madidi, al Norte em línea recta de la comunidade Ixiamas, aprox.. 93.4 km del campamento Lucachi, Parcela Gentry “Inambare”, 12°57′48.93″S, 67°49′10.7″W, 177 m elev., 26 Oct 2009, *F. Zenteno-R. et al. 9096* (MO). — **Brasil.** — ACRE: Bujari, Riozinho Andirá, along rio Andirá, 9°39.624′S, 68°2.492′W, 160 m elev., 24 Feb 2009, *P Acevedo-Rodriguez et a. 15034* (RB); Cruzeiro do Sul, rio Juruá Mirim, Comunidade Vista Alegre, 8°8′S, 73°49′W, 230 m elev., 18 Nov 2001, *P. Delprete et al. 7936* (U). — AMAZONAS: Acima do Mun. de Novo Japurá, rio Japurá, afluente do rio Solimões, ao longo do rio, 11 Nov 1982, *C. A. Cid Ferreira & J. Lima 3594* (INPA, MO, NY, RB); Igarapé Jandiatuba, border of river, 9 Jan 1949, *R. L. Fróes 23870* (IAN); Ilha Tupinambarana, Paraná Urariá, white water, between rio Abacaxis and rio Paraconi, 3°50′S, 58°30′W, 9 Jul 1983, *S. R. Hill et al 13019* (INPA, MO, NY, RB); Manacapuru, Lago do Jacaré, May 1979, *O. P. Monteiro et al. 20* (JPB, INPA); Manaus, Ilha do Pombo, 4 Aug 1997, *R. Mouzinho & L. F. Coêlho s.n.* (INPA 194347); Maraã, rio Japurá, margem direita, 3 Nov 2982, *I. L. Amaral et al. 308* (F, JPB, INPA, MO, NY, RB, US); Reserva de Desenvolvimento Sustentável de Mamirauá, Setor Jarauá, Dorico quadra K, planta número 30, 12 Oct 2000, *J. M. de Brito & P. A. C. L. Assunção 160* (IAN, INPA); Rio Juruá, 510 km above mouth, river bank, 19 Feb 1977, *G. T. Prance et al. 24497* (US); Rio Negro, embocadura do rio Maipedi, 23 Sep 1975, *K. Kubitzki 75-44* (INPA 58519); São Paulo de Olivença, near Palmares, 11 Sept – 26 Oct 1936, *B. A. Krukoff 8496* (MO). — RONDÔNIA: Porto Velho, Desmatamento, Margem direita, Setor 01, 4 Dec 2009, *M. P. N. Pereira 119* (RB). — **Colombia.** — CAQUETÁ: Araracuara, 1 Mar

1991, *A. van Dulmen & N. Matapi 131* (U). VALLE DEL CAUCA, Municipio de Buga, margen derecha del río Cauca, junto a la Laguna de Sonsó, 900 m elev., 25 Feb 1969, *J. Cuatrecasas et al. 27533* (US). — **Ecuador.** — NAPO: Río Yasuní y lagunas de Jatun-Cocha, 0°58′S, 75°41′W, 200 m elev., 29 Sep 1988, *C. E. Cerón & N. Gallo 5161* (MO, NY, US); Laguna de yuturi, coleciones em ambas márgenes del Río Yuturi, 0°36′S, 76°1′W, 220 m elev., 25 Feb 1990, *J. Jaramillo & E. Grijalva 11321* (NY). — **Peru.** — LORETO: Isla de Ushpa-Caño, near mouth of Río Itaya, 24 Aug 1972, *T. B. Croat 19620* (F, MO, NY); Prov. Requena. Dtto. Sapuena, Basin of Río Ucayali, Jenaro Herrera and vicinity, Supay Cocha, Quebrada Braga, entrance ½ hour upstream by 25 h.p. outboard from Jenaro Herrera, 4°55′S, 73°45′W, 25 Nov 1988, *D. C. Daly et al. 5771* (MO); Quebrada, Río Marañon, 3 Mar 1977, *G. T. Prance et al. 24652* (OWU). — MADRE DE DIOS: Prov. Maynas, Manu Park, Cocha Cashu uplands, 400 m elev., 22 Aug 1986, 11°45′S, 71°0′W, *P. Núñez 5897* (MO). — **Venezuela.** — AMAZONAS: Dpto. Atures, Valley of Río Coro-Coro, W of Serrania de Yutaje, E base of forested mountain 5 km W of river, 1100 m elev., 10 Mar 1987, *B. K. Holst et al. 3411*(US).

3.3.5.1.16 XYLOPIA LONGICUSPIS R.E.Fr., Acta Horti Berg. 12(1): 210. 1934. TYPE: BRAZIL. Amazonas: Esperança, ad ostium flum. Javary, fluvii Solimões affluentis, 21 Sep 1931, *A. Ducke s.n. RB 23910* (holotype: S-R-6859 (digital image!), isotypes: B-10 0242287 (digital image!), RB-00534171! [leaf branch], RB-00534195! [packet with small longitudinal section of branch, separate leaves and two flowers], US-00074236!).

Shrubs or **trees**. Twigs, petioles, and abaxial surfaces of leaves with golden to pale rusty hairs; inflorescences and flowers with golden, hyaline, rusty, or whitish hairs. **Twigs** villous to tomentose. **Petioles** 3–5 mm long, canaliculate, dark brown to black; **leaf blades** 20.4–24.7 × 5.8–6.8 cm, oblong, membranous, grayish green to pale brown on both surfaces, sparsely tomentose abaxially, denser on the midrib, glabrous adaxially, apex cuspidate, cusp 20–50 mm long, base obtuse to broad cuneate; midrib raised abaxially, impressed adaxially, secondary veins 12–16(–18) per side, raised abaxially, strongly impressed adaxially. **Flowers** cauliflorous; **peduncles** ca. 10 mm long; **buds** triangular ovoid; **bracts** 5–10 mm long, ovate, apex acute, pilose abaxially, glabrous adaxially. **Sepals** connate at the base, in ⅓ of their length or a little more, connate 3–5 mm long, calyx lobes 10–12 × 12–15 mm, triangular to triangular ovate, smooth, membranous, tomentose abaxially, apex cuspidate; **petals** whitish *in sched.*; **outer petals** 28–30 mm long, 10–12 mm wide at midpoint, triangular to triangular ovate, fleshy, densely sericeous abaxially, tomentellous adaxially, apex acute to acuminate; **inner petals** 18–23 mm long, 6–10 mm wide at midpoint, triangular to triangular lanceolate, fleshy, tomentellous abaxially, glabrous adaxially, apex acute to acuminate; **stamens** ca. 3.5 mm long, glabrous, anthers locellate, **outer staminodes, inner staminodes, staminal cone,** and **ovules** not observed; **carpels** numerous, ovary sericeous, stigma linear clavate, almost glabrous. **Fruits** and **seeds** unknown.

Distribution and habitat— This species is only known by two collections, one is the type collection. It occurs in Brazil, in the state of Amazonas.

Phenology— Specimens with flowers have been collected in September.

Notes— The fruits of *Xylopia longicuspis* are unknown. This is one of the difficulties to the correct delimitation of this species and its relatives. Another difficulty is the few vouchers available. *Xylopia longicuspis* is characterized by its leaf blades with secondary veins raised abaxially and strongly impressed adaxially, cuspidate apex, cusp 20–50 mm long, obtuse to large cuneate base; cauliflorous inflorescence; flowers pedicels ca. 10 mm long; triangular to triangular ovate outer petals, triangular to triangular lanceolate inner petals; stamens ca. 3.5 mm long; and linear clavate stigmas, almost glabrous (Fries 1934).

Xylopia longicuspis is close to *X. annoniflora*, *X. cuspidata* and *X. platypelata*. It can be distinguish from *X. annoniflora* by its membranous leaf blades (*vs*. papyraceous to subchartaceous), sparsely tomentose on the abaxial surface (*vs*. sparsely to rarely velutinous), with the cuspidate apex (*vs*. acuminate), cusp 20–50 mm long (*vs*. acumen 5–15 mm), the obtuse to broad cuneate base (*vs*. rounded and asymmetric); flower pedicels 10 mm long (*vs*. 1–2 mm long, according to Fries 1934), fertile stamens ca. 3.5 mm long (*vs*. ca. 3 mm); and stigmas almost glabrous, according to Fries (1934) (*vs*. pilose, Pombo *et al.* 2017).

Xylopia longicuspis is distinguished from *X. cuspidata* by its oblong leaf blades (*vs*. elliptic, oblong elliptic, or less frequently oblanceolate), with the obtuse to broad cuneate apex (*vs*. cuneate to acute), sparsely tomentose on the abaxial surface (*vs*. short sericeous); outer petals 28–30 mm long (*vs*. ca. 15 mm), 10–12 mm wide at midpoint (6–8 mm), inner petals 18–23 mm long (*vs*. 8–12 mm), 6–10 mm wide at midpoint (ca. 5 mm), and fertile stamens (2–)3 mm long (*vs*. ca. 3.5 mm).

Xylopia longicuspis differs from *X. platypetala* by its petioles 3–5 mm long (*vs*. 2–2.5 mm); leaf blades 14–17.3(–20) × 4.9–5.2(–6) cm (*vs*. 20.4–24.7 × 5.8–6.8 cm), sparsely sericeous in the abaxial surface (*vs.* sparsely tomentose); flower peduncles ca. 5 mm long (*vs.* ca. 10 mm), and outer petals 20–23 mm long (*vs.* 28–30 mm).

Specimen Examined— **Brazil.** — AMAZONAS: Coari, Projeto RADAM, ponto 17, SB 20 VD, 23 Sep 1976, *T. R. Bahia 137* (NY).

3.3.5.1.17 XYLOPIA MAASIANA Pontes-Pires, sp. nov. ined. (Pontes-Pires et al. in prep.). TYPE: BRAZIL. Mato Grosso: Mun. Nobres [Sorriso], along Rio Celeste at BR163, 52 km S of Sinop (km 775), 12°18′S, 55°37′W, 16 Sep 1985, *W. W. Thomas, D. Ackerly & R. P. Lima 3813* (holotype: MG-191800!, isotypes: F 2019795!, HSFL 128, INPA 150327!, MG-121672!, MO-1922945!, NY!, SPF-00045525!, US 3101263!, U-0134169 (digital image!)).

Trees 4–15(–20) m tall, and **shrubs** 2–3 m tall, d.b.h. 10–25 cm; **bole** with buttresses. Twigs, abaxial surfaces of leaves, inflorescences, and flowers with golden or golden hyaline hairs. **Twigs** tomentose to short sericeous, becoming sparsely tomentose, glabrate when older, pale brown to gray brown; with lenticels. **Petioles** 4–7 mm long, canaliculate, brown to dark brown, tomentose to short sericeous; **leaf blades** (4.2–)5.8–10.5(–11.8) × (1.8–)2.2–4.4(–5.8) cm, elliptic to oblong-elliptic, chartaceous to subcoriaceous, margin frequently slightly revolute to revolute, translucent glands rare (visible under stereomicroscope), pale brown to yellowish and densely short sericeous abaxially, brown and glabrous adaxially, apex mostly acute, sometimes short acuminate, less frequently rounded, acumen 3–6 mm long, base cuneate, acute or attenuate; midrib raised abaxially, forming a keel, impressed adaxially, secondary veins (9–)12–15(–17) per side, raised on both surfaces, more visible adaxially. **Inflorescences** axillary, 2–3(–4–6)-flowered**; peduncle** 1.5–3 mm long, tomentose; **pedicels** 1.2–1.5 mm long, tomentose; **buds** narrowly oblong to narrowly triangular, nearly panduriform, slightly constricted above the base; **bracts** 2, one at the base of the pedicel, and one at the midpoint, persistent, ca. 1.5 × 1 mm, triangular ovate, clasping, short sericeous abaxially, adaxially glabrous. **Sepals** slightly connate at the base, ca. ⅓–⅙ of their length connate, 1.5–2 × 1.5 mm, ovate, smooth, short sericeous abaxially, glabrous adaxially, apex acute; **petals** white, becoming maroon to purple towards the center; **outer petals** 13–14(–18) mm long, 2.5–5 mm wide at base, 1.5–2.5 mm wide at constriction, 2–3.5 mm wide at midpoint, narrowly triangular to narrowly oblong, lanceolate, slightly fleshy, reflexed in the median region at anthesis, apex acute, abaxially densely short sericeous, tomentellous, base enlarged and concave, papillate adaxially; **inner petals** 12–14 mm long, ca. 2 mm wide at base, 0.8 mm wide at constriction, ca. 1 mm wide at midpoint, linear from midpoint to apex, lanceolate, longitudinally keeled adaxially from midpoint to apex, tomentellous with base and convex region short sericeous abaxially, glabrous with the base slightly papillate and glabrous adaxially, apex acute to acuminate, base enlarged and concave; **stamens** 130–165; **fertile stamens** 80–100, slightly club-shaped, 0.6–0.8(–0.9) × 0.2 mm, glabrous, apex of connective 0.1–0.3 mm long, often rounded or slightly angular, flattened, papillate, anthers 6–8(–12)-locellate, filament 0.1–0.2 mm long; **outer staminodes** 35–40, 0.8–0.9 × 0.2 mm, slightly club-shaped, glabrous, anther connective apex 0.2–0.3 mm long, often rounded, or only slightly angular, or elongate, or sometimes longer and triangular, anthers(3–)4–6(–10)-locellate, filament ca. 0.1 mm long; **inner staminodes** 17–23, obtriangular, 0.5–0.8(–0.9) × (0.2–)0.3–0.4 mm, glabrous, apex of the connective ca. 0.2 mm long, very slightly dilated, or sometimes not differentiated, sometimes papillate, without locellate anthers and filaments; **staminal cone** depressed urceolate, 1.2–1.5 mm in diameter, 0.8 mm high, sometimes not concealing completely the ovaries; **carpels** 5–8, 3.2–4.5 mm long, ovary (0.5–)0.7–1 mm long, semi-fusiform to obclavate, densely sericeous; **ovules** 2–3, stigmas 2.7–3.5 mm long, linear, slightly geniculate above base, finely verruculose, glabrous. **Fruit** of 3–7 monocarps borne on **pedicels** 5–7.5 mm long, sparsely tomentose to glabrate; **torus** ca. 2.5 mm in diameter, 1.5 mm high, globose. **Monocarps** (6–)8–15(–17) × (5–)6–7.5 mm, 4–4.5 mm thick, oblong, compressed-falcate and obliquely clavate, slightly constricted between seeds, or obovoid and clavate (1-seed), glabrous to glabrate, becoming red, brown to dark brown when dried, obliquely wrinkled when dried, apex rounded or obtuse, sometimes obliquely apiculate, apiculus 1(–2) mm long; **stipes** 6–8 mm long, wrinkled when dried, glabrate. **Seeds** 1–3, oblong, 7–7.5 × 3–3.5 mm, ca. 3 mm thick, dark brown to black, shiny; aril yellowish beige, yellowish, orange, or transparent orange, lobes 1.5–2 × ca. 2.5 mm wide, ellipsoid, truncate or slightly oblique, fleshy.

Distribution and Habitat— *Xylopia maasiana* is endemic to the Brazilian Amazon, occurring in the states of Amazonas, Mato Grosso, Pará, Rondônia, and Tocantins (Figure 15). The species is found in riverine forests, and seasonally (*várzea*) or permanently flooded forests (*igapó*), on hydromorphic soils, and less frequently in non flooded lowland forests (*terra firme* forest), or in ecotone areas between the Amazon forest and the *cerrado* (the savanna in central Brazil).

Phenology**—** Specimens with flowers have been collected from May to October, and with fruits from May to September.

Notes**—** *Xylopia maasiana* is characterized by its leaf blades margins frequently slightly revolute to revolute, mostly acute apex, raised midrib abaxially, forming a keel; 2–3(–6)-flowered axillary inflorescences; narrowly oblong to narrowly triangular, nearly panduriform buds; sepals slightly connate at the base; 130–165 stamens; 5–8 carpels, glabrous stigmas; 3–7 monocarps per fruit; and 1–3-seeded each.

The leaves of *Xylopia maasiana* closely resemble those of *X. nitida.* Both have oblong-elliptic or elliptic leaf blades, with a golden-hyaline to golden sericeous indument, and the midrib quite raised, forming a small keel on the abaxial surface. *Xylopia maasiana* can be distinguished, however, by its inflorescences with only 2–3 (rarely 4–6) flowers per inflorescence (*vs.* often composed of 2–3 small branches, (2–)4–8(–15) flowers); narrowly oblong to narrowly triangular, nearly panduriform buds (*vs.* narrowly oblong to oblong, enlarged at the base, narrowing progressively towards the apex, in *X. nitida*); sepals only slightly connate at the base, connate ca. ⅓–⅙ of their length, not forming a short cup-shaped calyx (*vs.* sepals connate from ½ to ⅔ of their length, forming a short cup-shaped calyx); 130–165 stamens (*vs.* 170–270), fertile stamens 0.6–0.8(–0.9) mm long (*vs.* 1–1.5 mm); 5–8 carpels (*vs.* 20–30), glabrous stigmas (*vs.* tomentellous at apex); fruits of 3–7 monocarps (*vs.* 10–27); often compressed-falcate to obliquely clavate, monocarps, slightly constricted between the seeds (*vs.* mostly narrowly cylindrical or extremely narrowly oblong, sometimes slightly falcate, torulose or moniliform); 1–3 seeds (*vs.* mostly 4–7, rarely 1–3), 7–7.5 mm long (*vs.* 5–6.5 mm), and oblong (*vs.* obovoid).

Xylopia maasiana is also similar to *X. pittieri* Diels, another Amazonian species, sharing the small to medium sized leaf blades, (4.2–)5–10.5(–11.8) × (1.5–)1.8–4.8(–5.8) cm, densely short sericeous abaxially; narrowly oblong to narrowly triangular, slightly or nearly panduriform buds; sepals only slightly connate at the base; sepals 1.2–2.5 mm long; outer petals 8.5–15(–18) mm long, 1.4–3.5 mm wide at midpoint; inner petals 6.5–14 mm long, 0.6–1 mm wide at midpoint; 5–10 carpels; 3–9 monocarps per fruit; and 1–4 seeds.

But *X. maasiana* can be easily distinguished from *X. pittieri* by its 130–165 stamens (*vs.* (38–)50–60, in *X. pittieri*), anthers of fertile stamens 6–8(–12)-locellate (*vs.* 2–4(–5)-locellate); entirely glabrous stigmas (*vs.* villous to tomentellous from the apex to the midpoint and glabrous from the midpoint to the base); monocarp stipes 6–8 mm long (*vs.* (2.5–)3–4.5

mm); and seeds 3–3.5 mm wide (*vs.* 4–4.5 mm), oblong (*vs.* flattened obovoid, obovoid or ellipsoid).

***Specimens Examined*— Brazil.** — AMAZONAS: Humaitá, estrada Humaitá-Jacarecanga, km 45, rio Maici-Mirim, 7°45′S, 62°32′W, 19 Jun 1982, *L. O. A. Teixeira et al. 1230* (INPA, JPB, MG, MO, NY, RB, US); Rio Curuquetê, vicinity of Cachoeira Santo Antônio, 14 Jul 1971, *G. T. Prance et al. 14205* (INPA, MG, MO, NY, R). — MATO GROSSO: Alta Floresta, área particular de preservação ambiental, delimitada pelo Parque Estadual do Cristalino e pelos Rios Teles Pires e Cristalino, a leste do Rio Cristalino, nas proximidades da margem do Rio Teles Pires, 9°00′S, 55°00′W, 17 Jul 2006, *D. Sasaki et al. 79* (INPA, K, SPF); ibid., propriedade particular de preservação ambiental delimitada pelo Parque Estadual do Cristalino e pelos rios Teles Pires e Cristalino, entre o Cristalino Jungle Lodge e base do Limão, em curva acentuada do rio Cristalino, 17 Dec 2006, *D. Sasaki et al. 1294* (HERBAM, K); Aripuanã, Núcleo Pioneiro de Humboldt, forest along margin of Rio Aripuanã, 59°21′S, 10°12′W, 20 Out 1973, *C. C. Berg et al. P19802* (INPA, MG, MO, NY, US); [Cocalinho], região de Cocalinho, 1997, *A. Rozza et al. 449* (ESA, JPB, MT, RB); ibid., 1997, *A. Rozza et al. 498* (ESA, JPB, UFMT, RB); Colíder, Resgate da Flora da UHE Colíder, Lote B de supressão, 255 m elev., 2 Oct 2014, *M. Lautert et al. s.n.* (MBM 402949, RB 653442, TANG 3918); ibid., Resgate da Flora da UHE Colíder, Lote B de supressão, 385 m elev., 11 Aug 2015, *J. P. Battisti et al. s.n.* (MBM 403120, RB 641501, TANG 3111); ibid., Resgate da Flora da UHE Colíder, Lote B de supressão, 257 m elev., 5 Sep 2014, *L. F. Sardelli et al. s.n.* (MBM 403114, RB 652317); Confresa, Faz. Promissão, 8 Aug 1997, *L. C. Bernacci 2326* (ESA, IAC); Expedition Base Camp, by the Suiá Missu Ferry, c. 40 km NW of base camp, 24 Sep 1968, *R. M. Harley & R. Souza 10240* (IAN, MO, NY, RB, UB); Itaúba, margem do Rio Renato, afluente do Rio Teles Pires, 14 Jul 2008, *V. Maioli et al. 718* (RB, SPF); ibid., Resgate da Flora da UHE Colíder, Lote C de supressão, 255 m elev., 19 Sep 2014, *D. C. Dias et al. s.n.* (HCF 24488, MBM 402618, RB 640724, TANG 3232); Luciara, Margem direita rio Preto, Parque Indígena do Xingu, 8 Jun 1990, *M. Macedo & S. Assumpção 2519* (INPA); Nova Canaã do Norte, Resgate de Flora da UHE Colíder, Lote A de supressão, 251 m elev., 10 Sep 2014, *S. A. Antoniazzi et al. s.n.* (MBM 398648, TANG 2235); ibid., Resgate de Flora da UHE Colíder, Lote A de supressão, 256 m elev., 14 Jul 2015, *H. R. W. Zanin s.n.* (MBM 404594, RB 669481); Novo Mundo, Ilha do Sol no Rio Teles Pires, 9°38′48″S, 55°55′06″W, 223 m elev., 14 Sep 2007, *G. S. Henicka et al. 91* (HERBAM, INPA, K, SPF); Parque Indígena do Xingu, Posto Leonardo, 15 Jul 1973, *M. Emmerich 3753* (R); ibid., Posto

Leonardo, Aldeia Savalapíti, 29 Sep 1974, *M. Emmerich 4199* (R); Parque Nacional do Xingu, Aldeia as Camaiuras, Sep 1965, *E. A. Filho & D. F. Coelho s.n.* (INPA 15879, UEC 30821); Rio Juruena, nas proximidades da Cachoeira de Todos os Santos, SC 21 VB PT1, 20 May 1977, *N. A. Rosa & M. R. Santos 1947* (HAMAB, INPA, MG, NY [2 sheets]); Rio Teles Pires, Instituto Ecológico do Cristalino, 9°35′48″S, 55°55′55″W, 16 Aug 1994, *B. Dubs 1665* (ESA); Sinop, margem direita rio Nandico, 30 Mai 1995, *M. Macedo et al. 4165* (INPA, UFMT). — PARÁ: Conceição do Araguaia, entre Morro de Areia e Bacabau, 9 Sep 2001, *L. C. B. Lobato et al. 2848* (MG). — RONDÔNIA: Machadinho do Oeste, Tabajara, rio Machado, beira do rio Marmelo, 8°57′24″S, 61°55′57″W, 1 Jun 2015, *N.* C. *Bigio et al. 1672* (MO, NY, RON); Porto Velho, Saída leste de Mutum Paraná, margem esquerda do rio Mutum Paraná, 9°37′32″S, 64°52′14″W, 90 m elev., 28 Jun 2010, *G. Pereira-Silva et al. 15543* (CEN, HUEFS, INPA, RB, RON). — TOCANTINS [GOIÁS before]: Ilha do Bananal, Parque Nacional do Araguaia (IBDF) nr HQ, ca. 2 km from Macauba, 10°30′S, 50°30′W, 17 Sep 1980, *J. A. Ratter et al. 4432* (MO, NY, UB, UEC).

3.3.5.1.18 XYLOPIA MULTIFLORA R.E.Fr., Ark. Bot. n. s. 3(18): 605. pl. 5. 1957. TYPE: COLOMBIA. Amazonas, Río Apaporis, Caño Peritomé, tributary below Raudal Yayacopi, alt. about 750 feet, 0°5′S, 70°30′W, 18-20 Feb 1952, *R. E. Schultes and I. Cabrera 15537* (holotype: US-00098780!, isotypes: GH-00039722 (digital image!), S-08-15622 [fragment] (digital image!), US-00610719!).

Trees 6–20 m tall to **shrubs** 4 m, d.b.h. 7–30 cm. Twigs, petioles, abaxial surfaces of leaves, inflorescences, flowers and fruits with golden, brown, rusty, or hyaline hairs. **Twigs** brown to grayish brown when older, with lenticels pale brown to beige, densely sericeous, becoming sparsely sericeous, glabrate or glabrous when older. **Petioles** (4–)6–10 mm long, canaliculate, dark brown to black, sericeous to pubescent, glabrate when older; **leaf blades** (8–)13–22.3 × (4.5–)5.8–8.2 cm, elliptic to oblong, mostly coriaceous, sometimes chartaceous, brown and often densely short sericeous abaxially, greenish brown to pale brown and glabrous adaxially, apex cuspidate, or rarely acute, cusp 4–15 mm long, base cuneate, large cuneate, obtuse or attenuate; midrib raised abaxially, keeled, impressed adaxially, secondary veins 15–17(–20) per side, discrete on both surfaces. **Inflorescences** axillary, sometimes born in older twigs, (3–)4–10-flowered; **pedicels** 3–4 mm long, sparsely sericeous; **buds** narrowly oblong; **bracts** 2, 1–1.5 × 2–2.5 mm, triangular ovate, clasping, apex acute, sericeous abaxially. **Calyx** short cup-shaped, smooth, calyx tube 3–5 mm long, **sepals** connate at ½ of their length or more, calyx lobes ca. 3 × 3.5 mm, triangular to triangular ovate, sericeous to tomentellous abaxially, glabrous adaxially, apex acute; **petals** greenish white or white, red in center *in sched.*; **outer petals** (20–)24–32 mm long, 2–5.5 mm wide at midpoint, narrowly oblong, slightly enlarged and concave at base, slightly fleshy, apex acute to slightly rounded, short sericeous abaxially, tomentellous at margins and glabrous at the base to midpoint adaxially; **inner petals** (15–)20–27 mm long, 1–2 mm wide at midpoint, linear, base slightly enlarged and concave, slightly fleshy, tomentellous on both surfaces, the base glabrous adaxially, apex acute; **fertile stamens** ca. 100, 1–1.2 mm long, nearly club-shaped, glabrous, apex of the connective papillate, anthers 10–13-locellate; **outer staminodes** 1.2–1.5 mm long, nearly flat club-shaped, anthers 6–9-locellate, glabrous; **inner staminodes** ca. 14, glabrous; **staminal cone** ca. 2.5 mm in diameter, 1.5–2 mm high, flattened globose; **carpels** 20–25(–35), 1.5–2 mm long, ovary 0.5–1 mm long, densely sericeous, **ovules** 5, stigmas 0.5–1 mm long, glabrous. **Fruits** of 13–25(–35) monocarps borne on a **pedicel** 10–15 mm long. **Monocarps** 22–66 × 3–4.5 mm, narrowly oblong, moniliform or torulose, pinkish or red when ripe, green outside and red inside *in sched.*, apex acuminate to cuspidate, acumen or cusp 3–5 mm long, often hook-shaped, sometimes just apiculate, apiculus 2–2.5 mm long, glabrate to glabrous; **stipes** 9–13 mm long, glabrate to glabrous. **Seeds** (1–)3–7, 5–9 × 3–3.5 mm, ellipsoid to narrowly obovoid, dark brown to black, ruminate endosperm slightly impressed, aril whitish beige, lobes ca. 2.5 × 1.5 mm, ellipsoid, laterally almost circular and slightly bilobed. Figure 16A-E.

Additional Illustration— Fries (1957: Plate V).

Distribution and habitat— This species occurs in Bolivia, Brazil, Colombia, and Peru (Figure 17), in lowland dense ombrophylous forest (*terra firme*), and riverine forests, flooded (seasonally, *várzea*) or not, on sandy, clay, stony clay or laterite soils. In Brazil, this species occurs in the states of Acre, Amazonas and Rondônia.

Vernacular Names— "*Envira-pimenta*" (Brazil, Amazonas, *L. O. A. Teixeira et al. 1297*, RB).

Phenology— Specimens with flowers have been collected in January, March, and from June to September, and specimens with fruits have been collected in January, May, Jun, July, August, October, and November.

Notes— *Xylopia multiflora*, has as remarkable characters, the medium to large sized mostly coriaceous leaf blades, mostly cuspidate apex, with the cusp 4-15 mm long; midrib raised and keeled abaxially; (3–)4–10-flowered axillary inflorescences; narrowly oblong buds; short cup-shaped calyx present, sepals connate at ½ of their length or more; outer petals (20–)24–32 mm long, 3–5.5 mm wide; inner petals (15–)20–27 mm long, 1–2 mm wide; ca. 100 fertile stamens, 1–1.2 mm long; 20–25(–35) carpels, 1.5–2 mm long, glabrous stigmas; 15–25(–35); fruit pedicels 10–15 mm long; monocarps per fruit, 22–62 × 3–4.5 mm, narrowly oblong, moniliform or torulose, apex acuminate to cuspidate, often hook-shaped, or sometimes just apiculate; stipes 9–13 mm long; and (1–)3–7 seeds.

Xylopia multiflora is close to *X. nitida* Dunal, but differs from this by its leaf blades (3–)5.8–8.2 cm wide (*vs.* (1.5–)2.2–3.2 cm, in *X. nitida*), cuspidate, or rarely acute apex (*vs.* short acuminate to acute); calyx lobes ca. 3 mm long (*vs.* 0.5–1.5 mm); carpels 1.5–2 mm long (*vs.* 2.8–3.4 mm), and entirely glabrous stigmas (*vs.* tomentellous at apex).

In the original description of *Xylopia multiflora*, Fries (1957) indicated that the type specimen was at US, but there are two specimens in this herbarium. The specimen US-00098780 is clearly the holotype, because it is the specimen in the picture available in the protologue (Plate V, Fries 1957) and it also has an identification label of new species in Fries's handwriting. The specimen US-00610719 is an isotype.

Selected Specimens Examined**—** **Bolivia.** — PANDO: W. bank of Rio Madeira opposite Abunã, 19 Nov 1968, *G. T. Prance et al. 8671* (INPA). — **Brazil.** — ACRE: Cruzeiro do Sul, BR-364, km 87, Ramal 7, 7°46′21″S, 72°16′37″W, 24 Oct 2001, *P. J. M. Maas et al. 9200* (MO, NY); Mâncio Lima, Igarapé Japiim, 7°33′2″S, 72°56′32″W, 295 m elev., 15 Nov 2007, *H. C. de Lima et al. 6736* (RB); Marechal Thaumaturgo, rio Juruá, right bank, *D. C. Daly et al. 10493* (NY, OWU). — AMAZONAS: Carauari, cerca de 3 km norte da cidade, 13 Jul 1980, *A. S. L. da Silva et al. 629* (RB, UEC); Coari, Rio Urucu, BOGPM- Base de Operações Geólogo Pedro de Moura, 4°51′57″S, 65°7′00″W, 15 Sep 2005, *M. de L. Soares et al. 629* (INPA); Estrada Manaus-Porto Velho, estrada entre os rios Castanho e Tupana, 14 Jul 1972, *M. F. Silva et al. 740* (INPA); Humaitá, estrada Humaitá-Jacarecanga, km 150, a 62 km ao Sul, 21 Jun 1962, *L. O. A. Teixeira et al. 1297* (INPA, MO, NY, RB); Vicinity of Labrea airport, 29 Jun 1971, *G. T. Prance et al. 13972* (INPA, MO, NY, OWU). — RONDÔNIA: Porto Velho, Fazenda de propriedade do Sr. João Correia Oilveira, Linha de transmissão (LT) 67.2, entrada ao lado da Penitenciária Federal Urso Branco, na BR-364, 9°5′46″S, 64°4′39″W, 94 m elev., 20 Jul 2011, *A. A. Santos & J. F. Lacerda Jr. 3418* (CEN, INPA); Porto Velho – Cuiabá, km 79 da BR 29 [BR-364], 20 Sep 1962, *A. P. Duarte 7001* (INPA, RB); near Abunã, km 216–219 Madeira-Mamoré railroad near Abunã, 10 Jul 1968, *G. T. Prance et al. 5838*

(INPA, NY); Vicinity of Santa Barbara, 15 km. east of km 117, 16 Aug 1968, *G. T. Prance & J. Ramos 7009* (MO, NY). — **Colombia.** — VAUPÉS: Municipio de Mitú, Gran Resguardo Indígena del Vaupés, Caño Cuduyarí, sector entre comunidad e Wacurabá y comunidad de pacú, 1°25′00″S, 70°57′00″W, 220 m elev., 26 Jul 2006, *D. Cárdenas et al. 18871* (NY). — **Peru.** — LORETO: Prov. Loreto, Nauta, Carretera Nauta-Iquitos, km 5, 4°29′S, 73°35′W, 200 m elev., 28 Mar 1987, *R. Vásquez & N. Arevalo 8998* (MO). Maynas Province, Dtto. Iquitos, Allpahuayo, Estación Experimental del Instituto de Investigaciones de la Amazonía Peruana (IIAP), 150-180 m elev., 4°10′S, 73°30′W, 20 Jan 1991, *R. Vásquez 15873* (MO).

3.3.5.1.19 XYLOPIA NERVOSA (R.E.Fr.) Maas, Bot. Jahrb. Syst. 115(1): 87. 1993. *Oxandra nervosa* R.E.Fr., Acta Horti Berg. 12(3): 558. 1939. TYPE: BRAZIL. State of Amazonas, Basin of Rio Solimoes, Munipality Sao Paulo de Olivenca, basin of creek Belém, 26 Oct - 11 Dec 1936, *B. A. Krukoff 8792* (holotype: NY, isotypes: A-00032888 (digital image!), BM-000554089 (digital image!), BR-0000006963194 (digital image!), F-V0362138F, GH, K-000221087 (digital image!), LE-00001764 (digital image!), MO, P-00734912 (digital image!), S-17-11764 [2 sheets] (digital image!), S-R-3849 [fragment] (digital image!), U-0000360 (digital image!)).

Trees 4–6(–16) m tall, d.b.h. 5–13 cm. Twigs, petioles, abaxial surfaces of leaves, inflorescences, bracts, and sepals with golden to palebrown hairs; petals and stigmas with golden, golden hyaline or withish hyaline hairs. **Twigs** dark brown to grayish brown with beige or pale brown lenticels, densely lenticellate, pubescent to puberulent, becoming glabrate to glabrous when older. **Petioles** 3–4.5 mm long, slightly to strongly canaliculate, dark brown, pubescent, glabrous at the groove; **leaf blades** 7.4–13.3 × (1.3–)2.3–4 cm, oblong to elliptic, membranous to subchartaceous, smooth, sparsely pubescent to glabrate and pale brown abaxially, glabrous and greenish brown adaxially, translucent glands present, apex cuspidate to acuminate, acumen or cusp (7–)16–25(–30) mm long, base cuneate to obtuse, sometimes attenuate or asymmetric; midrib raised abaxially, forming a keel, strongly impressed adaxially, secondary veins (12–)15–17 per side, raised on both surfaces, but more conspicuous abaxially. **Inflorescences** axillary, 1-flowered; **peduncles** 2.5–3 × 1–1.2 mm, pubescent; **pedicels** 5–8 × 1–1.2 mm, pubescent; **buds** narrowly oblong to oblong, slightly enlarged at the base; **bracts** 2–3, one at the pedicel base and another at the midpoint of the pedicel, ca. 1.5 × 1.5–2 mm, ovate, clasping, apex obtuse, pubescent abaxially, ciliate at the apex, glabrous adaxially. **Calyx** short cup-shaped, smooth, **sepals** connate ca. ½ of their length, calyx tube 1.5–2 mm long, calyx lobes 1.5–2.5 × 3.5–6 mm, ovate or triangular ovate, ciliate, densely short sericeous abaxially, mainly at the apex, glabrous adaxially, apex acute; **petals** white or cream; **outer petals** 15–18 mm long, 3.5–4.5 mm wide at base, 2.5 mm wide at constriction, 2–3.5 mm wide at midpoint, narrowly oblong to narrowly triangular, slightly enlarged at the base, crass, short sericeous abaxially, denser at the base, tomentellous with the base glabrous adaxially, apex acute; **inner petals** (12–)14–15 mm long, 2.5 mm wide at base, 1.0 mm wide at constriction, 0.8 mm wide at midpoint,linear, narrowly lanceolate, crass, tomentellous from constriction to apex and the base glabrous on both surfaces, apex acute to acuminate; **stamens** ca. 220, **fertile stamens** ca. 165, 1–1.5 mm long, club-shaped, glabrous, apex of the connective enlarged, rounded or triangular, discoid, 0.1–0.2 mm long, papillate, anthers (4–)8–10-locellate, filament 0.2–0.3 mm long; **outer staminodes** ca. 35, 1.2–1.5 mm long, nearly club-shaped, flatter than the fertile stamens, glabrous, apex of the connective nearly triangular, papillate; **inner staminodes** ca. 25, obtriangular to oblong, 0.7–1.1 × 0.3–0.5 mm, glabrous, apex of the connective slightly enlarged, finely papillate, without locellate anthers and filaments; **staminal cone** ca. 1.5 mm in diameter, 0.8–1 mm high; **carpels** ca. 7, 5.5–6 mm long, ovary 0.8–1 mm long, obclavate, densely sericeous, **ovules** 2–4, stigmas filiform, slightly enlarged near midpoint, 4.7–5 mm long, slightly verruculose, villous. **Fruits** of 2–3 monocarps. **Monocarps** 10–15 × 8-10 mm, oblong, slightly falcate or obliquely clavate, green or reddish green *in sched.*, apex rounded, glabrous; **stipes** 3–6 mm long, glabrous. **Seeds** and aril not seen. Figure 18K-M.

Additional Illustration— Maas et al. (1993: 88, Fig. 3 [photos]).

Distribution and habitat— This species occurs in Bolivia, Brazil, Colombia, Ecuador, French Guiana, and Peru (Figure 10). It grows in lowland forests (*terra firme*), on clay soil, or in riverine forests, on white sandy soil. In Brazil, it occurs in the states of Acre, Amapá, Amazonas, Pará, and Rondônia.

Phenology— Specimens with flowers were collected in April, July, and September, and specimens with fruits were collected in January, April, June, July, August and November.

Notes— *Xylopia nervosa* can be distinguished by its medium sized leaf blades, 7.4–13.3 × (1.3–)2.3–4 cm, oblong or elliptic, membranous to subchartaceous, sparsely pubescent to glabrate abaxially, with a cuspidate to acuminate apex, with an acumen or cusp (7–)16–25(–30) mm long; axillary 1-flowered inflorescences, pedicels 5–8 mm long; and sepals connate up to half of their length, forming a short cup-shaped calyx. These leaf blades with a long acumen or cusp, the inflorescences single flowered, with long pedicels, and a cup-shaped calyx are unusual features among Amazonian species.

Xylopia nervosa is a little close to *X. trichostemon*, but it can be distinguished from this by its surfaces of the leaves without small black dots (*vs.* present); 1-flowered inflorescences (*vs.* 1–4(–7)-flowered); ca. 220 stamens (*vs.* ca. 170); fertile stamens with the apex of the connective enlarged, rounded, or triangular, discoid (*vs.* nearly triangular to mushroom-shaped), papillate at the apex tip (*vs.* setulose to strigose); ca. 7 carpels (*vs.* ca. 13); and 2–3 monocarps per fruits (*vs.* (7–)9–10).

Xylopia nervosa also resembles *X. uniflora*, but it differs from this by its stamens ca. 220 (*vs.* ca. 100), club-shaped fertile stamens (*vs.* narrowly obtriangular), with the apex of the connective enlarged, rounded, or triangular, discoid (*vs.* triangular to mushroom-shaped), and papillate at the apex tip (*vs.* setulose to strigose); and ca. 7 carpels (*vs.* 2–4).

***Selected Specimens Examined*—** **Bolivia.** — BENI: Cachuela Esperanza, Rio Beni, *G. Mayer 234* (NY). — PANDO: Provincia de Frederico Román, Río Negro, tributario del Río Abuná, Campamento Mocú, borde del Río Negro a 15 km suroeste de la boca, a 3 horas en bote lento de Fortaleza, 9°52′S, 65°42′W, 150 m elev., 16 Jul 1992, *L. Vargas et al. 945* (F). — SANTA CRUZ: Velasco, 4 Mar 2002, *I. G. Vargas & S. Surubí 6669* (MO). — **Brasil.** — ACRE: Upper Río Moa, near Fazenda Arizona, 7°29′S, 73°39′W, 24–30 Sep 1984 *D. G. Campbell et al. 8146* (U digital image!). — AMAPÁ: Macapá, perimetral Norte (BR-210), 122 km NW of Porto Grande, 1°21′S, 53°15′W, 1 Jan 1985, *D. C. Daly et al. 4026* (HAMAB, NY); Porto Grande, localidade de Munguba, 1°21′S, 53°15′W, 22 Apr 2006, *L. A. Pereira et al. 1414* (HAMAB); Rio Araguari, vicinity tin mine camp, between 1°26′N – 51°58′W and 1°9′N – 51°52′W, 11 Sep 1961, *J. M. Pires et al. 50840* (F, MG, NY, US). — AMAZONAS: Coari, Campo Petrolífero de urucu, LUC-A, 14 Aug 1994, *A. Knob et al. 1349* (U digital image!); Estirão do Equador, Rio Javari, 20 Oct 1976, *P. I. S. Braga & J. R. Nascimento 3306* (INPA); Estrada Manaus-Porto Velho, trecho compreendido entre os rios Castanho e Araçá, 12 Jul 1972, *M. F. da Silva 517* (INPA, JPB); ibid., trecho entre os rios Castanho e Tupana, 18 Jul 1972, *M. F. da Silva et al. 909* (INPA). — PARÁ: Viseu, *W. L. Balée & B. G. Ribeiro 265* (NY). — RONDÔNIA: Porto Velho, BR-319, km 1, Linha 20, Gleba Cuniã, *J. Oliveira et al. 509* (MG); id., ao longo da BR-364, 9 km E de Jaci Paraná, ramal 1 km ao sul, linha de transmissão Jirau – Porto Velho, 9°13′57″S, 64°19′39″W, 116 m elev., *M. F. Simon et al. 1542* (RB); id., Represa Samuel, campinarana et end of E dike road, 4°8′30.27″N, 52°7′36.73″W, 14 Jun 1986, *W. W. Thomas et al. 5102* (RB, NY). — **Colombia.** — AMAZONAS: Correg. de Pto. Santander, Quebrada “El Eden”, 0°37′S, 72°22′W, 160 m elev., 27 Nov 1993, *D. Cárdenas & J. Manaidego 4238* (U digital image!). — **Ecuador.** — PASTAZA: Via Auca, 115 km al S de Coca, 10 km al S de la frontera Napo-Pastaza; cerca del Río Tigüino, Carretera de PETRO-CANADA en construcción, 1°15′S, 76°55′W, 320 m elev., 7–9 Jan 1989, *F. Hurtado et al. 1376* (MO). — **French Guiana.** — Cayenne, Rives du bas-Yaroupi, afluent de l'Oyapock, 10 Apr. 1970, *R. A. Oldeman 3070* (OWU); Road Régina - St. George (RN2), 4°8′30,27″N, 52°7′36,73″W, 37 m elev., 8 Aug 2005, *P. J. M. Maas et al. 9631* (NY, OWU). — **Peru.** — LORETO: Provincia Maynas, Distrito Putumayo, Inventario rapido #23, Yaguas-Cotubé, NE de Iquitos y Puebas, en la esquina del trapezoide de Colombia, Campamento 3, “Cachimbo”, tributário S del bajo Yaguas, 44 km al oeste de planicie inundavel, 2°42′43.8″S, 70°31′31.7″W, 94 m elev., 20 Oct 2010, *I. Huamantupa et al. 14703* (F).

3.3.5.1.20 XYLOPIA NITIDA Dunal, Monogr. Anonac. 122. t. 20. 1817. *Xylopicrum nitidum* (Dunal) Kuntze, Rev. Gen. Pl. 1: 8. 1891. TYPE: FRENCH GUIANA. Hab. in montibus Orjac propè Cayennam, *Martin s.n.* (holotype: G-00201468 (digital image!) (photo in F!, MO!, NY!), isotypes: B-10 0249564 (digital image!) [photo in: F!, MO!, NY!], FI-004818 (digital image!), FI-004819 (digital image!), K-000221079 (digital image!), P-00202480 (digital image!), P-00202481 (digital image!), P-00202482 (digital image!), P-00202483 (digital image!), R 60814 [2 sheets, R-000060814!, R-000060814a!], US-1379829!).

Xylopia cinerea Sandw., Bull. Misc. Inform. Kew. 10: 478. 1930. TYPE: GUYANA. Essequibo River, Moraballi Creek, near Bartica, 1 Nov 1929, *N. Y. Sandwith 543* (holotype: K-000221076 (digital image!), K-000221077 (digital image!), K-000221078 (digital image!), isotypes: B-100242294 (digital image!), F-893773 [fragment!], NY-00066756!, P-00202501 (digital image!) [photo in F!, MO!], RB-00577778!, U-0000438 (digital image!), US-00098772!).

Xylopia nitida Dunal var. *nervosa* R. E. Fr., Acta Horti Berg. 12(2): 286. 1937. TYPE: BRAZIL. Amazonas, Municipality of São Paulo de Olivença, 26 Oct – 11 Dec 1936, *B. Krukoff 8715* (holotype: NY!, isotypes: A-00039724 (digital image!), BM-000554090 (digital image!), G-00226130 (digital image!), GB-0047048 (digital image!), F928304!, K-000221080 (digital image!), LA-00000050 (digital image!), LE-00001860 (digital image!), LP-002769 (digital image!), MICH-1115460 (digital image!), MO-216998!, P-00734913 (digital image!), S-R-6861 (digital image!), U-000418 (digital image!), US-00149228!, US 2250435!).

Trees 5–35 m tall, d.b.h. (5–)10–35(–50) cm; **bole** with buttresses extending 40–180 cm up from the base, bark smooth, *in sched.* Twigs, petioles, abaxial surfaces of leaves, inflorescences, and flowers with golden, golden hyaline, withish, or pale brown hairs. **Twigs** densely sericeous to tomentose, becoming sparsely tomentose or glabrous when older. **Petioles** 4–7 mm long, canaliculate, dark brown, glabrous inside the groove, the rest tomentellous; **leaf blades** (3.6–)6.6–10 × (1.5–)2.2–3.2 cm, oblong elliptic to elliptic, chartaceous, pale to dark brown and short sericeous abaxially, densely on young leaves, brown to grayish green and glabrous adaxially, apex short acuminate to acute, acumen 3–10 mm long, base acute or cuneate, sometimes with oblique angles at both sides of base, sometimes asymmetric; midrib raised and keeled abaxially, impressed adaxially, sometimes strongly impressed, secondary veins 10–19 per side, inconspicuous on both surfaces. **Inflorescences** axillary, sometimes born in older twigs, often composed of 2–3 small branches, (2–)4–8(–15) flowers; **peduncles** 1.5–3 mm long; **pedicels** 1.5–3(–6) mm long, densely sericeous to tomentellous; **buds** narrowly oblong to narrowly triangular, enlarged at the base, narrowing progressively towards the apex; **bracts** 2, both at pedicel base, (1.2–)1.5–1.8 × 2.2–2.5 mm, triangular ovate, often splitted at midpoint, clasping, densely short sericeous abaxially, glabrous adaxially, apex acute. **Calyx** short cup-shaped, smooth, calyx tube 2–3 mm long, **sepals** connate from ½ to ⅔ of their length, calyx lobes 0.5–1.5 × 3–3.5 mm, ovate to triangular ovate, densely short sericeous to tomentellous abaxially, glabrous adaxially, apex acute; **petals** withish, cream, yellow, yellowish green, orange yellow, or ochre orange, purple or deep maroon at the base inside; **outer petals** 12–21 mm long, 1.5–2.5 wide at midpoint, narrowly oblong, base enlarged and concave, slightly lanceolate, crass, densely short sericeous abaxially, tomentellous with the base slightly papillate adaxially, apex acute; **inner petals** 10–19 mm long, 0.7–1.5 mm wide at midpoint, linear from apex to midpoint, tetrangular to rhombic in cross section in this region, base enlarged and concave, nearly lanceolate, fleshy, short sericeous to tomentellous with the base glabrous abaxially, tomentellous with the base slightly papillate adaxially, apex acuminate; **stamens** 170–270,

fertile stamens 100–200, 1–1.5 × ca. 0.2 mm, nearly club-shaped, glabrous, apex of the connective 0.1–0.2 mm long, angular, discoid, papillate, sometimes strongly papillate, anthers 12–16-locellate, filament 0.2–0.5 mm long; **outer staminodes** 35–50, 1.2–1.5 × 0.4–0.5 mm, nearly club-shaped, glabrous; **inner staminodes** 13–15, 1–1.3 × 0.4–0.5 mm, glabrous; **staminal cone** 1.8–2.2 mm in diameter, 1.2–1.5 mm high, conical, sometimes slightly flattened, to flattened-globose; **carpels** 20–30, 2.8–3.4 mm long, ovary 0.8–1.2 mm long, obclavate, densely sericeous, **ovules** 3–6, stigmas 2–2.2 mm long, filiform, often geniculate above the base, verruculose, tomentellous at apex. **Fruits** of 10–27 monocarps borne on a **pedicel** 8–10 mm long, glabrate to glabrous; **torus** ca. 7 mm in diameter, 5 mm high, flattened-globose. **Monocarps** (6–)10–32(–50) × 3–5(–6) mm, narrowly cylindrical or extremely narrowly oblong, sometimes slightly falcate, torulose or moniliform, to rarely ellipsoid (1-seeded), green, or orange green, slightly obliquely or longitudinally wrinkled when dried, glabrate to glabrous, apex acute to rounded, sometimes apiculate, apiculus ca. 1 mm long; **stipes** 5–10 mm long, glabrate to glabrous. **Seeds** 4–7, rarely 1–3, 5–6.5 × 3.5–4 mm, obovoid, dark brown to black, aril whitish to beige, lobes ca. 2 × 1.5–2 mm, obliquely ellipsoid or ovoid. Figures 9E, 16F-M.

Additional Illustrations— Dunal (1817: Tab 20), Fries (1930: Tab 5).

Distribution and habitat— *Xylopia nitida* is broadely distributed in the Amazon Basin, in Brazil, Colombia, French Guiana, Guyana, Peru, Suriname, and Venezuela (Figure 15). It grows in riverine and lowland moist forests, flooded (seazonaly flooded, *várzea*) or not (*terra firme*), and also in dry forests, all, in general, less disturbed. In Brazil, it occurs in the states of Amapá, Amazonas, and Pará.

Vernacular Names— "*Dalli*" (Guyana, *M. J. Jansen-Jacobs et al. 1232*, MO), "*Envira-aritú*" (Brazil, Pará, *B. G. S. Ribeiro & O. C. Nacimento 68*, IAN), "*Pedrekoe-pisie*" (Suriname, *L.B.B. 11076*, U), "*Turi*" and "*Tikorijan*" (Suriname, *B. Hoffman 6201*, U).

Phenology— Specimens with flowers have been collected in February, March, May, and from August to October, and specimens with fruits have been collected from in March, and from September to November.

Notes— *Xylopia nitida* is characterized by its small to medium sized leaf blades, with insconspicuous secondary veins on both surfaces; axillary inflorescences, generally composed of 2–3 small branches, (2–)4–8(–15) flowers; buds narrowly oblong to narrowly triangular, enlarged at the base; short cup-shaped calyx, sepals connate from ½ to ⅔ of their length; 170–270 stamens, fertile 100–200 stamens, 1–1.5 mm long; 20–30 carpels, with tomentellous stigmas at apex; 10–27 monocarps per fruit, monocarps (6–)10–32(–50) × 3–5(–6) mm, narrowly cylindrical or extremely narrowly oblong, sometimes slightly falcate, torulose or moniliform, to rarely ellipsoid; stipes 5–10 mm long; and mostly 4–7 (rarely 1–3) seeds.

Xylopia nitida is morphologically close to *X. maasiana* and *X. multiflora*. *Xylopia nitida* shares with *X. maasiana* similar leaf blades in size, shape and indument however, it can be distinguished from that by its inflorescences of usually 4–8 flowers (*vs.* 2–3(–6) flowers in *X. maasiana*); buds enlarged at the base, narrowing progressively towards the apex (*vs.* nearly panduriform); sepals connate from ½ to ⅔ of their length, forming a short cup-shaped calyx (*vs.* only slightly connate at the base, connate ca. ⅓–⅙ of their length, not forming a short cup-shaped calyx); stamens 1–1.5 mm long (*vs.* 0.6–0.8(–0.9) mm long); carpels 20–30 (*vs.* 5–8), stigmas tomentellous at apex (*vs.* glabrous); 10–27 monocarps per fruit (*vs.* 3–7), monocarps mostly narrowly cylindrical or extremely narrowly oblong, sometimes slightly falcate, torulose or moniliform (vs. often compressed-falcate to obliquely clavate); mostly 4–7 (rarely 1–3) seeds (*vs.* 1–3), 5–6.5 mm long (*vs.* 7–7.5 mm), and obovoid (*vs.* oblong).

Xylopia nitida is similar to *X. multiflora*, sharing with this latter the position of the inflorescences and the number of flower; the shape of the buds; the sepals connation; the fertile stamens length; the large numbers of carpels and monocarps per fruit, the monocarps length and the shape and the number of seeds. But, *Xylopia nitida* can be distinguished from that by its leaf blades chartaceous (*vs.* mostly coriaceous in *X. multiflora*), (1.5–)2.2–3.2 cm wide (*vs.* (3–)5.8–8.2 cm), short acuminate to acute apex (*vs.* cuspidate, or rarely acute); calyx lobes 0.5–1.5 mm long (*vs.* ca. 3 mm); carpels 2.8–3.4 mm long (*vs.* 1.5–2 mm), and tomentellous stigmas at apex (*vs.* glabrous).

***Selected Specimens Examined*—** **Brazil.** — AMAPÁ: Calçoene, 11 Dec 1984, *B. V. Rabelo et al. 2985* (HAMAB, MG, OWU). — AMAZONAS: Estrada Manaus-Itacoatiara, km 26, Reserva Florestal Ducke, próximo à entrada da Reserva, 2°53′S, 59°58′W, 2 Feb 1995, *J. R. Nascimento & M. A. S. Costa 737* (NY); Manaus, Estação Biológica, km 60, Manaus-Caracaraí, 16 Jan 1991, *D. Coelho & J. Coelho s.n.* (INPA 161808); ibid., E.E.F.T., km 40, 6 Apr 2000, *V. F. Kinupp s.n.* (INPA 208836, JPB); ibid., Estrada do Jardim Tarumãzinho, a 2 km da Cachoeira, 18 Nov 1975, *O. P. Monteiro s.n.* (INPA 53553). PARÁ: Almeirim, Mt. Dourado, área do ideal, 7 Feb 1980, *N. T. Silva 5238* (INPA, MG); Estrada de Marabá, 25 Jan 1971, *B. G. S. Ribeiro & O. C. Nascimento 68* (IAN); Ilha de Marajó, rio Anajás, logo acima de Anajás, 0°59′S, 49°55′W, 1 Nov 1987, *G. T. Prance et al. 30199* (EAC, INPA, HAMAB, MG, MO, U); Jari, estrada do Munguba, 31 Mar 1969, *N. T. Silva 1819* (NY); Melgaço, Floresta Nacional de Caxiuanã, Estação Científica Ferreira Penna, margem do rio Caxiuanã, 14 Oct 1991, *A. S. L. da Silva & M. C. da Silva 2406* (NY); [Novo Repartimento], Remansão, Rio Tocantins, 1 Jul 1948, *R. L. Fróes 23508* (INPA, RB); Peixe-boi, Vila do Ananim, 1 Apr 2000, *F. Cardoso et al. s.n.* (MG 105031); Prainha, Curuá-Una, Distrito de Barreirinha, Projeto Curuá-Una, 8 Sep 1977, *Pessoal do L.P F./Brasília 971* (INPA). — **French Guiana.** — CAYENNE: Piste de Saint-Elie – Interfluve Sinnamary/Counamana, Piste km 22, 5°20′S, 53°0′W, 9 Oct 1989, *D. Sabatier & M. F. Prevost 3032* (INPA, MO, NY, P, U, US). — MACOURIA: Lieu-dit Maya, route de la Carapa, 4°56′13″S, 52°26′29″W, 9 m elev., 15 Mar 2006, *O. Tostain 579* (NY). RÉGINA: Réserve des Nouragues, Station de Recherches, Petit plateau, layon F, entre les cascades et le layon 23, 4°3′S, 52°42′W, 100–150 m elev, 9 Mar 2004, *O. Poncy et al. 1834* (NY). — SAINT ÉLIE: CIRAD experimental research station at Paracou, just S of the coastal highway Route 1, ca. 5 km SE of Sinnamary, 5°18′N, 52°53′W, near sea level, 13 Nov 2006, *S. A. Mori et al. 26484* (NY); Fleuve Sinnamary Petit Saut, Basin du Sinnamary, 5°3′S, 53°3′W, 8 Sep 1988, *D. Sabatier & M. F. Prevost 2210* (NY). — SAÜL: Vicinity of Eaux Claires, Route de Belizón, 24 kms S of Eaux Claires, 3°37′N, 52°12′W, 200 m elev., 20 May 1992, *S. Mori et al. 22201* (NY). — **Guyana.** — Base of Mt. Makarapan, Makarapan Creek about 1/2 mile downstream from rapids, near abandoned balata bleeders camp, 3°59′N, 58°57′W, 80–130 m elev., 17 Sep 1988, *P. J. M. Maas et al. 7498* (HTSA, INPA, MG, MO, NY, U); Ibid., 17 Sep 1988, *P. J. M. Maas et al. 7512* (F, INPA, MO, NY, RB, U, US); Demerara compartment, CD 920 road forest, and Mabura region, Centra, 5°1.95′95″N, 58°37.73′73″W, 11 Mar 1993, *R. C. Ek 746* (NY); Kanuku Mts., Maipaima, Camp 3 on Tsikoma Creek, 3°22′N, 59°30′W, 160 m elev., 25 Nov 1987, *M. J. Jansen-Jacobs et al. 1232* (MO); Rupununi Distr., Bushmouth Shea to Quitaro R., Bowl Creek, 2°54′N, 59°7′W, 200 m elev., 28 Aug 1995, *M. J. Jansen-Jacobs et al. 4892* (NY); U. Takutu – U. Essequibo Region: Bulldozed treefall along road clearing, ca. 15 km NE of Surama village, 4°15′N, 58°56′W, 90 m elev., 27 Feb 1990, *T. McDowell et al. 2072* (NY). — **Peru.** — LORETO: Maynas Province, Distrito Iquitos, Allpahuayo, estación IIAP, 4°10′S, 73°30′W, 150 m elev., 15 Oct 1993, *R. Vásquez et al. 18361A* (NY); Requena, Centro Forestal J. Herrera, cerca al arboretum, márgem derecha del Río Ucayali, 25 Feb 1982, *F. Encarnación 26047* (MBM). — **Suriname.** — Jodensavanne-Mapane Creek área, rain forest near camp 8, 9 Nov 1968, *L.B.B. 1076* (U digital image!); Sipaliwini, 3.13 km SW from Kwamalasamutu village center, access trail begins at confl. Peritu Eeku (creek) & Sipalawini R. (1.0 ha research plot "KW3"), 2°20′4″N, 56°48′21″W, 220 m elev., 26 Apr 2005, *B.*

Hoffman 6201 (U digital image!). — **Venezuela.** — BOLÍVAR: Dist. Roscio, "El Abismo", dry forested slopes of small range S of río Samay and N of río Icabaru, 4°23′N, 61°38′W, 600–700 m elev., 23 Oct 1985, *B. K. Holst & R. Liesner 2436* (MO, NY). — DELTA AMACURO: Bosque pluvial, este de rio Grande, Este-Noreste de El Palmar, cerca de los límites del Estado Bolívar, 25 Feb 1982, *L. Marcano-Berti 581* (INPA, MBM, NY, SP, UFP).

3.3.5.1.21 XYLOPIA OCHRANTHA Mart., Fl. Bras. 13(1): 43. 1841. *Xylopicrum ochranthum* (Mart.) Kuntze, Rev. Gen. Pl. 1: 8. 1891. TYPE: BRAZIL]. [Espírito Santo] In Prov. Spiritus sancti: crescit in silvarum margiae, locis apricis, sabulosis, *Wied zum Neuwied s.n.* (lectotype, here designated: BR-0000006592363 (digital image!), isolectotypes: BR-0000006592318 (digital image!), MEL-2122490 (digital image!)).

Trees 3–25 m tall **or shrubs** ca. 1.5 m, d.b.h. 5–17 cm; **bole** with bark ribbed, peeling in irregular large plates *in sched.* Twigs, petioles, abaxial surfaces of leaves, and flowers with golden, yellowish, or hyaline hairs; inflorescence and fruits with golden to pale rusty hairs. **Twigs** sparsely tomentose, becoming glabrous when older, grayish or whitish brown. **Petioles** (3.5–)4.5–7 mm long, canaliculate, dark brown to black, sericeous abaxially and at the groove margins glabrate, groove glabrous; **leaf blades** (5–)7.3–12.5(–15.5) × (2–)2.6–4.5(–5.3) cm, elliptic to elliptic ovate, chartaceous, grayish brown and sparsely sericeous abaxially, grayish to greenish brown, opaque and glabrous adaxially, apex acuminate to cuspidate, acumen or cusp (5–)10–22 mm long, base acute to cuneate, sometimes attenuate; midrib raised abaxially, impressed almost flat adaxially, secondary veins (9–)11–13 per side, slightly raised on both surfaces, tertiary and quaternary veins impressed or flat adaxially. **Inflorescences** axillary, or cauliflorous, (1–)2–5-flowered; **peduncles** ca. 1 mm long, sericeous; **pedicels** 2–3 mm long, indument as in the peduncles; **buds** broad triangular or triangular ovoid, yellowish or brownish; **bracts** 2, one at the base of the pedicel and other at midpoint, ovate, clasping, the basal one caducous, tearing up close to the anthesis. **Sepals** ⅓–¼ connate at the base, 3.5–4.5 × 4–4.5 mm, triangular, smooth, densely sericeous abaxially, glabrate to glabrous adaxially, apex acute; **petals** cream, brown at the base; **outer petals** ca. 13 mm long, 2.5–2.7 mm wide at base, ca. 6 mm wide at midpoint, triangular to triangular oblong, base narrower, enlarged and concave above the base, fleshy, densely sericeous with the base pubescent abaxially, tomentellous with the base pubescent to glabrous adaxially, apex acute; **inner petals** 9.5–10 mm long, ca. 0.8 mm wide at base, 4–4.5 mm wide at midpoint, nearly rhombic to lanceolate, concave from midpoint to base, fleshy, tomentellous from midpoint to apex and glabrous at the other parts on both surfaces, apex acuminate; **stamens** 175–195, **fertile stamens** 135–155, 1.7–2.7 × 0.3–0.5 mm, narrowly oblong, glabrous, apex of the connective 0.2–0.3 mm long, pentagonal, discoid, finely papillate, anthers (7–)10–12(–14)-locellate, filament 0.35–0.6(–0.8) mm long; **outer staminodes** ca. 20, 2.2–2.7 × 0.5–0.7 mm, narrowly oblong, flattened falcate, glabrous, anthers irregularly locellate, (2–)4–9–locellate; **inner staminodes** 10–20, 1.5–2 × 0.6–0.9 mm, obtriangular to obpyramidal, glabrous, anthers 2-4-locellate or without locelli; **staminal cone** 2–2.5 mm in diameter, 1.8–2 mm high, nearly urceolate to cylindrical; **carpels** 12–13, 4.5–5.7 mm long, ovary ca. 2 mm long, filiform to slightly falcate, densely sericeous, **ovules** 2–5(–6), stigmas 2.5–3.7 mm long, falcate, nearly geniculate or enlarged near apex, sericeous, denser from the midpoint to the apex. **Fruits** of 7–10 monocarps borne on a **pedicel** 7–8 mm long, tomentose to sericeous; **torus** 7–7.5 mm in diameter, 5–5.5 mm high, flattened globose. **Monocarps** 18–33 × 9–12 mm, oblong, falcate or curved, moniliform or torulose, red *in vivo*, obliquely wrinkled when dried, tomentose to pubescent, apex obtuse to acute, apiculate; **stipes** 7–12 mm long, indument as in the monocarp. **Seeds** 2–6, ca. 10 × 6 mm, flattened obovoid, shiny black, aril milky white, amber-colored *in sicco*, lobes 2–2.5 × 2.5–3 mm, semicircular. Figure 4D.

Distribution and habitat— This species is endemic to Brazil, where it occurs in the states of Bahia, Espírito Santo and Rio de Janeiro, in the Atlantic Coastal Forest, and disjunct in the states of Amazonas, Pará, and Rondônia, in the Amazon Basin. In the Amazonian forest *Xylopia ochrantha* occurs in lowland forests (*terra firme*), on clay soils, and also in disturbed forests elsewhere. In the Atlantic forest it occurs in the *restinga* vegetation.

The disjunction between the Atlantic Coastal Forest of eastern Brazil and the Brazilian Amazon is not unusual for Brazilian plant species, and was already mentioned by Andrade-Lima (1981) and others. *Aechmea mertensii* (G.Mey.) Schult. & Schult.f. (Bromeliaceae), *Anthodiscus amazonicus* Gleason & A. C. Sm. (Caryocaraceae), *Lacistema pubescens* Mart. (Lacistemataceae), and *Lecythis pisonis* Cambess. (Lecythidaceae) are other examples of species with this pattern of disjunction (Mori et al. 1981, Maciel at al. 2017). The hypothesis is that these forests were probably connected in the past, but with the dryness increase during the late Terciary they were separated by the expansion of the *caatinga* and the *cerrado* and lost connection (Bigarella et al. 1975).

Vernacular Names— "*Embira*" (Brazil, Pará).

Notes— The diagnostic characteristics of *Xylopia ochrantha* are the flowers and fruits with golden yellowish to pale rusty hairs; leaf blades medium sized, (5–)7.3–12.5(–15.5) × (2–)2.6–4.5(–5.3) cm, elliptic to elliptic ovate, chartaceous, with an acuminate to cuspidate apex, acumen or cusp (5–)10–22 mm long; (1–)2–5-flowered axillary or cauliflorous inflorescences; broad triangular or triangular ovoid buds; outer petals ca. 6 mm wide at midpoint, triangular to triangular oblong, base narrower, enlarged and concave above the base; inner petals 4–4.5 mm wide at midpoint, nearly rhombic to lanceolate, concave from midpoint to base; 175–195 stamens, fertile stamens 1.7–2.7 mm long; 12–13 carpels; sericeous stigmas; and monocarps 18–33 × 9–12 mm, oblong, falcate or curved, moniliform or torulose, obliquely wrinkled when dried, tomentose to pubescent, with an apex obtuse to acute, apiculate.

Xylopia ochrantha is similar to *X. laevigata* (Mart.) R.E.Fr., *X. langsdorffiana* A. St.-Hil. & Tul., and *X. peruviana* R.E.Fr. *Xylopia laevigata* and *X. langsdorffiana* are extra-Amazonian species, both from the Atlantic forest, not included in this treatment. Fries (1930) mentioned the similarity in buds, petals and monocarps shape, and size and indument of monocarps among *X. ochrantha* and them. But he differentiated *X. ochrantha* from *X. peruviana* and *X. langsdorffiana* basically by the monocarps covered with golden or pale rusty hairs (*vs*. almost glabrous in the latter two). And Fries (1930) distinguished *X. ochrantha* from *X. laevigata* by its pilose sepals (*vs*. almost glabrous), the golden and yellowish indument of the petals (*vs*. grayish silver), and the outer petals ca. 13 mm long (*vs*. less than 10 mm).

Xylopia ochrantha can be distinguished from *X. peruviana* by its leaf blades without rigid aspect and opaque adaxially (*vs*. with a somewhat rigid aspect and often lustrous adaxially); (1–)2–5-flowered inflorescences (*vs*. solitary flowers); and monocarps 9–12 mm wide (*vs*. ca. 7 mm).

When Martius (1841) described *Xylopia ochrantha* he mentioned a collection of "*Maxim. Princ. Vidensis*" (Prince Alexander Philipp Maximilian zu Wied-Neuwied), from Espírito Santo (Brazil), but he did not mention in which herbarium it was. Fries (1930) quoted the type material was at Martius' Herbarium. We found two sheets of "*Maxim. Princ. Vidensis*" at BR, both without locality on the label. The specimen BR-0000006592363 has a label from Martius' Herbarium, it has flowers remains in the packet, and it also fits the original description, therefore we chose this here as the lectotype.

Selected Specimens Examined— **Brazil.** — AMAZONAS: Maués, basin of Rio Maués, Rio Uripadi, at mouth of Igarapé Quininha, 3°45′S, 57°17′W, 19 Jul 1983, *J. L. Zarucchi 3101*

(INPA, NY). — PARÁ: Santarém, km 35 da estrada do Palhão, arredores do Acampamento do Igarapé Gurupira, 24 Aug 1969, *M. Silva & R. Souza 2375* (MG, OWU); ibid., 1 Sep 1969, *M. Silva & R. Souza 2459* (MG, OWU); Serra dos Carajás, 8 Jun 1982, *C. R. Sperling et al. 5985* (MO, NY); id., 8 Jun 1982, *C. R. Sperling et al. 5987* (MO, NY); Approx. 18 km from Tucuruí, 16 km S on old BR-422, then 2 km W on overgrown logging road, approx. 3°53′S, 49°41′W, 1 Nov 1981, *D. C. Daly et al. 1172* (NY). — RONDÔNIA: Road to Cassiterite Mines in Serra dos Três Irmãos, north bank of Rio Madeira, 8 km de Mutumparaná, 5 Jul 1968, *G. T. Prance et al. 5646* (INPA).

Additional Specimens Examined**— Brazil.** — BAHIA: Porto Seguro, Parque Nacional Monte Pascoal, along road from park entrance to matura/conference center, 15°15′53″S, 40°34′29″W, 4 Nov 1996, *W. W. Thomas et al. 11331* (NY).

3.3.5.1.22 XYLOPIA ORINOCENSIS Bagstad & D.M.Johnson, Contr. Univ. Michigan Herb. 22: 26. 1999. TYPE: VENEZUELA. Amazonas: Dpto. Atabapo, Alto Rio Orinoco, 3°03′N, 65°25′W, 180 m elev., 17 Feb 1990 (fl), *G. Aymard and L. Delgado 7921* (holotype: MO 4064965!, isotypes: NY!, U-0008113 (digital image!)).

Trees 9–21 m tall, d.b.h. up to 25 cm. Twigs with golden to brown hairs; petioles, abaxial surfaces of leaves, inflorescences and flowers with golden hairs. **Twigs** densely velutinous to tomentose. **Petioles** 0.5–1.7 mm long, dark brown, tomentose; **leaf blades** 3.5–6.3 × 0.8–1.5 cm, narrowly oblong, narrowly elliptic or narrowly lanceolate, chartaceous or subcoriaceous, pale brown to golden brown and sparsely pubescent, tomentose or velutinous abaxially, dark brown to brown and glabrous adaxially, apex acuminate, acumen 3.5–10 mm long, base cuneate to attenuate, sometimes minutely decurrent; midrib raised and semiterete, impressed to flat adaxially, secondary veins 7–11 per side, raised on both sides. **Inflorescences** axillary, 1–2-flowered; **pedicels** 1.6–4.2 mm long, tomentose to woolly tomentose; **buds** narrowly triangular to linear; **bracts** 2–3, 1.9–4 mm long, ovate, clasping, pubescent. **Calyx** short cup-shaped, smooth, calyx tube 1.5–1.8 mm long, sepals connate in more than ⅓ to a little more than ½ of their length, calyx lobes 1.1–2.2 × 1.8–2.4 mm, ovate, tomentose abaxially, apex apiculate; **petals** orange *in sched.*; **outer petals** 17–24 mm long, 1.4–3 wide at base, 1.3–1.5 mm wide at midpoint, linear lanceolate, coriaceous to fleshy, short sericeous to pubescent abaxially, glabrous adaxially, apex acute; **inner petals** 18–20 mm long, 1.3–1.6 mm wide at base, 0.5–0.6 mm wide at midpoint, linear filiform, apex acute, base expanded and concave, rhombic in cross section at midpoint, pubescent abaxially, glabrous adaxially; **stamens** ca. 60, 0.8–1 mm long, narrowly oblong, glabrous, anthers septate at anthesis, innermost stamens staminodial; **outer** and **inner staminodes** not seen; **staminal cone** conical, 1.6 mm in diameter, pubescent around circumference; **carpels** 4–5, ca. 4.2 mm long, ovary ca. 0.7 mm long, long sericeous, **ovules** 2, stigmas ca. 3.5 mm long, filiform, pubescent. **Fruits** and **seeds** unknown.

Illustration— Bagstad and Johnson (1999: 23, Fig. 1, A–B).

Distribution and habitat— This species is endemic to Venezuela, occurring in the state of Amazonas, in lowland forest (*terra firme*).

Phenology— Specimens with flowers have been collected in February, October and November.

Notes— *Xylopia orinocensis* is characterized by its twigs densely golden to brown velutinous to tomentose; small sized leaf blades, 3.5–6.3 × 0.8–1.5 cm; axillary, 1–2-flowered inflorescences; narrowly triangular to linear buds; short cup-shaped calyx, calyx tube 1.5–1.8 mm long, sepals connate in more than ⅓ to a little more than ½ of their length; orange petals; outer petals 17–24 mm long, 1.3–1.5 mm wide at midpoint, linear lanceolate; inner petals 18–20 mm long, 0.5–0.6 mm wide at midpoint, linear filiform; ca. 60 stamens, 0.8–1 mm long; 4–5 carpels, ca. 4.2 mm long, ovary ca. 0.7 mm long, and stigmas ca. 3.5 mm long, filiform, pubescent.

Xylopia orinocensis is close to *X. barbata* and *X. rigidiflora* Bagstad & D.M.Johnson. It can be differentiated from *X. barbata* by its leaf blades sparsely pubescent, tomentose or velutinous on the abaxial surface (*vs*. densely velutinous to sericeous); orange petals (*vs*. yellow), inner petals 0.5–0.6 mm wide at the midpoint (*vs*. ca. 1 mm); carpels ca. 4.2 mm long (*vs*. 5.2–4.8 mm), ovary ca. 0.7 mm long (*vs*. 1–1.2 mm long), and stigmas ca. 3.5 mm long (*vs*. 4.2–5.6 mm).

Xylopia orinocensis can be distinguished from *X. rigidiflora* by its leaves sparsely pubescent, tomentose or velutinous on abaxial surface (*vs*. sericeous or puberulent, denser on the midrib), acuminate apex (*vs*. cuspidate); orange petals (*vs*. yellow), outer petals 1.3–1.5 mm wide at the midpoint (*vs*. 2.5–4 mm), inner petals 0.5–0.6 mm wide at the midpoint (*vs*. 1.5–1.8 mm); 4–5 carpels (*vs*. 9), and ovary ca. 0.7 mm long (*vs*. ca. 2 mm).

There are few collections of *X. orinocensis* at the herbaria, with only a few flowers available, so, the flower description is largely based on the original description of Bagstad and Johnson (1999). Since *X. orinocensis* is very close to *X. barbata*, efforts to collect it (specialy with fruits) would be important to discover more characters to reinforce the distinction of these taxa.

Selected Specimens Examined — **Venezuela.** — AMAZONAS: Municipio Casiquiare, Boca de río Pamoni del Alto Casiquiare, 700 m de la boca a altura del final de la primera vuelta, Apr 2000, *B. Stergios et al. 18507* (MO); Prov. Alto Orinoco, 24 Nov 1996, *J. Wesenberg et al. 11* (U); id., 28 Oct 1997, *D. Warming 4/97* (U); Río Caname, a 36 km de la confluencia con el río Atabapo, 3°37′N, 67°7′W, 95 m elev., Nov 1989, *M. Yanez 172* (US).

3.3.5.1.23 XYLOPIA PARVIFLORA Spruce, J. Proc. Linn. Soc., Bot. 5: 6. 1861. *Xylopicrum neglectum* Kuntze, Rev. Gen. Pl. 1: 8. 1891. *Xylopia neglecta* (Kuntze) R.E.Fr., Kongl. Svenska Vetensk.-Akad Handl. 34(5): 31. 1900. TYPE: [VENEZUELA]. Prope San Carlos, ad Rio Negro, Brasiliae Borealis, 1853–54, *R. Spruce 3678* (lectotype, designated here: K-00022196 (digital image!), isolectotypes: B-100242286 (digital image!) [photo in: F!, NY!], BM-000554091 (digital image!), F 893864! [fragment], F 931079! [fragment], G-000226126 (digital image!), G-000226127 (digital image!), GH-00039723 (digital image!), GOET-000137 (digital image!), K-00022197 (digital image!), LE-00006689 (digital image!), MG-019388!, NY-00066766!, P-00734910 (digital image!), P-00734911 (digital image!), S-R-7418 (digital image!), TCD-0000866 (digital image!)).

Trees 17–18 m tall, d.b.h. ca. 20 cm. Twigs with rusty to pale brown hairs, petioles, leaves and sepals abaxially with golden to pale brown hairs. **Twigs** densely tomentose to sericeous, becoming glabrate to glabrous when older. **Petioles** 1–1.5 mm long, canaliculate; **leaf blades** narrowly elliptic to lanceolate, (1.5–)2–4.6 × 0.4–0.9 cm, membranous, smooth, grayish pale green and sericeous at margins and midrib, abaxially, grayish pale green and glabrous adaxially, with a tuft of hairs longer than the midrib abaxially; midrib raised abaxially, impressed adaxially, apex attenuate to acuminate mostly with a retuse tip, acumen ca. 3 mm long, base cuneate to asymmetric, often with oblique angles at both sides of the base. **Inflorescences** axillary, 1-flowered; **pedicels** 1–2 mm long; **buds** narrowly oblong to narrowly triangular, slightly panduriform; **bracts** 2, triangular ovate. **Sepals** slightly connate at the base, ca. 1.5 × 2 mm, triangular, smooth, sericeous abaxially, glabrous adaxially, apex acute; **outer petals** narrowly oblong, slightly fleshy, short sericeous abaxially, apex acute to slightly rounded, ca. 5 mm long, **fertile stamens** ca. 0.5 mm long, glabrous; **inner petals, outer staminodes**; **inner staminodes**; **staminal cone** not seen. **carpels** 4, ovary pilose, **ovules** and stigmas not seen. **Fruits** of 3–5 monocarps. **Monocarps** ovoid, clavate, wrinkled when dried, apex rounded; **stipes** ca. 6 mm long. **Seeds** not seen.

Distribution and habitat— This species is distributed in the Amazon Basin, in Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, and Venezuela. In Brazil it grows in lowland forests (*terra firme*), in the states of Acre and Amazonas.

Phenology— Specimens with flowers have been collected in April and June, and specimens with fruits in June.

Notes— *Xylopia parviflora* is characterized by its short petioles, 1–1.5 mm long; small leaf blades, (1.5–)2–4.6 × 0.4–0.9 cm, membranous, sericeous at margins and midrib, and with a tuft of hairs longer than the midrib abaxially; attenuate to acuminate apex, mostly with a retuse tip, cuneate to asymmetric base, often with oblique angles at both sides of the base; narrowly oblong to narrowly triangular buds, slightly panduriform; sepals slightly connate at the base, ca. 1.5 × 2 mm; outer petals ca. 5 mm long; fertile stamens ca. 0.5 mm long; 4 carpels; 3–5 monocarps per fruit, ovoid, clavate, wrinkled when dried, with an rounded apex; and stipes ca. 6 mm long.

A group of species with retuse/emarginate apex within *Xylopia* was mentioned by Berry and Johnson (1993), and englobes *X. emarginata*, *X. plowmanii* P.E. Berry & D.M. Johnson, *X. spruceana* Benth. ex. Spruce, and *X. venezuelana* (a new synonym of *X. emarginata* established here). *Xylopia parviflora* is morphologically related to this group, and shares with *X. emarginata* and *X. spruceana* a tuft of hairs abaxially on the midrib exceeding the apex of the leaves, and shares with all the species of the group other characters as the buds shape, connation of sepals, small number of carpels and monocarps.

Xylopia parviflora is distinguished from *X. emarginata* by the leaf blades membranous (*vs.* chartaceous), abaxially sericeous at margins and midrib (*vs.* pubescent to short sericeous on young leaves, hairs more concentrated on the midrib and close to it); sepals ca. 1.5 × 2 mm (*vs.* 2–2.5 × 2–3 mm); outer petals ca. 5 mm long (*vs.* 14–15 mm); fertile stamens ca. 0.5 mm long (*vs.* 0.7–1.5 mm); and 4 carpels (*vs.* 8–12).

To distinguish *X. parviflora* from *X. plowmanii* the following characters must be checked: young twigs densely tomentose to sericeous (*vs.* pubescent to puberulent); petioles 1–1.5 mm long (*vs.* 3–4 mm); leaf blades (1.5–)2–4.6 × 0.4–0.9 cm (*vs.* 5.3–7.5 × 2.2–2.9 cm), membranous (*vs.* chartaceous or subcoriaceous), attenuate to acuminate apex, mostly with a retuse tip (*vs.* conspicuously emarginate apex); sepals slightly connate at the base (*vs.* short cup-shaped calyx,); outer petals ca. 5 mm long (*vs.* 14.5–18 mm); and fertile stamens ca. 0.5 mm long (*vs.* 1–1.4 mm).

Xylopia parviflora differs from *X. spruceana* by its membranous leaf blades (*vs.* mostly coriaceous, sometimes chartaceous to subcoriaceous), attenuate apex, mostly with a retuse tip (*vs.* emarginate or retuse apex); sepals ca. 1.5 × 2 mm (*vs.* 3.5–4 × 3–3.5 mm); outer petals ca. 5 mm long (*vs.* 14–23 mm); fertile stamens ca. 0.5 mm long (*vs.* 1–1.4 mm); 4 carpels (*vs.* 8–13); 3–5 monocarps per fruit (*vs.* 6–9), and ovoid, clavate monocarps (*vs.* oblong, clavate, sometimes slightly falcate, or ellipsoid).

It is also morphologically close to *X. discreta*, but it can be distinguished from this latter by its leaf blades with golden to pale brown hairs abaxially (*vs.* silver or pearly hairs), acumen ca. 3 mm long (*vs.* ca. 7 mm); outer petals ca. 5 mm long (*vs.* 7–8 mm); 4 carpels (*vs.* 5–6); and monocarp stipes ca. 6 mm long (ca. 2.5 mm).

Spruce (1861) described *Xylopia parviflora* as "*the most beautiful of the genus, grows 60 feet high, and has a dense pyramidal head of four times pinnate branches*", mentioning the specimen "Pl. Am. 3678". Although this description was mentioned as "*short and very incomplete*", by Maas et al. (1986), they accepted it as a valid publication.

Fries (1900), however, considered *X. parviflora* as a *nomen nudum*, and proposed *Xylopia neglecta,* as a new name for this species. At that time, a new combination, *X. parviflora* (A.Rich.) Benth., for an African species, had already been made and prevented Fries to use this epithet for the American species. So, he adopted the epithet used by Kuntze (1891) when he transferred Spruce's name to *Xylopicrum*.

The main South American material of Spruce is at K (Stafleu and Cowan 1985), and examining all the specimens fragments and digital images from the type collection, we considered the specimen K-00022196 as the lectotype. It has a label in the handwriting of Spruce with his short original description in Latin, and it also has some buds and flowers.

Selected Specimens Examined— **Brazil.** — ACRE: Cruzeiro do Sul, Vicinity of Serra do Moa, 23 Apr 1971, *G. T. Prance et al. 12329* (INPA, MO, NY, OWU). — AMAZONAS: Lábrea, Ponto 16, SB-20-VD, 24 Jun 1976, *C. D. A. Mota s.n.* (INPA 60404); São Paulo de Olivença, basin of Creek Belem, 26 Oct to 11 Dec 1936, *B. A. Krukoff 8930* (F, NY, US). — **Colombia.** — Prov. Sucumbios, Estación Científica Cuyabeno, transecto D0 a D8, 220 m elev., 21 Jul 2019, *J. Jaramillo 14914* (MO). — **Ecuador.** — PASTAZA: Via Auca, 115 km south of Coca, Petrocanada, 1°15′S, 76°55′W, 300 m elev., 13 feb 1989, *D. Neill et al. s.n.*

(MO) — **Peru.** — LORETO: Provincia Maynas, Ecuador border, 1-5 km from Puerto Peru, military post 8 km from mouth of Río Gueppi, tributary of Río Putamayo, 200 m elev., 17 May 1978, *A. Gentry et al. 22040* (MO); Prov. Maynas, Mishana, Río Nanay, 3°55′S, 73°35′W, 130 m elev., 25 Sep 1986, *R. Vásquez & N. Jaramillo 7977* (MO); Maynas Province, Puerto Almendras, 3°48′S, 73°45′W, 122 m elev., 25 Jan 1987, *N. Arévalo & M. P. Díaz 80* (MO); Prov. Requena, J. Herrera km 13, 4°55′S, 73°45′W, 180 m elev., 30 Jul 1986, *R. Vásquez & N. Jaramillo 7736* (MO); Ucayali Province, Jenaro Herrera, 4°50′S, 73°45′W, 27 Jul 1986, *N. Arévalo & M. P. Díaz 77* (MO). — **Venezuela.** — AMAZONAS: Bosque de tierrra firme arriba de Caño Barro, por lá carreteria San Carlos de Río Negro-Solano, justo al este de la Bana de Mary, 1°57′40″S, 66°59′49″W, 120 m elev., 2 Apr 2000, *P. Berry & G. Aymard 7511* (MO).

3.3.5.1.24 XYLOPIA PERUVIANA R.E.Fr., Acta Horti Berg. 10(1): 117. f. 10. 1930. – TYPE: [PERU]. Ost Peru, prope Tarapoto, 1855–56, *R. Spruce 4166* (holotype: W [destroyed] [photo in: F!, MO!], lectotype, designated here: BR-000000696050 (digital image!), isolectotypes: F 870921! [fragment], TCD-0000867 (digital image!)).

Trees ca. 5 m tall **and shrub** 2–4 m tall, d.b.h. ca. 4 cm. Twigs, abaxial surfaces of leaves, inflorescences and flowers with golden, pale rusty, or rusty hais. **Twigs** sparsely short sericeous to tomentellous. **Petioles** 3–8 mm long, canaliculate, black, glabrous; **leaf blades** 6–12 × 2.6–5 cm, elliptic, coriaceous or chartaceous, somewhat rigid, sparsely to rarely pubescent to glabrate abaxially, with a somewhat rigid aspect, often lustrous and glabrous adaxially, apex acuminate, acumen 10–20 mm long, base cuneate, leaf shape obtuse near base; midrib raised abaxially, impressed adaxially, secondary veins 9–12(–14) veins per side, distinct on both surfaces, slightly raised abaxially. **Flowers** axillary, solitary, yellow or yellow cream *in sched.*; **peduncles** 3–4 mm long, appressed pilose; **buds** triangular ovoid; **bracts** caducous. **Sepals** connate at the base, calyx 4 mm long, smooth, appressed pilose abaxially, glabrous adaxially, calyx lobes triangular, apex acute; **petals** densely sericeous abaxially; **stamens**, **outer staminodes**, **inner staminodes**, and **staminal cone** not observed and not described in the original description; **carpels** numerous, ovary hirsute, **ovules** not observed and not described in the original description. **Fruits** of 7–10 monocarps borne on a **peduncle** ca. 7 mm long. **Monocarps** ca. 20 × 7 mm, obliquely cylindric, constricted between seeds, sometimes slightly falcate, green blushed red along dorsal surface, bright red, or salmon red, apex obtuse, obliquely apiculate, glabrate to glabrous; **stipes** 5–8 mm long. **Seeds** 1–4, ca. 10 mm long, 5 mm in diameter, oblong obovoid, black *in sched.*, aril white, lobes ca. 2 mm long.

Illustration— Fries (1930: 118, Fig. 10).

Distribution and habitat— This species is endemic to Peru, at the province of San Martín, around the city of Tarapoto, where it occurs in dry or gallery forests, on white sandy soils, or on rocky calcareous hills. It occurs often on less disturbed areas.

Phenology— Specimens with flowers have been collected in May and December, and with fruits in May and October.

Notes— *Xylopia peruviana* is characterized by its coriaceous or chartaceous leaf blades, with a somewhat rigid aspect and often lustrous adaxially; solitary axillary flowers; triangular ovoid buds; sepals connate at the base, calyx 4 mm long; fruit peduncles ca. 7 mm long; 7–10 monocarps per fruit, monocarps ca. 20 × 7 mm, glabrate to glabrous; and 1–4 seeds, ca. 10 mm long, 5 mm in diameter, oblong obovoid.

Xylopia peruviana resembles *X. laevigata*, *X. langsdorffiana,* and *X. ochrantha* (see notes under *X. ochrantha*). Fries (1930) distinguished *X. peruviana* from *X. langsdorffiana* by the base of its leaves more rounded (*vs*. cuneate), flower peduncle 3–4 mm long (*vs*. 7–8 mm) and fruit peduncle ca. 7 mm long (*vs*. ca. 15 mm). He also differentiated *X. peruviana* from *X. laevigata* by its sericeous calyx (*vs*. glabrous), petals with golden or rusty hairs (vs. grayish silver hairs) and outer petals more than 1 cm long (up to 1 cm), but he did not quoted the measure of the petals in the description of *X. peruviana*.

Fries (1930) did not presented many details of the flowers in the original description of *X. peruviana*. Besides the type collection, there are only a few more specimens of this species in the herbaria, and they have no complete mature flowers. We saw buds in only one specimen (*S. Knapp et al.* 7394, MO) and a receptacle on the same collection at U (observed from digital image). Because of that our description of the flowers of *X. peruviana* was based on the original one. Efforts to collect *X. peruviana* with flowers are essential to have a good circumscription of it and to understand its relationship with *X. ochrantha*.

The holotype of *Xylopia peruviana* was destroyed during the Second World War. We chose the isotype at BR (BR-000000696050) as the lectotype, because it fits the original description, has an identification label with Fries's handwriting indicating it as a new species and has a more developed fruit when compared with the other isotypes.

Specimens Examined— **Peru.** — SAN MARTÍN: Estación “Biodiversidad”, km 28 on road from Tarapoto to Yurimaguas, trail leading from road to “Biodiversidad”, 6°27′50″S, 76°16′52″W, 970 m elev., 3 Dec 2003, *M. D. Pirie et al. 136* (F, NY); id., km 28 of road from Tarapoto to Juanjui, near to Hacienda San Rafael, 200–300 m elev., 6 Oct 1984, *P. J. M. Maas et al. 5953* (FUEL, U); id., km 28 of road from Tarapoto to Chazuta, 275 m elev., 9 Oct 1984, *P. J. M. Maas et al. 6008* (U); id., 9 Oct 1984, *P. J. M. Maas et al. 6013* (FUEL, INPA, U); id., Quebrada Mamonaquihua to junction of Río Mayo, 9.6 km W of carretera marginal on road Flores and Mamonaquihua, turnoff in on 24 km of carretera marginal from Tarapoto, 6°39′S, 76°30′W, 250 m elev., 25 May 1986, *S. Knapp et al. 7394* (OWU, U).

3.3.5.1.25 XYLOPIA PITTIERI Diels, Notizbl. Bot. Gart. Berlin-Dahlem 9: 52. 1924. – TYPE: VENEZUELA. Zulia, in silvis regionis Lorae fluminis, 18 Dec 1922, *H. F. Pittier 10990* (lectotype, designated by Fries 1930: B-10 0242285 (digital image!), isolectotypes: A-00039725 (digital image!), F 893669! [fragment], F 930989! [fragment], G-00226125 [photo in: F!] (digital image!), GH-00039726 (digital image!), NY-00066773!, P-00734916 (digital image!), S-R-6862 [fragment] (digital image!), US-00098782!, VEN-1504 (digital image!).

Xylopia pulcherrima Sandwith, Bull. Misc. Inform. Kew. 1930 (10): 477. 1930. TYPE: [GUYANA]. BRITISH GUIANA In mixed forest, Essequibo River, near Bartica, 15 Oct 1929, *N. Y. Sandwith 456* (lectotype, here designated: K-000221091 (digital image!), isolectotypes: B-10 0242282 (digital image!), F 893770! [fragment], K-000221092 (digital image!), NY-00066773!, P-00202511 [photo in: F!, US!] (digital image!), RB-00534173!, S-R-6868 (digital image!), U-0000444 (digital image!), US-00098785!); syn. nov.

Xylopia micans R.E.Fr., Acta Horti Berg. 12(2): 276. 1937. TYPE: PERU. Ost-Peru, Dep. Loreto, Balsapuerto, altitude about 220 meters, *G. Klug 3034* (lectotype, here designated: S-13-3033 (digital image!), isolectotypes: A-00039721 (digital image!), BM-000554088 (digital image!), F 684743!, F 1914869!, GH-00039720 (digital image!), MO-216997!, NY-00066765!, S-R-6860 (digital image!), US-00098779!); syn. nov.

Xylopia calophylla R.E.Fr., Acta Horti Berg. 12(3): 563. 1939. TYPE: BRAZIL. Civit Amazonas: Cucuhy, silva primaeva non inundabili secus rivum Macacuny, ad limina reipubl. Columbiae, 19 Sep 1935, *A. Ducke RB-29016* (holotype: S-R-6845 (digital image!), isotypes: RB-00534162! [photo in: NY!], RB-00567779!); syn. nov.

Xylopia amoena R.E.Fr., Ark. Bot. 33A(9): 7. 1947. TYPE: PERU. Ost-Peru, Dep. Loreto, Iquitos, 30 Oct 1940, *E. Asplund 14164* (lectotype, here designated: S-13-2945 (digital image!), isolectotypes: R-000076970!, S-R-6844 (digital image!), U-0061409 (digital image!), UPS V-078486, US-00098768!); syn. nov.

Trees 5–30 m tall, d.b.h. (6–)12–35(–50) cm; **bole** often with buttresses 50–65 cm high. Twigs, petioles, abaxial surfaces of leaves, inflorescences, flowers, and fruits with golden, hyaline, pale rusty or sometimes pale brown hairs. **Twigs** densely tomentose to rarely sericeous. **Petioles** (2–)3–6(–7) mm long, canaliculate, brown to dark brown, tomentose; **leaf blades** (4.3–)5–10 × (1.5–)1.8–3.5 cm, elliptic, narrowly elliptic, oblong elliptic, or lanceolate, rarely oblanceolate, papyraceous to subcoriaceous, often with translucent glands visible under stereomicroscope on both surfaces, margin flat, pale golden brown or pale brown, and densely short sericeous abaxially, with longer and darker hairs on the midrib and margins, hairs decreasing with age, pale reddish brown, brown or dark brown, often lustrous and glabrous adaxially, apex acuminate, to slightly cuspidate, acumen (3–)5–14 mm long, base cuneate to less frequently obtuse or asymmetric, often with oblique angles close the petiole; midrib mostly strongly raised to raised, keeled (sometimes only slightly) abaxially, often strongly impressed (canaliculate) adaxially, secondary veins (10–)12–14(–16) per side, raised abaxially, but covered by hairs, flat and discrete adaxially. **Inflorescences** axillary, sometimes born in older twigs, (2–)3–9(–20)-flowered; **peduncles** 0.5–1.5 mm long, tomentellous; **pedicels** 1.5–3 mm long, tomentellous, tomentose or short sericeous; **buds** narrowly triangular, slightly panduriform; **bracts** 2, one at the base and the other at the midpoint of the pedicel, 1–2 × 0.8–1.5 mm, triangular ovate to ovate, clasping, sometimes caducous, apex acute, short sericeous to tomentellous abaxially, glabrous adaxially. **Sepals** slightly connate at the base, ca. ⅓–⅕ of their length connate, 1.2–2.5 × 1.4–2.4 mm, ovate to triangular ovate, smooth, short sericeous to tomentose abaxially, with hairs denser at the apex, glabrous to rarely glabrate adaxially, apex acute; **petals** white or cream, brownish *in sicco* or when older; **outer petals** 8.5–15(–18) mm long, 1.5–2.4 wide at base, 0.8–1.4 mm wide at constriction, 1.4–2.2 mm wide at midpoint, narrow triangular to linear, nearly lanceolate, base enlarged and concave, obliquely cut at both sides, slightly panduriform, slightly fleshy, abaxially densely short sericeous to tomentellous, mainly sericeous at the base, adaxially densely to sparsely tomentellous with the base glabrate, apex acute; **inner petals** 6.5–12 mm long, 1–1.4 mm wide at the base, 0.5–0.7 mm wide at the constriction, 0.6–1 mm wide at the midpoint, linear, narrowly lanceolate, base enlarged and concave, obliquely cut at both sides, fleshy, tomentellous with the base short sericeous (region apparent between the outer petals) abaxially, tomentellous with base up to constriction glabrous adaxially, apex acute; **stamens** (38–)50–60, **fertile stamens** 25–32, (0.4–)0.5–0.8 × 0.2–0.4 mm, glabrous, apex of the connective 0.1–0.2 mm long, discoid, papillate, anthers 2–4(–5)-locellate, locelli irregularly shaped, filament 0.1–0.2 mm long; **outer staminodes** ca. 14, (0.4–)0.6–0.9 × 0.3–0.4 mm, obtriangular, glabrous, apex of the connective papillate; **inner staminodes** 8–9, (0.4–)0.5–0.8(–1) × 0.3–0.5 mm, obtriangular, glabrous, often appressed to the stigmas; **staminal cone** 1–1.5 mm in diameter, (0.5–)0.6–1 mm high, flattened globose or flattened urceolate, sometimes conical, nearly incomplete in the circumference edges, not completely concealing the ovaries; **carpels** 6–10, 3.5–5.3 mm long, ovary 0.9–1.1 mm long, obclavate or slightly falcate, densely sericeous, **ovules** 2–4, stigmas filiform from base up to midpoint, slightly geniculate or slightly enlarged above base, (2.5–)3.3–4.2(–5) mm long, villous to tomentellous from apex to midpoint, hairs crooked and erect, glabrous from midpoint to base. **Fruits** of (4–)7–9 monocarps borne on a **pedicel** 4–7.5 mm long, tomentellous; **torus** (2–)4.7–5.5 mm in diameter, (2.5–)3.5–4.5 mm high, nearly globose to flattened globose. **Monocarps** 8–16 × 5–9 mm, ellipsoid (1–2-seeded), or slightly compressed falcate (3–4-seeded), clavate, red, reddish green, salmon green or brownish green *in sched.*, obliquely or longitudinally wrinkled to rugolose when dried, puberulent or glabrate, rarely pubescent, apex obtuse, apiculate, apiculus 1–1.5 mm long; **stipes** (2.5–)3–4.5 × 1.4–1.8 mm, pubescent, puberulent or glabrate, rarely tomentellous, longitudinally wrinkled to rugolose. **Seeds** 1–4, 5.5–7 × 4–4.5 mm, flattened obovoid, obovoid or ellipsoid, pale brown to pale yellowish brown, smooth, aril yellowish, whitish or amber-colored, often translucent, lobes 1.4–2.2 × 1.5–2.2 mm, ovoid to nearly square-shaped, smooth. Figure 9F.

Distribution and habitat— This species is distributed in Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, and Venezuela. In Brazil it occurs in the states of Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia and Roraima. It growns in flooded (*igapó*) and non flooded lowland forests (*terra firme*), often less disturbed.

Vernacular Names— "*Envira-cana*" (Brazil, Pará), "*Red Kuyama*" (Guyana), "*Piraquina*" (Bolivia, *M. Toledo & J. Justiniano 1127,* MO), "*Piraquina blanca*" (Bolivia).

Phenology— Specimens with flowers have been collected from in February, March, April, September and October, and specimens with fruits have been collected in June, September and October.

Notes— Analyzing the type collections of *X. pittieri* (*sensu stricto*), *X. pulcherrima*, *X. micans*, *X. calophylla,* and *X. amoena*, we noticed they show different stages of the same species: those of *X. calophylla, X. micans*, and *X. pulcherrima* present only flowers, and those of *X. pittieri* and *X. amoena* present only fruits, with very young monocarps on the last one.

Xylopia pittieri sensu lato has variations on the shape, width and on the length of the acumen at the apex of the leaves, but the variation is compatible to the pattern we have in other species of *Xylopia* from the Neotropics. On the other hand, it has many consistent and distinctive characters as: densely short sericeous leaf blades abaxially, with longer and darker hairs on the midrib and margins, often slightly lustrous and glabrous adaxially; midrib mostly raised and keeled abaxially, often strongly impressed (canaliculate) adaxially; axillary inflorescences, with (2–)3–9(–20) white or cream small flowers; narrowly triangular buds, slightly panduriform; sepals slightly connate at the base, ca. ⅓–⅕ of their length; (38–)50–60 stamens, fertile stamens (0.4–)0.5–0.8 mm long, with 2–4(–5)-locellate anthers; 6–10 carpels, 3.5–5.3 mm long, villous or tomentellous stigmas, from midpoint to the apex; and (4–)7–9 monocarps per fruit, clavate, ellipsoid or slightly falcate, and 1–4 seeds each.

Xylopia pittieri is morphologically close to *X. ligustrifolia*, but it can be distinguished by its leaf blades with flat margins (*vs*. undulate margins); (2–)3–9(–20) flowers per inflorescence (*vs*. (1–)2); and villous to tomentellous stigmas, from apex to midpoint, and glabrous from midpoint to base (*vs*. entirely sericeous to tomentose).

Diels (1924) mentioned *Xylopia pittieri* was similar to *X. benthamii*, as regards to the shape of the leaves, but *X. pittieri* could be easily distinguished from that latter by its young twigs indument with shorter and not erect hairs, the denser indument of the leaves on the abaxial surface, the non cauliflorous, axillary inflorescences, and the pubescent peduncles. He also mentioned the flowers would be a "*further inquiry*", because the type collection had no flowers.

Sandwith (1930), when describing *Xylopia pulcherrima*, quoted the affinity of this with *X. sericea* A.St.-Hil., and in his diagnosis he distinguished the new species by its narrowly elliptic-oblong leaf blades, with a cuspidate-acuminate apex, beautiful sericeous indument on the abaxial surface, secondary veins much more straight and parallel, narrow petals, and style indument notably distinctive. He also mentioned the style of *X. sericea* as glabrous and that the leaves of *X. pulcherrima* resembles those from *X. nitida*, rather than those from *X. sericea*. We agree with Sandwith (1930) that these characteristics are remarkable for *X. pulcherrima*, but all these characters fit our morphological concept and description of *X. pittieri sensu lato*. Thus, we cannot maintain this as a distinct species and included it as a synonym of *X. pittieri*.

Fries (1937), stated *Xylopia micans* shows close relationship with *X. ligustrifolia* and *X. pulcherrima*, in regards to the flowers shape and the dense indument with long hairs on the stigmas. He also mentioned that *X. micans* differs from *X. pulcherrima* by its narrower leaf blades with an acuminate apex, and shiny golden long hairs on the abaxial surface. It is also distinguished from *X. ligustrifolia* by its elongated leaf blades and an acuminate-cuspidate apex; and pilose pedicels and calyx. All of these characters described by Fries (1937) to *X. micans* is within the range of morphological variation of our concept of *X. pittieri sensu lato*, therefore we have to include *X. micans* as a synonym of *X. pittieri*.

Fries (1939) pointed that *Xylopia calophylla* resembles *X. nitida* in the shape and size of the leaf blades, and in the number of flowers per inflorescence. However, he had already noticed that *X. calophylla* was not so closely related to the latter because it differs from *X. nitida* by its almost free sepals and small number of carpels. So, he quoted *X. calophylla* as similar to *X. barbata*, *X. ligustrifolia*, and more closely related to *X. polyantha*. Fries (1939) mentioned *X. calophylla* was "slightly" different from these latter three by its leaf blades coriaceous and lustrous on the abaxial surface, with secondary veins impressed and densely reticulate, and persistent densely silvery indument on the adaxial surface. He also quoted the indument of the leaf blades as very similar to the one from *X. pulcherrima*. These characteristics described by Fries (1939) to *Xylopia calophylla* also fit our morphological concept of *Xylopia pittieri sensu lato*, and led us to include *X. calophylla* as a synonym of *X. pittieri*.

Fries (1947) commented that "*only with hesitation*" he had separated *Xylopia amoena* from *X. calophylla*", and quoted *X. amoena* differs from the latter by its lanceolate leaf blades (*vs.* more or less elliptic), shorter in length, with tip not so sharply set, base more acute and cuneate, and inflorescences, judging by the fruit material, seeming to have less flowers. Again, these characters fit our morphological concept of *Xylopia pittieri sensu lato*, and we included *X. amoena* as a synonym of *X. pittieri*.

Regarding the geographic distribution of the type specimens, they all occur in a nearby geographic region in the Neotropics. *Xylopia amoena* was collected in Peru, in Iquitos, at the Department of Loreto; *Xylopia calophylla* was collected in Cucuí, a district of the municipality of São Gabriel da Cachoeira, in the triple border of Brazil, Colombia and Venezuela; *Xylopia micans* was collected in Peru, in Balsapuerto, a district of the Department of Loreto; *Xylopia pittieri* was collected in Venezuela, in the Lora river, at the state of Zulia; and *Xylopia pulcherrima* was collected in Guyana, at the Moraballi Creek, at the Essequibo River.

In the protologue of *Xylopia pittieri* Diels (1924), the author did not mention in which herbarium was the type specimen. Fries (1930) quoted the specimen from B as the "*typus speciei*". We found only one specimen at B (B-10 0242285), and we considered his choice as the lectotypification.

Sandwith (1930) stated at the beginning of his manuscript were *X. pulcherrima* was described that he studied the material at K. However, at K there are two sheets of the type collection of *X. pulcherrima,* and both fit the original description. We are here chosing the specimen K-000221091 as the lectotype, because it fits the protologue and has more flowers than the specimen K-000221092.

In the original description of *X. micans*, Fries (1937) mentioned the holotype was at S, but there are two specimens (S-13-3033 and S-R-6860) of the type collection at this herbarium. We are chosing the specimen S-R-6860 here as the lectotype, because this material fits the protologue, it has a largest branch and with more flowers than the specimen S-13-3033, and it presents an identification label with Fries' handwriting stating "*X. micans*, n. sp., R. E. Fr. 37".

Fries (1947) stated in the protologue of *X. amoena* the holotype was at Herbarium Regnellianum, at S, but there are two sheets of the type collection there. We are choosing the specimen S-13-2945 as the lectotype because it matches the original description, and it has more mature fruits and remains of flower. The other specimen (S-R-6844) has fruits more imature and only one flower.

Selected Specimens Examined— **Bolivia.** — BENI: Prov. Vaca Diéz, Propriedad Roysil (Forever green Amazon S.R.I.) de Jorge Damasceno, a 32 Km NE de Riberalta, 10°50′S, 65°57′0.748″W, 150 m elev., 16 Oct 1999, *M. Toledo & J. Justiniano 1127* (MO). — **Brazil.** — AMAPÁ: Munguba a 2 km da Perimetral Norte, sobrecarregada de fogo há muitos anos anteriores, 23 Apr 1977, *N. A. Rosa & M. R. Santos 1817* (MG). — AMAZONAS: Manaus, Reserva Ducke, Trilha da Torre, próximo à beira da trilha, 2°56′0.21″S, 59°57′0.748″W, 115 m elev., 16 Sep 2015, *A. F. Pontes-Pires & L. S. Mergulhão 918* (JPB). — MATO GROSSO: Aripuanã, km 238 da BR-174, Núcleo Juína, área urbana, 16 Jan 1979, *M. G. Silva & A. Pinheiro 4275* (IAN, INPA). — RORAIMA: Caracaraí, Parque Nacional do Viruá, grade do PPBio, parcela L03_1500, 9 Jun 2017, *A. F. Pontes-Pires et al. 973* (JPB); ibid., trilha de acesso à grade do PPBio, 12 Dec 2011, *R. O. Perdiz et al. 1024* (INPA, MIRR, UFRR); ibid., grade do PPBio, parcela L03_1500, 1 Oct 2012, *R. O. Perdiz et al. 1634* (INPA, MIRR, UFRR); ibid., Vicinal do Iriruba, localidade ilha, 1°25.79′N, 60°50.49′W, 11 Jun 2017, *A. F. Pontes-Pires et al. 978* (JPB). — **Colombia.** — Municipio de Vélez, Campo Capote, Proyecto Forestal Carare Opón Santader, 14 Aug 1969, *I. Cabrera R. 767* (F, OWU). — **Ecuador.** — Morona Santiago, Río Cuyes y vía Bomboiza-Gualaquiza, 1 Nov 1986, *W. Palacios 1485* (MO, NY, OWU). — **French Guiana.** — Entre Saut Vata et Saut Bérard, — **Guyana.** — Potaro-Siparuni, Iwokrama Forest Reserve, Riparuni River heading the Burro-burro River, between Pakatau Falls base camp and junction with Burro-Burro River, 4°46′1.4″N, 58°55′43.2″W, 84 m elev., 22 Sep 1965, *R. A. Oldeman 1529* (US); Fleuve Kourou, sur la crique Couy, rive gauche, 4°46′1.4″N, 58°55′43.2″W, 19 Sep 1967, *B. Oldemen 1327* (MO). — **Peru.** —LORETO: Maynas Province, Santa María de Nanay, Mishana (Río Nanay), 8 Sep 1990, *R. Vásquez et al. 14320* (MO, OWU). — MADRE DE DIOS, Tambopata, 5 Oct 1997, *C. Díaz & H. Ramírez 9355* (MO, OWU). — **Venezuela.** — Em selva pluvial al SE de Sta Elena, 900 m elev., 23 Apr 1957, *A. L. Bernardi 6775* (NY, OWU). AMAZONAS: Dpto. Atabapo, frente de Trabajo n. 13, Río Puruname, 3°25′N, 66°22′W, 150 m elev., Apr 1990, *M. Yanez 561* (MO, US). — BOLÍVAR: Dtto. Roscio, El Abismo al morte dele río Icabarú, 500 m elev., Oct 1985, *F. Delascio 12489* (MO).

3.3.5.1.26 XYLOPIA PLATYPETALA R.E.Fr., Acta Horti Berg. 12(1): 211. 1934. TYPE: COLOMBIA Caquetá: Rio Dedo, Dec 1930 (blühend), *C. Uribe P.* [*Pedrahita*] *s.n.* (holotype: US-00098783!, isotype: S-R-6863 [fragment] (digital image!)).

Shrubs or **trees**. Twigs, petioles, and abaxial surfaces of leaves with pale brown, pale rusty, or golden hairs; inflorescences and flowers with pale rusty, golden, whitish, or grayish hairs. **Twigs** pale grayish brown with beige or cream lenticels, densely tomentose to velutinous, becoming glabrate when older. **Petioles** 2–2.5 mm long, canaliculate, brown; **leaf blades** 14–17.3(–20) × 4.9–5.2(–6) cm, oblong elliptic or elliptic, membranous to subchartaceous, and sparsely sericeous abaxially, denser, longer and darker hairs on the midrib, glabrous adaxially, apex acuminate to cuspidate, acumen or cusp 20–27 mm long, base broad cuneate, sometimes with oblique angles at both sides; midrib raised abaxially, impressed adaxially, secondary veins 10–12 per side, slightly raised on both surfaces. **Flowers** axillary, solitary; **peduncles** ca. 5 mm long; **buds** ovoid; **bracts** ca. 6 × 8 mm, ovate, clasping, sericeous abaxially. **Sepals** connate around ⅓ of their length, forming a short cup-shaped calyx**,** smooth, calyx tube ca. 3 mm, spreading, calyx lobes 7–10 × 8–9 mm, triangular ovate, densely sericeous abaxially, glabrous adaxially, apex acute to acuminate; **outer petals** 20–23 mm long, 10–15 wide at midpoint, ovate to triangular ovate, flat, crass, densely sericeous abaxially, puberulent adaxially, apex acute; **inner petals** ca. 18 mm long, lanceolate, crass, tomentellous on both surfaces, apex acute; **stamens** numerous, **fertile stamens** 3–3.5 mm long, narrowly oblong, glabrous; **outer staminodes** ca. 3.2 mm long, narrowly oblong, flattened; **inner staminodes**, **carpels,** ovary, **ovules** and stigmas not observed and not described in the original description. **Fruits** and **seeds** unknown.

Distribution and habitat— This species is distributed in Bolivia, Brazil, and Colombia. It grows in lowland forest (*várzea*).

Phenology— Specimens with flowers have been collected in January, October and December.

Notes— *Xylopia platypetala* is characterized by its large leaf blades, (14–17.3(–20) × 4.9–5.2(–6) cm); axillary and solitary flowers, with peduncles ca. 5 mm long; large ovoid buds (young buds ca. 10 mm wide); and fertile stamens 3–3.5 mm long.

This species is morphologically similar to *X. annoniflora, X. cuspidata* and *X. longicuspis*. Fries (1934) commented that *X. cuspidata, X. longicuspis, X. poeppigii* (now a synonym of *X. cuspidata*), and *X. platypetala* all occur in the upper Amazon Basin and form a natural group of species. We agree with him, and add *X. annoniflora* to this group. As mentioned before (see notes under *X. cuspidata*), the lack or scarcity of fertile material in the type collections of *X. cuspidata, X. longicuspis* and *X. platypetala*, is an obstacle to delimitation, circumscription and identification of these species.

Particularly in *X. platypetala*, is only known by the type material, and it is restricted to two specimens, the holotype at US and the isotype (fragment) at S. Besides that the holotype has just a bud in the voucher and only fragments of flowers in the packet. So, our description of the flower was complemented with data from Fries (1934). The fruits and seeds of *X. platypetala* were unknown at the time of the original description and remains so. The description of the flower here was complemented with data from the original description (Fries 1934).

Xylopia platypetala can be distinguished from *X. annoniflora* by its apices of the twigs without cataphylls (*vs*. cataphylls present); sparsely sericeous on abaxial surfaces of the leaf blades (*vs*. sparsely to rarely velutinous), with acumen or cusp 20–27 mm long (*vs*. 5–15 mm), broad cuneate base, sometimes with oblique angles at both sides (*vs*. rounded and asymmetric); and flower peduncles 5 mm long (Fries 1934) (*vs*. 1–2 mm, Pombo et al. 2017)

Xylopia platypetala differs from *X. cuspidata* by its calyx lobes 7–10 mm long (*vs*. ca. 3 mm), outer petals 20–23 mm long, 10–15 mm wide at midpoint (*vs*. ca. 15 mm long, 6–8 mm wide), and inner petals ca. 18 mm long (*vs*. 8–12 mm).

To differentiate *Xylopia platypetala* from *X. longicuspis*, the following characters must be checked: petioles 2–2.5 mm long (*vs*. 3–5 mm); medium to large leaf blades 14–17.3(–20) × 4.9–5.2(–6) cm (*vs*. 20.4–24.7 × 5.8–6.8 cm), sparsely sericeous (*vs*. sparsely tomentose); peduncles ca. 5 mm long (*vs*. ca. 10 mm), and outer petals 20–23 mm long (*vs*. 28–30 mm).

Selected Specimens Examined**—** **Bolivia**. — SANTA CRUZ: Velasco Province, Parque Nacional Noel Fempff M. Campamento La Torre, 13°39′30″S, 60°49′12″W, 2 Oct 2003, *R. Quevedo et al. 2377* (MO). — **Brazil**. — AMAZONAS: Barcelos, Rio Negro, near Ilha da Silva, 16 Jan 1978, *W. C. Steward et al. 377* (INPA, MO, NY, US).

3.3.5.1.27 XYLOPIA PLOWMANII P.E.Berry & D.M.Johnson, Novon 3(2): 99. f. 1. 1993. TYPE: VENEZUELA. Amazonas: Dept. Átures, Tobogán de la Selva, along Río Coromoto, 35 km S de Puerto Ayacucho, approximately 5°22′N, 67°33′W, 6 Apr 1984, *T. C. Plowman and F. Guánchez M. 13523* (holotype: MO-216999!, isotypes: F 1932755!, K-000221104 (digital image!), NY!, U-0000419 (digital image!), VEN-345565 (digital image!)).

Trees 12–20 m tall, d.b.h. 13–15 cm. Twigs, petioles, abaxial surfaces of leaves, inflorescences, flowers, and fruits with golden, pale rusty, rusty, brown, or hyaline hairs. **Twigs** pubescent to puberulent, becoming glabrate or glabrous when older. **Petioles** 3–4 mm long, slightly canaliculate, dark brown to black, glabrous abaxially, pubescent adaxially; **leaf blades** 5.3–7.5 × 2.2–2.9 cm, elliptic, oblong or oblong elliptic, chartaceous or subcoriaceous, smooth, pale brown and glabrous abaxially, except for some hairs on the midrib, reddish brown, slightly lustrous, and glabrous adaxially, margins flat, apex conspicuously emarginate, base acute, with oblique angles strongly marked at both sides, sometimes asymmetric; midrib raised abaxially, impressed adaxially, secondary veins 7–11 per side, raised on both surfaces. **Inflorescences** axillary, 2(–3)-flowered; **peduncles** 1–2.2 mm long; **pedicels** 2.8–4 mm long; **buds** narrowly triangular to narrowly oblong, slightly constricted above the calyx; **bract** 1, at the midpoint of pedicel, 0.9–1 × 1.1–1.3 mm, triangular ovate to semicircular, clasping. **Calyx** short cup-shaped (more conspicuous in buds), smooth, calyx tube 1.5–2 mm long, **sepals** connate in about ⅓ to ½ of their length, calyx lobes 1.5–2 mm long, triangular ovate, glabrous, apex acute; **petals** cream yellowish, or yellowish at the base, orange elsewhere abaxially, pale yellow adaxially; **outer petals** 14.5–18 mm long, ca. 3 wide at base, ca. 2 mm wide at midpoint, narrowly oblong, base enlarged and concave, densely pubescent abaxially, puberulent adaxially, apex acute to slightly rounded; **inner petals** 14–15 mm long, 2 mm wide at base, 1–1.2 mm wide at midpoint, linear, except for the base enlarged and concave, nearly lanceolate, puberulent at midrib abaxially, puberulent and with the base papillate adaxially, apex acute; **stamens** numerous, **fertile stamens** 1–1.4 × 0.2–0.4 mm, nearly club-shaped, glabrous, apex of the connective 0.1–0.2 mm long, discoid, dome-shaped, short conical or truncate, papillate, filament 0.3–0.4 mm long; **outer staminodes** 0.9–1.2 × 0.4-0.5 mm, nearly club-shaped, glabrous; **inner staminodes** 0.8–1.1 × 0.3 mm, glabrous; **staminal cone** 1.5–2.1 mm in diameter, 0.6–0.8 mm high, pyramidal or broad conical, sometimes not concealing completely the ovaries, the apex of ovary outward; **carpels** 6–10, 4.3–4.8(–5.8) mm long, ovary 0.8–1 mm long, densely sericeous, **ovules** 4, stigmas 3.5–3.9(–4.8) mm long, filiform, slightly enlarged above base, slightly verruculose, few hairs along edges and at apex. **Fruits** of 4–6 monocarps borne on a **pedicel** ca. 10 mm long, glabrate. **Monocarps** 19–28 × 10–18 mm, irregularly ovoid, green and red, densely covered with matted indument, becoming glabrate when older, apex rounded; **stipes** 4–7 mm long. **Seeds** often 3, 6.5–7.5 × 4–5 mm, ellipsoid, smooth.

Additional Illustration— Berry and Johnson (1993: 100, Fig. 1).

Distribution and habitat— *Xylopia plowmanii* occurs in Colombia and Venezuela, in riverine forests, and in savanna swamps dominated by *Mauritia* palms (*morichal*).

Notes— *Xylopia plowmanii* has as remarkable characteristics its young twigs pubescent to puberulent; small to medium sized leaf blades 5.3–7.5 × 2.2–2.9 cm, glabrous abaxially, except for some golden to hyaline hairs on the midrib, apex conspicuously emarginate, acute, with oblique angles strongly marked at both sides, sometimes asymmetric base; axillary, 2(–3)-flowered inflorescences; buds narrowly triangular to narrowly oblong, slightly constricted above the calyx; calyx short cup-shaped, glabrous; fertile stamens 1–1.4 mm long; 6–10 carpels, 4.3–4.8(–5.8) mm long, stigmas 3.5–3.9(–4.8) mm long, with few hairs along edges and at the apex; 4–6 monocarps per fruits, pedicel ca. 10 mm long, monocarps 19–28 × 10–18 mm, irregularly ovoid; and stipes 4–7 mm long.

Xylopia plowmanii, according to Berry and Johnson (1993), is close to *X. emarginata*, *X. spruceana,* and *X. venezuelana* (currently a synonym of *X. emarginata*), species also with an emarginate or retuse apex. *Xylopia parviflora* seems to be also morphologically related to this group (see notes under *X. parviflora*).

Xylopia plowmanii differs from *X. emarginata* by its young twigs pubescent to puberulent (*vs.* densely sericeous to tomentellous); leaf blades 2.2–2.9 cm wide (*vs.* (0.6–)0.8–1.4(–1.9) cm), without a tuft of hairs at the apex (*vs.* with a tuft of hairs exceeding the apex), base with oblique angles strongly marked at both sides of the base, sometimes asymmetric (*vs.* oblique angles slightly marked); short cup-shaped calyx, more conspicuous in buds, sepals connate from ⅓ to ½ of their length (*vs.* sepals connate at the base up to ⅓), glabrous calyx lobes (*vs.* sepals sparsely short sericeous at apex abaxially); and carpels 4.3–4.8(–5.8) mm long (*vs.* 3.3.–4.2 mm).

Xylopia plowmanii can be distinguished from *X. spruceana* by the following characters: young twigs pubescent to puberulent (*vs.* densely sericeous to tomentose); leaf blades 2.2–2.9 cm wide (*vs.* (1–)1.5–2 cm), margins flat (*vs.* strongly revolute), apex conspicuously emarginate (*vs.* emarginate to retuse); short cup-shaped calyx, sepals connate in about ⅓ to ½ of their length (*vs.* sepals ¼–⅙ of their length connate at the base), glabrous calyx lobes (*vs.* sepals tomentose to sericeous abaxially); and irregularly ovoid monocarps (*vs.* oblong, clavate, sometimes slightly falcate, or ellipsoid).

To distinguish *Xylopia plowmanii* from *X. parviflora*, the following characters must be checked: young twigs pubescent to puberulent (*vs.* densely tomentose to sericeous); petioles 3–4 mm long (*vs.* 1–1.5 mm); leaf blades 5.3–7.5 × 2.2–2.9 cm (*vs.* (1.5–)2–4.6 × 0.4–0.9 cm), chartaceous or subcoriaceous (*vs.* membranous), apex conspicuously emarginate (*vs.* apex attenuate to acuminate mostly with a retuse tip); cup-shaped calyx short, sepals connate in about ⅓ to ½ of their length (*vs.* sepals slightly connate at the base); outer petals ca. 5 mm long (*vs.* 14.5–18 mm); and fertile stamens ca. 0.5 mm long (*vs.* 1–1.4 mm).

There are few collections of *X. plowmanii* at the herbaria, and it was not possible to open buds, flowers and monocarps to describe them in more detail. We only described flowers already open on the type collection, available in the packet. Therefore, details of sepals, outer and inner petals, monocarps and seeds, were also obtained from the original description (Berry and Johnson 1993).

Selected Specimens Examined— **Colombia.** — AMAZONAS: Río Caquetá margen Izquierda (norte), frente a la Isla de Mariname, Jun 1989, *L. E. Urrego S. et al. 646* (U); — **Venezuela.** — AMAZONAS: Depto. Atures, Serrania Batata, 2 km al NE de Salto Colorado, Caño Colorado sobre corazas lateriticas, 55 km SE Puerto Ayacucho, 05°33'N, 67°08'W, Oct 1989, *E. Sanoja et al. 3327* (MO, NY, US). APURE: Distrito Pedro Camejo, Caño (or Morichal) El Caballo, 16 airline km NW of Mata de Guanábana between the Río Meta and the Río Cinaruco, 6°19′N, 68°19′W, 75 m elev., 27 Feb 1979, *G. Davidse & A. C. González 15875* (MO). — BOLÍVAR: Municipio Ascensíon Farreras, Maripa-Aripao, 7°29′N, 65°20′W, 80 m elev., Jul 1990, *S. Elcoro et al. 841* (NY); Municipio Sucre, 7°30′N, 65°16′W, 50 m elev., Jul 1990, *L. Delgado 1259* (NY).

3.3.5.1.28 XYLOPIA POLYANTHA R.E.Fr., Acta Horti Berg. 12(1): 208. 1934. TYPE: BRAZIL. State of Pará: upper Cupary River, plateau between the Xingu and Tapajos Rivers, Sept 1931 (blühend), *B. A. Krukoff 1204* (holotype: S-R-6864 (digital image!), isotypes: B-10 0242283 (digital image!), G-00226124 (digital image!), K-000221089 (digital image!), MICH-1115461 (digital image!), MO-1916478!, NY-00066770!, P-00734917 (digital image!), U-0000442 (digital image!), UC-497935 (digital image!)).

Xylopia polyantha R.E.Fr. var. *nicaraguensis* R.E.Fr., Acta Horti Berg. 12(1): 209. 1934. TYPE: NICARAGUA. Nordost [Northeastern] Nicaragua, 4 Aug 1928 (blühend), *F. C. Englesing 198* (holotype: WIS MAD-0000304 [Holotype first in Y as cited in protologue, but in 1969 it was transferred to MAD, and in 2002 transferred to WIS, as cited in Thiers 2019], isotypes: F 585248!, NY-00060000!, S-R-6866 (digital image!)); syn. nov.

Xylopia polyantha R.E.Fr. var. *longesericea* R.E.Fr., Acta Horti Berg. 12(2): 276. 1937. TYPE: BRAZIL. Territory of Acre, near mouth of Rio Macauhan (tributary of Rio Yacu), 9°20′S, 69°0′W, 27 Aug 1933, *B. A. Krukoff 5704* (holotype: S-R-6865 (digital image!), isotypes: A-00039727 (digital image!), BM-000554092 (digital image!), F 810157! [photo in F!], G-00226051 (digital image!), K-000221088 (digital image!), LE-00001861 (digital image!), LP-002770 (digital image!), M-0240141 (digital image!), MICH-1115462 (digital image!), MO-247086!, NY-00066771!, RB-00534172!, UC-606628 (digital image!), US-00074234!); syn. nov.

Xylopia densiflora R.E.Fr., Field Mus. Nat. Hist. Bot. Ser. 13(2): 744. 1938. TYPE: PERU. Loreto, Maucallacta, Río Paranapura, Jan 1935, *G. Klug 3923* (holotype: F 853087!; isotypes: BM-000554086 (digital image!), CAS-0005000 (digital image!), F 1914862! [Purchased from the Catholic University of America, July 1985], GH-00039719 (digital image!), MO-216996!, NY-00066760!, S-R-6853 (digital image!), S-13-2998 (digital image!), UC-710094 (digital image!), US-00098775!); syn. nov.

Trees 8–43 m tall, d.b.h. 7.5–35 cm; **bole** often with buttresses up to 1m high. Twigs, petioles, abaxial surfaces of leaves, inflorescences, flowers and fruits, with golden, rusty, pale rusty, hyaline, or brown hairs. **Twigs** dark brown with beige or cream lenticels, grayish brown when older, densely tomentose, becoming glabrate to glabrous when older. **Petioles** 2.5–5(–6) × 1–1.3 mm, canaliculate, brown to dark brown, tomentose at the groove margins and glabrate at other parts; **leaf blades** (4.3–)4.8–11.3 × (1.3–)1.8–3.3 cm, elliptic, lanceolate elliptic, to narrowly elliptic, subchartaceous to chartaceous, pale brown or brown and sericeous abaxially, pale brown or grayish brown and glabrous adaxially, apex acuminate, acumen (4–)6–18 mm long, base acute or cuneate, with oblique angles at both sides; midrib raised abaxially, mostly strongly impressed (canaliculate) adaxially, secondary veins (7–)10–12(–15) per side, raised abaxially, flat or slightly raised adaxially. **Inflorescences** axillary, (2–)3–8(–10)-flowered; **peduncles** 1–2 mm long, sparsely tomentose; **pedicels** (1–)1.8–2.5 mm long, sparsely tomentose; **buds** narrowly triangular to narrowly oblong, slightly panduriform; **bracts** 2, one close to the midpoint of the pedicel and the other one close to the base, sometimes splitted at midpoint in mature flowers, the basal caducous, 1–1.5 × 1.2–1.6(–2) mm, ovate to triangular ovate, clasping, tomentose or sericeous abaxially, mostly from midpoint to apex, glabrous or with sparce appressed hairs at the base adaxially, apex acute. **Sepals** slightly connate at the base, ⅓–⅕ of their length, 1.5–2.5 × 1.5–2.2 mm, triangular to triangular ovate, smooth, short sericeous to pubescent abaxially, denser at apex, glabrous adaxially, apex acute; **petals** white to pale cream *in vivo*; **outer petals** (8.5–)12–19 mm long, 2.5–3.8 wide at base, 1.4–2 mm wide at constriction, 1.5–2.6 mm wide at midpoint, narrowly oblong, slightly panduriform, nearly lanceolate, base enlarged and concave, slightly fleshy, densely short sericeous from the base up to midpoint and tomentellous at other parts abaxially, golden or hyaline tomentellous from base up to midpoint adaxially, the concave region papillate, apex acute to slightly rounded; **inner petals** (8–)12–18 mm long, ca. 1.3 mm wide at base, 0.5–0.6 mm wide at constriction, 0.6–1 mm wide at midpoint, linear, narrowly nearly lanceolate, triangular in cross section at the midpoint, slightly fleshy, short sericeous abaxially, tomentellous from the base up to midpoint, glabrous or papillate adaxially, tomentellous at the base, apex acute; **stamens** 100–185, **fertile stamens** 70–155, 0.6–1 × 0.15–0.25 mm, nearly club-shaped, glabrous, apex of the connective 0.1–0.15 mm long, capitate, discoid, or pentagonal, papillate, anthers 7–12-locellate, filament 0.1–0.2 mm long; **outer staminodes** 10–16, 0.7–0.9 × 0.1–0.2 mm, hard to distinguish from the fertile stamens, flattened, glabrous, similar in shape to the fertile stamen, anthers 5–7-locellate; **inner staminodes** 12–30, 0.4–0.7 × 0.25–0.45 mm, obtriangular to obovate or nearly square-shaped, glabrous, apex of the connective slightly differentiated, anthers 5–7-locellate or without locellate anthers, without filaments; **staminal cone** 1–1.2(–1.5) mm in diameter, 0.7–0.8(–1) mm high, flattened globose; **carpels** (6–)8–11, (1.9–)2.7–3.6 mm long, ovary (0.4–)0.6–0.9 mm long, falcate, densely sericeous, **ovules** (1–)2–5, stigmas (1.5–)2–2.7 mm long, filiform, geniculate above base, finely rugulose, glabrous or with rare hairs at the apex tip. **Fruits** of (2–)4–9 monocarps borne on a **pedicel** ca. 6.5 mm long, rarely tomentellous to glabrate; **torus** ca. 4 mm in diameter, ca. 2 mm high, flattened globose. **Monocarps** (6–)9–15 × (5–)7–9 mm, broad oblong or obovoid, or reniform and slightly falcate, clavate, or sometimes just obovoid (1–2-seeded), and clavate, slightly constricted between the seeds, glabrate, rarely pubescent, apex obtuse, red *in sched.*; **stipes** 2–3.5 mm long, rarely pubescent, slightly wrinkled. **Seeds** 1–4, ca. 6.5 × 4.8 mm, flattened ellipsoid to flattened obovoid, black, aril whitish translucent *in sched.*, lobes 1.2–1.5 × 1.8 mm, slightly square-shaped. Figure 4B.

Distribution and habitat**—** *Xylopia polyantha* is distributed in Bolivia, Brazil, Colombia, Ecuador, Nicaragua, Peru, and Venezuela. In Brazil, it occurs in the states of Acre, Amazonas, Mato Grosso, Pará, Rondônia, and Roraima. It grows in lowland (*terra firme*) and gallery forests, disturbed or not.

Vernacular Names**—** "*Envira-preta*" (Brazil, Roraima, *J. G. S. Alarcón & E. F. Barbosa 12*, INPA), "*Escobillo*" (Colombia, *J. de Brujin 1563*, MO), "*Espintana*" (Peru, *M. Rimachi Y. 4309*, MO), "*Facheiro*" (Brazil, Pará), "*Mangalargo*" (Nicaragua, *F. C. Englesing 198*, F).

Phenology**—** Specimens with flowers have been collected from January to March, and from July to October, and specimens with fruits have been collected in April and May.

Notes— *Xylopia polyantha* is characterized by its elliptic to narrowly elliptic leaf blades, (4.3–)4.8–11.3 × (1.3–)1.8–3.3 cm, subchartaceous to chartaceous, sericeous on the abaxial surface, and with (7–)10–12(–15) secondary veins per side; narrowly triangular to narrowly oblong buds; sepals slightly connate at the base; outer petals (8.5–)12–19 mm long, 1.5–2.6 mm wide at midpoint; 100–185 stamens, fertile stamen 0.6–1 mm long; (6–)8–11 carpels, (1.9–)2.7–3.6 mm long, filiform stigmas, geniculate above the base, finely rugulose, glabrous or with rare hairs at the apex tip; monocarps (6–)9–15 × (5–)7–9 mm; and stipes 2–3.5 mm long.

Xylopia polyantha is morphologically close to *X. frutescens*, *X. pittieri* and *X. sericea* A.St.-Hil. It can be distinguished from *X. frutescens* by its sepals 1.5–2.5 mm long (*vs*. ca. 3 mm); monocarps stipitate, slightly constricted between the seeds (*vs*. almost sessile, not constricted between the seeds,); stipes 2–3.2 mm long (*vs*. ca. 1 mm); and seeds flattened ellipsoid to flattened obovoid (*vs*. ovoid or ellipsoid).

Xylopia polyantha differs from *X. pittieri* by its 100–185 stamens (*vs*. (38–)50–60), anthers of the fertile stamens 7–12-locellate (*vs*. 2–4(–5)-locellate); stigmas glabrous or with rare hairs at the apex tip (*vs*. villous to tomentellous from the apex to the midpoint, glabrous from there to the base); broad oblong or obovoid, or reniform and slightly falcate, or clavate monocarps, slightly constricted between the seeds, apex not apiculate (*vs*. ellipsoid or slightly compressed falcate, clavate, apex apiculate).

Xylopia polyantha is distinguished from *X. sericea* by its leaf blades sericeous on the abaxial surface (*vs*. densely sericeous); sepals 1.5–2.5 mm long (*vs*. 3–3.5 mm); carpels (1.9–)2.7–3.6 mm long (*vs*. 4–5 mm); and monocarps slightly constricted between the seeds (*vs*. not constricted between the seeds).

Xylopia polyantha var. *nicaraguensis*, *X. polyantha* var. *longesericea* and *X. densiflora* were treated as synonyms of *X. polyantha*, because the type specimens of these fit almost totally within the protologue of *X. polyantha*.

When Fries (1934) described *Xylopia polyantha* var. *nicaraguensis* he mentioned two specimens (one from Pará, Brazil, and another, his new variety, from Nicaragua) from regions far apart. He considered the specimen from Nicaragua a variety because of minor differences between that and thematerial, as the long cuspidate apex (long acuminate, for us); less flowers on the inflorescenses (ca. 2–3); smaller flowers (outer petals 12–13 mm long); stamen 0.7–0.8 mm long; 9 carpels; monocarps ca. 8 × 6 mm, obovoid, apex obtuse, glabrous; and stipes ca. 2 mm long. But, despite Fries (1934) having mentioned he saw the monocarps, we did not see any monocarp in the type collection (either in the digital image and the voucher at NY). However, for us, all the characters mentioned by him fit in the protologue of *Xylopia polyantha* var. *polyantha*, so we considered *Xylopia polyantha* var. *nicaraguensis* as a synonym of *Xylopia polyantha.*

Another variety, *Xylopia polyantha* var. *longesericea* was described by Fries in 1937. In this case, although describing it as a new variety, he commented the new variety could represent a particular species particularly close to *Xylopia polyantha.* He distinguished this variety by its shorter and narrower leaf blades, 6–7 × 1.4–2.2 cm, with an acumen ca. 10 mm long; the long appressed hairs, 1.5–2.5 mm long; and ca. 9 carpels. These characteristics also fit the protologue of *X. polyantha* and, therefore, we list *Xylopia polyantha* var. *longesericea* as a synonym of *X. polyantha.*

In the original description of *Xylopia densiflora* Fries (1938) in "*Flora of Peru*" (Macbride 1938) did not comment on the affinity of this species and others within the genus. But he presented a identification key and included the new species close to *X. micans* (here considered as a synonym of *X. pittieri*) and *X. ligustrifolia.* Analyzing Fries' (1938) description of *Xylopia densiflora* the characteristics of young twigs, leaves and inflorescences fit within the protologue of *X. polyantha.* Three small differences between them, in the length of the outer petals and stamens, and the number of carpels, were considered as variations, with intermediate measures, within our morphological concept of *X. polyantha sensu lato* presented here. Hence, we included *Xylopia densiflora* as a synonym of *X. polyantha.*

Fries (1938) mentioned the type of *Xylopia densiflora* was at F. There are two vouchers at F, but only the specimen F 853087 has an identification label with Fries' handwriting stating it as a new species and dated from 1937. The other specimen, F 1914862, has an label mentioning: "*Purchased from the Catholic University of America with funds provided by Mr. Jack C. Staehle July 1985*". Therefore, we recognized F 853087 as the holotype, and F 1914862 as an isotype, purchased by F many years later.

Selected Specimens Examined— **Bolivia.** — LA PAZ: Fraz Tamayo, Parque Nacional Madidi, laguna Chalalan, 293 m, 23 Sep 2006, *A. Araújo M. et al. 3050* (MO). — PANDO: W. Bank of rio Madeira, 3 km of Ribeirão, 27 Jul 1968, *G. T. Prance et al. 6535* (IAN). — SANTA CRUZ: Prov. Guarayos, Reserva de Vida Silvestre Rios Blanco y Negro, Campamento a 8 km NE del Río Blanco em la zona de los Tutumos, 15°3.68′S, 63°19.24′W, 300 m elev., 28 Sep – 5 Oct 1993, *I. G. Vargas C. et al. 2832* (NY); Velasco, Huanchaca 2, Parcela Permanente de estúdio, 14°31′11″S, 60°44′14″W, 700 m elev., 29 May 2001, *A. L.*

Arbeláez 814 (MO). — **Brasil.** — ACRE: Upper rio Moa, near Fazenda Arizona, 7°29′S, 73°39′W, 10–16 Oct 1985, *D. G. Campbell et al. 6625* (INPA). — AMAZONAS: BR-319, km 175, Manaus - Porto Velho road, 11 Oct 1974, between rio Tupana and rio Igapó-açu, *G. T. Prance et al. 22802* (IAN, INPA, MO); Fonte Boa, rio Solimões, rio Jutai, povoado Laranjal, 23 Oct 1968, *M. Silva 2157* (IAN); Manaus, Reserva Ducke, Trilha da Torre, 2°56′0.203″S, 59°57′0.708″W, 134 m elev., 18 Sep 2015, *A. F. Pontes-Pires et al. 921* (JPB); Nova Olinda do Norte, Rio Paca, tributary of the Rio Mari Mari, 2 Jul 1983, *C. A. Todzia et al. 2297* (IAN, INPA, MO); Presidente Figueiredo, Estrada do Pau Rosa, cerca de 5 km da margem da estrada, 1 Oct 1998, *J. A. Silva et al.* 784 (INPA); São Paulo de Olivença, near Palmares, Basin of Rio Solimões, 11 Sep - 26 Oct 1936, *B. A. Krukoff 8352* (MO). — MATO GROSSO: Alta Floresta, 17.5 km of Alto Paraíso, 22.5 km W of rio Apiacás on road to Alta Floresta (MT-208), 9°57′S, 57°6′W, 30 Sep 1985, *W. W. Thomas et al. 4116* (IAN, MO); Chapada dos Guimarães, Gorge of Véu de Noiva, 17 Oct 1973, *G. T. Prance et al. 19104* (IAN, INPA); Rio Juruena, estrada para Aripuanã, 5 Jul 1977, *M. G. da Silva & J. Maria 3278* (IAN, INPA); Luciara, distrito de Porto Alegre, ca. 10–11 km da BR-158, 11°10′S, 51°40′W, 16 Oct 1985, *J. R. Pirani et al. 1259* (MO, NY). — PARÁ: Rio Trombetas, Jazida de Bauxita de Alcoa Mineração, Monte Branco, Acampamento 22, 8 Oct 1982, *J. Revilla 7049* (INPA). — RONDÔNIA: Basin of Rio Madeira, km 12, road Guajá-Mirim to Abunã, 5 Aug 1968, *G. T. Prance et al. 6808* (MO); Guajará-Mirim, estrada do Bom Sucesso km 50, Ramal Natanael, Sítio do Sr. Jorge Bisudo, 10°42′56″S, 65°00′27″W, 17 Sep 1996, *L. C. B. Lobato et al. 1428* (IAN). — RORAIMA: Caracaraí, Caicubi, Parcela nº 13, 1°1′43″S, 62°5′21″W, 24 Nov 2003, *J. G. S. Alarcón & E. F. Barbosa 12* (INPA). — **Colombia.** — ANTIOQUIA: Municipio Puerto Berrio, Vereda Alicante, Finca Penjamo, Quebrada Penjamo, em la vía San Juan de Bedout-La Cabaña, 6°39′N, 74°31′W, 350–410 m elev., 5 Mar 1990, *R. Callejas et al. 9375* (NY); Mcipio. de San Luis, Vereda de las Confusas, Finca las Confusas, 6°3′N, 74°48′W, 350-500 m elev., 10 Apr 1990, *D. Cárdenas et al. 2685* (MO). — BOLIVAR: 150 km N of Barrancabermeja, 8°15′N, 74°4′W, 25 Aug 1966, *J. de Brujin 1122* (MO); Border between Departamentos Antioquia and Bolivar, secondary forest near the confluence of the rivers Ité and Tamar into Cimitarra ± 38 km W of Barrancabermeja, 6°55′N, 74°15′W, ± 100 m elev., 3 Mar 1967, *J. de Brujin 1563* (MO). — GUAVIARE: Municipio San José del Guaviare, Río Guaybero, Raudal Payara, finca El Carmen, bosque de terraza intervenido, 300 m elev., 2°16′N, 73°44′W, 29 Jan 1990, *O. Marulanda & S. Márquez 1826* (NY). — **Peru.** — LORETO: Requena, Dtto. Saquena, Río Ucayali, Quebrada de Aucayacu slightly above San Pedro above Genaro Herrera, 1 Mar 1979, *M. Rimachi Y. 4309* (MO). — UCAYALI: Coronel Portillo Puerto Alegre, Río Tamaya, 6 Apr 1988, *R. Vásquez 10525* (NY). — **Venezuela.** — AMAZONAS: Dpto. Río Negro, Río Casiquiare, Sector "El Pijiguao", 3 km al S del El Porvenir, 2°2′N, 66°28′W, 132 m elev., 2 Feb 1992, *G. Aymard et al. 9885* (MO).

Additional Specimens Examined**— Ecuador.** — NAPO: La Joya de los Sachas, Comunidad Indillamam, Río Indillama, Carretera Maxus km 5–6, 0°25′S, 76°36′W, 250 m elev., 14–28 Jan 1993, *A. Grijalva et al. 408* (MO). — ORELLANA: Parque Nacional Yasuni – ECY, Sendero "Tinamu", 0°40′40″S, 76°23′40″W, 200–300 m elev., 19 Nov 2009, *A. J. Pérez & W. Santillán 4438* (MO).

3.3.5.1.29 XYLOPIA RIGIDIFLORA Bagstad & D.M.Johnson, Contr. Univ. Michigan Herb. 22: 24. 1999. TYPE: BRAZIL. Amazonas: Município Barcelos, Rio Jauari, 0°42′N, 63°22′W, abaixo do entroncamento com igarapé Pretinho, 2 Jul 1985 (fl), *J. A. Silva et al. 221* (holotype: INPA 133302!, isotypes: MIRR 2814!, NY!, U-0008112 (digital image!)).

Shrubs 2–4 m tall. Twigs, petioles, abaxial surfaces of leaves, inflorescences, flowers and fruits, with golden, pale rusty, or hyaline hairs. **Twigs** densely tomentose, becoming glabrate when older. **Petioles** 1–2 mm long, tomentose; **leaf blades** (4–)5.3–9.1 × 2.3–3.8 cm, elliptic or ovate elliptic, subcoriaceous to coriaceous, pale brown on both surfaces, sericeous or puberulent abaxially, denser on the midrib, lustrous and glabrous adaxially, apex cuspidate, cusp 5–12 mm long, base cuneate; midrib raised abaxially, impressed or flat adaxially, secondary veins 10–13 per side, raised on both surfaces. **Inflorescences** axillary, 1-flowered; **pedicels** ca. 1.5 mm long, tomentose; **buds** extremely narrowly triangular or linear, slightly enlarged at the base; **bracts** 2–3, 3–5 × 5 mm, ovate, clasping, tomentose abaxially. **Calyx** cup-shaped, smooth, calyx tube 1.7–2.4 mm long, **sepals** connate in more than ⅓ to close to ½ of their length, calyx lobes 2.6–4.1 × 2.7–3.6 mm, triangular ovate, sericeous abaxially, glabrous adaxially, apex acute; **petals** yellow *in sched.*; **outer petals** 15–29 mm long, 3.2–4.6 wide at base, 2.5–4 mm wide at midpoint, narrowly triangular to linear lanceolate, base slightly enlarged and concave, fleshy, densely sericeous abaxially, puberulent adaxially, spreading slightly at anthesis, apex acute; **inner petals** 18–24 mm long, 1.5–1.8 mm wide at midpoint, linear, rhombic in cross section at the midpoint, fleshy, puberulent with the base sericeous abaxially, puberulent adaxially, apex acute; **stamens** 1–1.2 mm long, narrowly oblong, glabrous, anthers septate at anthesis, apex of the connective 0.15–0.3 mm long, truncate or slightly hemispheric, papillate, filament 0.2–0.3 mm long; innermost stamens staminodial, appressed to the stigmas base, flattened, oblong or square-shape; **outer** and **inner staminodes** not observed; **staminal cone** 1.9 mm in diameter, 0.9 mm high, conical, deeply concave, tomentose at the margin; **carpels** 9, not concealing completely the ovaries, stigmas and the upper half of ovaries outward, ovary ca. 2 mm long, lanceolate, sericeous, **ovules** 3, stigmas filiform, pubescent. **Fruits** and **seeds** unknown.

Illustration— Bagstad and Johnson (1999: 23, Fig. 1, C–E).

Distribution and habitat—This species is endemic to Brazil, occurring in the states of Amazonas and Roraima. It grows in open savanna vegetation on sandy soil (*campina*) (Bagstad and Johnson 1999).

Notes— *Xylopia rigidiflora* has as remarkable characteristics its shrub habit (2–4 m tall); the young twigs densely tomentose; elliptic or ovate elliptic leaf blades, sericeous or puberulent on the abaxial surface, with a cuspidate apex, the cusp 5–12 mm long; 1-flowered inflorescences; extremely narrow triangular or linear buds; cup-shaped calyx, calyx tube 1.7–2.4 mm long, sepals connate in more than ⅓ to close to ½ of their length, calyx lobes 2.6–4.1 × 2.7–3.6 mm, sericeous abaxially; yellow petals; the narrow triangular to linear lanceolate outer petals, base slightly enlarged and concave; linear inner petals, rhombic in cross section at the midpoint; stamens 1–1.2 mm; 9 carpels, and pubescent stigmas.

Xylopia rigidiflora is close to *X. barbata* and *X. orinocensis*. It can be distinguished from *X. barbata* by its leaf blades 2.3–4.6 cm wide (*vs.* 0.9–2.1 cm wide), subcoriaceous to coriaceous (*vs.* chartaceous), with the abaxial surface sericeous or puberulent (*vs.* densely velutinous to sericeous), and a cuspidate apex (*vs.* acute, short acuminate, obtuse or retuse); outer petals 2.5–4 mm wide at the midpoint (*vs.* 1–2.2 mm), inner petals ca. 1 mm wide at the midpoint (*vs.* 1.5–1.8 mm); 9 carpels (*vs.* 4–5), and ovary ca. 2 mm long (*vs.* 1–1.2 mm).

Xylopia rigidiflora can be differentiated from *X. orinocensis* by its leaf blades sericeous or puberulenton the abaxial surface (*vs.* sparsely pubescent, tomentose or velutinous), a cuspidate apex (*vs.* acuminate); yellow petals (*vs.* orange), outer petals 2.5–4 mm wide at the midpoint (*vs.* 1.3–1.5 mm), inner petals 1.5–1.8 mm wide at the midpoint (*vs.* 0.5–0.6 mm); 9 carpels (*vs.* 4–5), and ovary ca. 2 mm long (*vs.* ca. 0.7 mm).

The specimens of this species in the herbaria are restricted to the type collection and paratype listed here, and no flower was available to be opened and described. During this revision, we went in a field trip to Roraima, but unfortunately it was not possible to find the species in the field. So, we described the flowers from the remaining parts available in a packet and we complemented the description with data from the original description (Bagstad & Johnson 1999). The fruits and seeds remain unknown.

***Specimen Examined*— Brazil.** — RORAIMA: Município São Luiz do Anauá, entre kms 350 e 355 da Estrada Manaus-Caracaraí (BR-174), próximo ao Equador, 0°0′N, 60°45′W, 21 Aug 1987, *C. A. Cid Ferreira et al. 9064* (MIRR, OWU, U).

3.3.5.1.30 XYLOPIA SERICEA A.St.-Hil., Fl. Bras. merid. 1(2): 41. 1825. TYPE: [BRAZIL]. Crescit in silvis primaevis provinciae Rio de Janeiro (floret octobre, novembre), *A.F.C.P. de Saint-Hilaire s.n.* [668] (lectotype, designated here: P-00635586 (digital image!), isolectotypes: B [probably destroyed] [photo in: MO!], MPU-026922 (digital image!), P-00735134 (digital image!), P-00735135 (digital image!), P-00735136 (digital image!)).

Xylopia intermedia R.E.Fr., Kongl. Svenska Vetenskapsakad. Handl. n. s. 34(5): 32. 1900. TYPE: BRAZIL. Rio de Janeiro: Restinga de Cabo Frio, 10 Feb 1882, *A. F. M. Glaziou 10225* (lectotype, designated by Fries 1930: B-10 0249562 [photo in: F!] (digital image!), isolectotypes: C-10005716 (digital image!), K-000221073 (digital image!), P-00734904 (digital image!)).

Trees 5–20 m tall, d.b.h. 10–22.5 cm; **bole** rarely with buttresses. Twigs, petioles, abaxial surfaces of leaves, inflorescences, flowers and fruits, with golden, hyaline, rusty, or whitish hyaline hairs. **Twigs** densely sericeous to tomentose, becoming sparsely to glabrate when older. **Petioles** 2.5–6 mm long, canaliculate, brown to dark brown, densely tomentose, becoming glabrate when older; **leaf blades** 4.7–13 × (0.8–)1–3 cm, narrowly elliptic, elliptic or narrowly lanceolate, subchartaceous to chartaceous, with translucent glands, more conspicuous at younger leaves, pale brown to golden pale brown, and densely sericeous abaxially, becoming less dense when older, greenish to pale brown and glabrous adaxially, apex acuminate, acumen 5–10 mm long, base acute, with oblique angles close to the petiole; midrib raised abaxially, impressed adaxially, secondary veins 7–10(–14) per side. **Inflorescences** axillary, 2–8(–13)-flowered, fasciculate, not congested; **peduncles** 1.5–2 mm long, tomentose; **pedicels** 1–1.5 mm long, tomentose; **buds** narrowly triangular, slightly panduriform; **bracts** 2, one at the base of pedicel and the other at midpoint, 2–2.5 × 2–2.5 mm, ovate to triangular ovate, clasping, apex acute, tomentose abaxially. **Sepals** connate at the base up to ⅓ of their length, 3–3.5 × 2 mm, triangular to triangular ovate, smooth, tomentose to sericeous abaxially, glabrous adaxially, apex acute; **petals** white or pale beige; **outer petals** 11.5–12.5 mm long, ca. 3 mm wide at midpoint, narrowly triangular to linear, slightly panduriform, base enlarged and concave, nearly lanceolate, slightly fleshy, sericeous abaxially, tomentelous with the base glabrous adaxially, apex acute; **inner petals** ca. 11 mm long, ca. 1 mm wide at midpoint, linear from midpoint to apex, base enlarged and concave, nearly lanceolate, fleshy, densely tomentellous abaxially, tomentellous with the base glabrous adaxially, apex acute; **stamens** 105–185, **fertile stamens** 0.6–0.8 × 0.1–0.2 mm, nearly club-shaped, glabrous, apex of the connective papillate, anthers 7–11(–13)-locellate; **outer staminodes** hard to differentiate from the fertile stamens, nearly club-shaped, glabrous; **inner staminodes** 15–30, 0.3–0.6 × 0.5–0.7 mm, glabrous; **staminal cone** 1–1.2 mm in diameter, ca. 1 mm high, urceolate or globose; **carpels** (3–)5–10, 4–5 mm long, ovary 1–1.5 mm long, obclavate, densely golden sericeous, **ovules** 3–6, stigmas 3–3.5 mm long, filiform from the apex to the midpoint, nearly falcate at the base, glabrous. **Fruits** of 2–6 monocarps. **Monocarps** 8–18 × 6–9 mm, obovoid, ovoid, reniform, or broad oblong, slightly falcate, clavate, reddish green *in vivo*, not constricted between the seeds; smooth, or sometimes slightly wrinkled when dried, rarely pubescent or tomentellous, glabrate or glabrous when older, apex rounded; **stipes** 3–3.5 mm long, glabrate or glabrous, rarely pubescent or tomentellous. **Seeds** (1–)2–5, ca. 6 × 4 mm, ellipsoid, black, smooth, aril white to pale yellow, lobes ca. 2.5 × 3 mm, nearly rounded.

Illustration— Saint-Hilaire (1825: t. 33); Pontes and Mello-Silva (2005: 81, Fig. 2, R–W).

Distribution and habitat— This species occurs in Bolivia, Brazil, Colombia, Costa Rica, Ecuador, French Guiana, Guyana, Peru, and Venezuela, growing in forests and savannas. In Brazil, *X. sericea* is distributed throughout the country, in the Northeastern (Bahia, Ceará, and Pernambuco); Northern (Amazonas, Pará, Roraima and Tocantins), Central (Distrito Federal, Goiás and Mato Grosso); Southeastern (Espírito Santo, Minas Gerais and Rio de Janeiro) and Southern (Paraná) regions.

Vernacular Names— "*Envira preta*" (Brazil, Mato Grosso, *C. C. Berg et al. P18474,* MO), "*Pindaíba preta*" (Brazil, Pará, *J. A. Ratter et al. 6883*, MO).

Phenology— Specimens with flowers have been collected from February to April, and in October and November, and specimens with fruits have been collected in March, April, June, July, November and December.

Notes— The remarkable characters of *Xylopia sericea* are the small to medium size leaf blades, 4.7–13 × (0.8–)1–3 cm, narrowly elliptic, elliptic or narrowly lanceolate, densely golden or hyaline sericeous, with an acuminate apex; 2–8(–13) flowered inflorescences; narrowly triangular buds, slightly panduriform; sepals connate at the base up to ⅓ of their length; 105-185 stamens, 0.6–0.8 mm, with 7–11(–13)-locellate anthers; carpels (3–)5–10, 4–5 mm long, ovary 1–1.5 mm long, stigmas 3–3.5 mm long, glabrous; 2–6 monocarps per fruit; monocarps slightly falcate, clavate, not constricted between the seeds, with a rounded apex; stipes 3–3.5 mm long; and (1–)2–5 seeds.

Xylopia sericea is morphologically close to *X. frutescens*, *X. glomerulosa*, and *X. polyantha*. It can be distinguished from *X. frutescens* by its ovary 1–1.5 mm long (*vs*. ca. 0.8 mm); slightly falcate, stipitate monocarps (*vs*. not falcate, almost sessile); and stipes ca. 1 mm long (*vs*. 3–3.5 mm).

Xylopia sericea differs from *X. glomerulosa* by its smaller and narrower leaf blades, 4.7–13 × (0.8–)1–3 cm (*vs*. (12.3–)14.5–18.4 × 3.8–4.8(–5.3) cm), densely sericeous on the abaxial surface, with hairs becoming less dense when older (*vs*. always densely sericeous); 2–8(–13)-flowered inflorescences (*vs*. (5–)9–22)), fasciculate, not congested (*vs*. glomerular, generally congested), sepals 3–3.5 × ca. 2 mm (*vs*. 3.7–4.5 × ca. 3.5 mm); outer petals 11.5–12.5 mm long (*vs*. (13–)15–17 mm), ca. 3 mm wide at midpoint (*vs*. 2.2–2.5 mm); ovary 1–1.5 mm long (*vs*. 0.9–1 mm); monocarps 6–9 mm wide (*vs*. 12–16 mm); and seeds ca. 6 × 4 mm (*vs*. 9–9.5 × ca. 6 mm).

Xylopia sericea can be distinguished from *X. polyantha* by its densely sericeous leaf blades on the abaxial surface (*vs*. sericeous); sepals 3–3.5 mm long (*vs*. 1.5–2.5 mm); carpels 4–5 mm long (*vs*. (1.9–)2.7–3.6 mm); and monocarps not constricted between the seeds (*vs*. slightly constricted between the seeds).

Xylopia sericea was described by Saint-Hilaire in "*Flora Brasiliae Meridionalis*" (1825). Although he did not cite the herbarium where the type collection was stored, as usual at that time, his Brazilian herbarium, including the types, were left at P. We found four sheets of *X. sericea* from Rio de Janeiro (Brazil), at P. The specimens P-00635586 and P-00735135 have a very small collecting label with the number "668". The specimen P-00735134 also has a similar small label, but it was not possible to see the number on it, and the specimen P-

00735136 does not have the same type of label. The specimen P-00635586 was chosen here as the lectotype, because it fits the protologue, has the label of the Herbarium of Florae Brasiliae Meridionalis of Auguste de Saint-Hilaire, and has many flowers.

Fries (1900) mentioned in the protologue of *Xylopia intermedia* the description was based on materials from B and C. Later, in 1930, Fries quoted the specimen from B (B-10 0249562) as the "*typus speciei*", and we considered this as a lectotypification, because he chose a specimen between the two syntypes he mentioned before.

Selected Specimens Examined**— Bolivia.** — BENI: Camino Riberalta a Cahuela Esperanza, 10°41′21264″S, 65°26′25152″W, 11 Jun 2006, *S. Altamirano et al. 3330* (MO). — SANTA CRUZ: Velasco Province, Parcela Montecristo 2, Reserva Biológica El Refugio, 14°42′34″S, 61°8′33″W, 210 m elev., *P. F. Foster et al. 804* (MO). — **Brazil.** — AMAZONAS: Barcelos, 3 km ao sul da parte central da Serra do Aracá e 8 km E do rio Jauarí, 0°49′S, 63°19′W, Mar 1984, *J. M. S. Miralha 82* (NY). — MATO GROSSO: Aripuanã, at base of Salto dos Dardanelos, west side of river, 10°12′S, 59°21′W, 13 Oct 1973, *C. C. Berg et al. P18474* (MO, US); Cocalinho, 1997, *A. Rozza et al. 506* (RB); Luciara, distrito de Porto Alegre, ca. 10-11 km da BR-158, 11°10′S, 51°40′W, 16 Oct 1985, *J. R. Pirani et al. 1265* (INPA, OWU); Rio Juruena, 10 Jul 1994, *A. M. Duarte 19* (RB); Santa Cruz do Xingu, Parque Estadual do Xingu, limite nordeste do parque, subindo o rio Fontourinha, 9°42′13″S, 52°21′18″W, 2 Nov 2011, *D. C. Zappi et al. 3047* (RB); Santa Terezinha, Serra Cobrinha, ca. 10 km W of BR-158, and 17 km N of jct BR-158 and road to Santa Terezinha (MT-413), 10°10′S, 51°14′W, 14 Oct 1985, *W. Thomas et al. 4423* (MO, US); Serra do Roncador, road Garapu to Rio Sete Septembro, 1 Oct 1964, *G. T. Prance et al. 59220* (US). — PARÁ: Redenção, Fazenda Chocolate, 8°21′S, 50°00′W, 18 Jul 1993, *J. A. Ratter et al. 6883* (MO, NY). — RORAIMA: Antigo Território Federal do Rio Branco, Serra Tepequem, 1000–1200 m elev., 23 Nov 1954, *B. Maguire & C. K. Maguire 40038* (RB). — TOCANTINS: Lagoa da Confusão, Folha: SD-22-Z-A, Bacia do Tocantins, Sub-bacia do Rio Javaés, 11°7′14″S, 49°55′30″W, 196 m elev., 1 Oct 2010, *R. F. Haidar et al. 1373* (RB). — **Colombia.** — VALLE DEL CAUCA: Bajo Calima, Concesión Pulpapel / Buenaventura, aprox. 3°55′N, 77°W, 100 m elev., 3 Dec 1986, *M. Monsalve R. 1408* (MO). — **Guyana.** — Region: E. Berbice-Corentyne, W bank Canje River, Cow Savanna, ± 1 km N of Digitima Creek, 5°37′N, 57°35′W, 0 to 20 m elev., 14 Apr 1987, *J. J. Pipoly et al. 11570* (NY).— **Venezuela.** — AMAZONAS: Dpto. Atabapo, Sabanas de Cucuri, 4°58′N, 65°16′W, 260 m elev., Feb 1992, *A. Chaviel 464* (US). — BOLÍVAR: 0 to 4 km N of El Paujl on trail to Uaipar, 4°30′N, 61°35′W, 800 to 900 m elev., 4

Nov 1985, *R. L. Liesner 19478* (MO, NY); Between camp and Agua Linda, 7 km E of Hato de Nuria, E of Miamo Altiplanicie de Nuria, 400 m elev., 14 Jan 1961, *J. A. Steyermark 88433* (NY); Dist. Cedeño, vicinity of Panare, village of Corozal, 6 km from Maniapure toward Caicara, 6°55′S, 66°30′W, 400 m elev., 18 May 1986, *B. Boom & S. Wentzel 6624* (MO); Gran Sabana, ca. 10 km SW of Karaurin Tepui at junction of Río Karaurin and Río Asadon (Río Sanpa), 5°19′N, 61°3′W, 900–1000 m elev., 26 Apr 1988, *R. Liesner 23871* (US); Represa Guri, ca. 0.5 km SSW of dam, 7°46′S, 63°0′W, 250–350 m elev., 31 Mar 1981, *R. Liesner & A. Gonález 11007* (MO); along Río Karuai, at base of Sororopán-tepuí, West of La Laja, 1220 m elev., 29 Nov 1944, *J. A. Steyermark 60788* (MO).

3.3.5.1.31 XYLOPIA SPRUCEANA Benth. ex Spruce, J. Proc. Linn. Soc., Bot. 5: 5. 1861. *Xylopicrum spruceanum* (Benth. ex Spruce) Kuntze, Rev. Gen. Pl. 1: 8. 1891. TYPE: [VENEZUELA]. From the Casiquiari, Nov 1853, *R. Spruce 3160* (lectotype, designated by Fries 1930: B-10 0242280 (digital image!) [photo in: F! NY!], isolectotypes: BM-000554093 (digital image!), BR-000000695637 (digital image!), F-0047936F! [fragment], F-0047937F! [fragment], G-00226049 (digital image!), G-00226050 (digital image!), K-000221098 (digital image!), K-000221099 (digital image!), NY-00066774!, P-00734861 (digital image!), P-00734862 [fragment] (digital image!), TCD-0000868 (digital image!)).

Trees 5–18 m tall, d.b.h. 10–28 cm; with a small crown at the top, branches ascending in a manner similar to a pine tree *in sched.* Twigs with golden hyaline, or grayish, to less frequent brown hairs; petioles, abaxial surfaces of leaves, inflorescences, flowers and fruits, with golden, golden hyaline, or rusty hairs. **Twigs** pale brown, lenticels not observed, often densely sericeous to tomentose, becoming sparsely tomentellous, pubescent, or glabrate when older, with an oblique line formed by the indument, connecting one node to another, more visible near the apex. **Petioles** (1–)1.5–3(–3.5) mm long, canaliculate, dark brown to black, glabrate, tomentellous on the margins; **leaf blades** (3.2–)5.8–9 × (1–)1.5–2.0 cm, narrlowly oblong, narrowly elliptic, or elliptic, mostly coriaceous, sometimes chartaceous or subcoriaceous, smooth, margin mostly strongly revolute, pale brown or grayish brown and glabrate or glabrous, rarely pubescent, sparsely sericeous on the midrib abaxially, dark brown, reddish dark brown to almost black, sometimes lustrous, and glabrous adaxially, apex emarginate to retuse, sometimes with a tuft of hairs on the midrib exceeding the apex abaxially, base obliquely truncate, cuneate or asymmetric; midrib raised abaxially, strongly impressed adaxially, secondary veins (7–)9–11(–13) per side, inconspicuous on both sides. **Inflorescences** axillary, sometimes born in older twigs, 2–3-flowered; **peduncles** ca. 1 mm long, tomentellous to sericeous; **pedicels** ca. 2.5 mm long, indument as in the peduncle; **buds** narrowly oblong; **bracts** 1–2, one at the base of pedicel and another at midpoint, the basal one early caducous, 1.5–2 × 2.5–3 mm, ovate, clasping, sericeous abaxially, glabrous adaxially. **Sepals** ¼–⅙ of their length connate at the base, 3.5–4 x 3–3.5 mm, triangular ovate to ovate, smooth, tomentose to sericeous abaxially, glabrous adaxially, apex acute; **petals** beige or yellow; **outer petals** 15–23 mm long, ca. 3.5 wide at base, 2–2.5 mm wide at midpoint, narrowly oblong, slightly lanceolate, base concave, crass, densely short sericeous with only glabrousbase abaxially, tomentellous with the base papillate or glabrous adaxially, apex acute; **inner petals** 13–19 mm long, ca. 2 mm wide at base, 0.8–1 mm wide at midpoint, extremely narrowly oblong to linear, triangular to rhombic in cross section at midpoint, nearly lanceolate, base concave, obliquely cut at both sides, crass to fleshy, tomentellous with the base short sericeous abaxially, tomentellous with the base glabrous or papillate adaxially, apex acute; **stamens** 110–125, **fertile stamens** 70–85, 0.9–1.5 mm long, nearly club-shaped, glabrous, apex of the connective 0.1–0.2 mm long, enlarged, angular, papillate, anthers (5–)7–11-locellate, filament 0.3–0.5 mm long; **outer staminodes** 15–30, 1.2–1.8 mm long, nearly club-shaped, apex of the connective slightly enlarged, nearly triangular or angular, papillate, without locellate anthers or rare (1–)4–7-locellate anthers; **inner staminodes** 10–20, 0.8–1 × 0.3 mm wide, obtriangular, glabrous, apex of connective slightly enlarged, papillate, mostly without locellate anthers or rarely anthers 1–3-locellate; **staminal cone** 1.2–1.8 mm in diameter, ca. 1 mm high, conical; **carpels** (8–)11–13, 4.8–5.3 mm long, ovary 0.8–1 mm long, obclavate, densely sericeous, **ovules** 3–4, stigmas 4–4.5 mm long, narrowly fusiform, slightly geniculate above the base, slightly verruculose, sparsely to rarely tomentose above the base up to the apex, with a tuft of hairs at the apex. **Fruits** of 6–9 monocarps borne on a **pedicel** 9–12 mm long, sparsely pubescent; **torus** ca. 4.5 mm in diameter, ca. 5 mm high, globose. **Monocarps** (10–)13–36 × (6–)10–15 mm, oblong, clavate, sometimes slightly falcate, or ellipsoid (1-seeded), reddish to orange red, slightly wrinkled when dried, finely verruculose, glabrate to glabrous, apex obtuse to rounded, sometimes tiny apiculate, apiculus 0.5–1 mm long; **stipes** (3–)5–10 mm long, glabrate to glabrous, slightly wrinked longitudinally. **Seeds** (1–)2–3, oblong ellipsoid.

Distribution and habitat— This species occurs in Brazil and Venezuela, growing in flooded or non-flooded riverine forests, open vegetation (*campina* and *campinarana*) on sandy soils. In Brazil, it is found only in the state of Amazonas.

Phenology— Specimens with flowers have been collected in November, and specimens with fruits have been collected in February and October.

Notes— *Xylopia spruceana* presents a small crown at the top of the tree, and branches ascending in a manner similar to a pine tree, aspects which were included in the original description (Spruce 1861). It is characterized by its twigs with a striking oblique line on the indument, connecting one node to another, more visible near the apex; leaf blades often coriaceous, mostly glabrate to glabrous, sparsely sericeous on the midrib on the abaxial surface, with strongly revolute margins; 2–3-flowered inflorescences; sepals 3.5–4 × 3–3.5 mm; 110–125 stamens; inner staminodes 0.8–1 mm long; carpels 4.8–5.3 mm long, and stigmas 4–4.5 mm long.

This species is morphologically close to *X. emarginata*, *X. venezuelana* (now a synonym of *X. emarginata*), and *X. plowmanii,* all belonging to the group of species with an emarginate or retuse apex, cited by Berry and Johnson (1993). *Xylopia parviflora* seems to be also morphologically related to this group, as we commented before (see the differences under *X. parviflora*).

Xylopia spruceana can be differentiated from *X. emarginata* by its twigs with an oblique line on the indument, connecting the one node to another, more visible near the apex (*vs.* without oblique line); leaf blades with margins strongly revolute (*vs.* with margins sometimes slightly revolute); sepals 3.5–4 × 3–3.5 mm (*vs.* 2–2.5 × 2–3 mm), tomentose to sericeous (*vs.* ciliate and glabrous); 110–125 stamens (*vs.* ca. 150), inner staminodes 0.8–1 mm long (*vs.* 0.5–0.6 mm); carpels 4.8–5.3 mm long (*vs.* 3.3–4.2 mm), and stigmas 4–4.5 mm long (*vs.* 2.5–3.2 mm).

Xylopia spruceana can be distinguished from *X. plowmanii* by its young twigs often densely sericeous to tomentose (*vs.* pubescent to puberulent); leaf blades (1–)1.5–2 cm wide (*vs.* 2.2–2.9 cm), margins mostly strongly revolute (*vs.* flat), apex emarginate to retuse (*vs.* conspicuously emarginate); sepals ¼–⅙ of their length connate at the base (*vs.* sepals connate in about ⅓ to ½ of their length, forming a short cup-shaped calyx), sepals tomentose to sericeous abaxially (*vs.* calyx lobes glabrous); and oblong, or ellipsoid, clavate, sometimes slightly falcate monocarps (*vs.* irregularly ovoid).

We considered *Xylopia spruceana* Benth. ex Spruce as a valid name, because we think the original description from Spruce (1861) was, at that time, enough to distinguish this species. Fries (1930) mentioned the specimen *Spruce 3160* at B as the "*typus speciei*". There is only one specimen *Spruce 3160* at B (B-10 0242280), which is interpreted as the lectotype designated by Fries (1930).

***Selected Specimens Examined*— Brazil.** — AMAZONAS: AM-010, estrada Manaus-Itacoatiara, cidade de Barão de Mauá, km 182, 18 Oct 1965, *W. A. Rodrigues 7249* (INPA, JPB); id., Reserva Florestal Ducke, km 26, Iagarapé do Acará, 2°53′S, 59°58′W, 4 Feb 1997, *M. A. D. Souza et al. 321* (INPA); Itapiranga, margem esquerda do rio Uatumã, atrás da cacoeira dos Padres, 13 Aug 1979, *C. A. Cid Ferreira et al. 282* (MG); Presidente Figueiredo, BR174, km 130, Manaus-Caracaraí Highway, forest near Igarapé Lages, km 130, 13 Feb 1974, *W. C. Steward et al. P20256* (INPA, MG); Presidente Figueiredo, REBIO Uatumã, Entorno, Estrada da Morena, km 03, 31 Aug 2006, *J. G. Carvalho Sobrinho et al. 943* (INPA, RB); Rio Negro, right side of Ilha Tamanduá (local Ilha Marajó), 0°6′N, 67°16′W, 20 Oct 1987, *P. J. M. Maas et al. 6812* (MO); São Gabriel da Cachoeira Rio Demiti (Bemiti), afluente do alto rio Negro, 0°50′N, 66°53′W, 1 Nov 1987, *W. A. Rodrigues 10811* (INPA, MO, RB). — **Venezuela.** — AMAZONAS: Dept. Casiquiari, Rio Casiquiare, El Povenir, 2°22′N, 66°29′W, 13 Feb 1991, *M. Collela & E. Guayamare 2155* (MO, NY).

3.3.5.1.32 XYLOPIA SURINAMENSIS R.E.Fr., Acta Bot. Neerl. 1: 243. 1952. TYPE: SURINAME. Boschreserve, Sectie O, Junio 1944 (florifera), *Wood Herbarium Surinam 139* [*G. Stahel*] (lectotype, designated here: U-0000448 (digital image!), isolectotypes: B-10 0242279 (digital image!), K-000221093 (digital image!), MO-149696!, NY-00066775!, OWU!, U-0000445 (digital image!), U-0000447 (digital image!), WIS-00000315MAD (digital image!)).

Trees 6–15 m tall, d.b.h. 10–25 cm. Petioles with grayish, golden, or brown hairs; twigs, abaxial surfaces of leaves, inflorescences and flowers with golden, hyaline or brown hairs. **Twigs** densely tomentose, becoming glabrate to glabrous when older, dark brown with paler lenticels. **Petioles** 5–7 mm long, canaliculate, dark brown, sparsely tomentellous; **leaf blades** 8–12 × 2–2.8 cm, narrowly elliptic to narrowly lanceolate, coriaceous, densely short sericeous abaxially, with longer hairs on the midrib and margins, glabrous, verruculose and with translucent dots adaxially, warts more conspicuous on younger leaves, apex acuminate, acumen 5–8 mm long, base acute or cuneate, to asymmetric, with oblique angles close to the petiole; midrib strongly raised abaxially, impressed to canaliculate adaxially, secondary veins 14–15 per side, inconspicuous on both surfaces. **Inflorescences** axillary, 3–7-flowered; **buds** narrowly oblong to narrowly triangular, the base enlarged; **bracts** 2, one at the base of pedicel and another at the midpoint, basal bract caducous, 1.5–2 mm long, ovate to triangular ovate, clasping, apex acute. **Calyx** short cup-shaped, smooth, **sepals** connate ca. ⅔ of their length, calyx tube 2.2–2.5 × 5–6 mm, calyx lobes 0.8–1.5 mm long, triangular ovate to truncate ovate, densely tomentose or sericeous abaxially, tomentellous adaxially, apex acute; **outer petals** 13–15 mm long, ca. 2 mm wide at midpoint, narrowly oblong to narrowly triangular, base enlarged and concave, apex acute, densely sericeous abaxially; **inner petals** 12–13 mm long, 1–1.3 mm wide at midpoint, linear from midpoint to apex, rhombic in cross section at the midpoint, base enlarged and concave, crass, tomentellous to pubescent abaxially, apex acute; **stamens** 1.2–1.5 mm long; **outer staminodes**; **inner staminodes**; and **staminal cone** not seen; **carpels** ca. 30, ca. 3 mm long, ovary ca. 1 mm long, densely sericeous, stigmas ca. 2 mm long. **Fruits** of 20–25 monocarps borne on a **pedicel** ca. 20 mm long; **torus** depressed globose. **Monocarps** ca. 25 × 6.5 mm, oblong, or clavate (1-seeded), slightly falcate, moniliform, green (immature) *in sched.*, glabrate to glabrous, apex often cuspidate, cusp 2–3 mm long, or obtuse and apiculate, apiculus ca. 1 mm long; **stipes** 9–10 mm long, glabrate to glabrous, obliquely or longitudinally wrinkled when dried. **Seeds** (1–)3–7. Figure 18H-J.

Distribution and habitat— This species is distributed in Brazil, French Guiana, Guyana, and Suriname, growing in non-flooded Lowland forests. *Xylopia surinamensis* is reported here for the first time from Brazil, occurring only in the state of Amapá (*J. M. Pires et al. 51447*, IAN, MG, MO, NY, US).

Phenology— Specimens with flowers have been collected in June, and specimens with fruits have been collected in February and August.

Notes— The most remarkable character of *Xylopia surinamensis* is the presence of warts on the adaxial surface of its leaves. *X. surinamensis* is morphologically similar to *X. aromatica* and to *X. cayennensis* (see the differences under both).

Fries (1952) cited the type specimen of *Xylopia surinamensis* was at U. As we found three sheets at U, the specimen U-0000448, is being here designated as the lectotype because it fits the protologue, has buds and flowers, and has an identification label with Fries's handwriting from 1948, indicating this as a new species.

Fries (1952) indicated the Surinam Wood Collection 139, made by G. Stahel, in June 1944, as the type collection. Some specimens with the same number (139) from the same place (Boschreserve, Sectie O), but collected in November 1942, were mistaken with the type collection. As we could understand, many specimens were collected at this natural reserve (Boschreserve) to constitute a Wood Collection from Suriname, so, probably 139 was the number of the tree in the field.

There are few collections of this species in the herbaria, and it was not possible to dissect a mature flower to analysis, so, we completed our description with floral details from the original description (Fries 1952). The fruits of *X. surinamensis* were unknown at that time (Fries 1952), but we found a few specimens (*T. B. Croat & G. Ferry 102314*, MO; *R. A. A. Oldeman B 1221*, NY; *J. M. Pires et al. 51447*, IAN, MG, MO, NY, US) with immature fruits and they were described here for the first time.

Specimens Examined— **Brazil.** — AMAPÁ: Rio Araguari, vicinity of Camp 12, 1°11′N, 52°8′W, 2 Oct 1961, *J. M. Pires et al. 51447* (IAN, MG, MO, NY, US). — **French Guiana.** — Fleuve Sinnamary, sur la riviére Courcibo au saut Lucifer, 15 Aug 1967, *R. A. Oldeman B1221* (NY, US). — **Suriname.** — Boschreserve, Section O, Nov 1942, *Wood Herbarium Surinam 139* [G. Stahel] (MO, NY [2 sheets], RB); Sipaliwini, along road from Zanderij to Apoera, on the Corantijn River and border with Guyana, 76 km SW of Witagron, 4°56′8″N, 56°29′3″W, 30 m elev., 17 Feb 2011, *T. B. Croat & G. Ferry 102314* (MO, US).

3.3.5.1.33 XYLOPIA TRICHOSTEMON R.E.Fr., Acta Horti Berg. 12(2): 275. 1937. TYPE: BRAZIL. Territory of Acre, near mouth of Rio Macauhan (tributary of Rio Yaco), 9°20′S, 69°W, 26 Aug 1933 (blühend), *B. A. Krukoff 5690* (holotype: S-R-6871 [2 sheets] (digital image!), isotypes: BM-000554094 (digital image!), F 810947! [photo in: F!], G-00226052 (digital image!), K-000221094 (digital image!), LP-002771 (digital image!), M-0240144 (digital image!), MICH-1115730 (digital image!), MO-216992!, NY-00066776!, NY-00066777!, RB-00577773!, U-0000449 (digital image!), UC-606616 (digital image!), US-00074233!).

Trees 25–32 m tall, d.b.h. 28–32 cm; **bole** with low plank buttresses. Twigs, petioles and abaxial surfaces of leaves with golden, or hyaline hairs; inflorescences and flowers with golden, rusty, pale brown, or hyaline hairs. **Twigs** brown or dark brown with beige or pale brown lenticels, short sericeous to pubescent, becoming glabrous when older. **Petioles** 3–6 mm long, canaliculate, dark brown to black, tomentose to glabrate at margins; **leaf blades** (5.7–)6.4–11(–12) × (1.7–)2–3.3(–3.6) cm, elliptic or narrowly elliptic, subchartaceous to chartaceous, smooth, small black dots visible under light microscope, more conspicuous abaxially and on young leaves, pale brown and sparsely pubescent to glabrate abaxially, sericeous on the midrib, greenish brown to pale brown and glabrous adaxially, apex acuminate to acute, acumen 3–15 mm long, base cuneate, acute or attenuate, with slightly oblique angles near the petiole; midrib raised abaxially, keeled, impressed adaxially, sometimes slightly canaliculate, secondary veins 10–14(–16) per side, raised on both surfaces. **Inflorescences** axillary, 1–4(–7)-flowered; **peduncles** 1–2 mm long, rarely tomentellous to glabrate; **pedicels** 3–4.5 mm long, sparsely sericeous or tomentose; **buds** narrowly oblong, slightly constrict above the base; **bracts** 2, one at the base of pedicel and another at midpoint or close to the sepals, the basal caducous, 1.6–1.8 × 1.4–2 mm, ovate to triangular ovate, clasping, sometimes ciliate, short sericeous abaxially, apex triangular. **Sepals** connate at the base up to ⅓ of their length, 2.3–3 × 3.5–4.3 mm, triangular to triangular ovate, smooth, sparsely short sericeous to tomentellous near the apex abaxially, glabrous adaxially, apex acute; **petals** white *in sched.*, **outer petals** 15–25 mm long, ca. 4 wide at base, ca. 2.6 mm wide at constriction, 2.5–3.5 mm wide at midpoint, narrowly oblong, base enlarged and concave, nearlylanceolate, slightly fleshy, abaxially slightly keeled longitudinaly at midpoint, short sericeous with the base glabrous abaxially, densely tomentellous with the base glabrous adaxially, apex acute; **inner petals** 13–18 mm long, ca. 3.6 mm wide at base, ca. 1.5 mm wide at constriction, 1–2 mm wide at midpoint, linear oblong, narrowly lanceolate, fleshy, abaxially slightly keeled longitudinally at midpoint, short sericeous to tomentellous with the base glabrous, sometimes base verruculose, abaxially, tomentellous with the base glabrous adaxially, apex acute, base enlarged and concave; **stamens** ca. 170, **fertile stamens** 1.5–1.8 × 0.2 mm, narrowly oblong, glabrous, apex of the connective 0.35–0.5 mm long, nearly triangular or mushroom-shaped, setulose to strigose at the apex, anthers 9–14-locellate, filament 0.6–0.7 mm long; **outer staminodes** 1.5–2 × 0.2–0.3 mm, narrowly oblong, glabrous, apex of the connective triangular, setulose to strigose at the apex; **inner staminodes** 0.9–1 × 0.3–0.4 mm, glabrous, apex of the connective setulose to strigose at the apex tip, anthers 6–7-locellate; **staminal cone** 2–2.2 mm in diameter, 1.3–1.6 mm high, conical to depressed conical; **carpels** ca. 13, 3.4–3.7 mm long, ovary 1.2–1.5 mm long, slightly falcate to fusiform, densely sericeous, **ovules** ca. 5, stigmas ca. 2.2 mm long, filiform to fusiform, often geniculate above the base, verruculose, with a tuft of hairs at the apex and glabrate at other parts. **Fruits** of (7–)9–10 monocarps borne on a **pedicels** ca. 10 mm long; **torus** 8–10 mm in diameter, ca. 4.5 mm high, semi globose. **Monocarps** 18–33 × 16–22 mm, ovoid, obovoid or oblong, clavate, slightly reniform or slightly falcate, green with red pulp *in sched.*, woody, slightly grooved, or sometimes slightly obliquely wrinkled when dried, apex rounded, glabrate to glabrous; **stipes** 5–7 mm long, glabrate to glabrous, slightly longitudinally wrinkled. **Seeds** 3, 11–12 × 8.4–8.8 mm, flattened ellipsoid to flattened obovoid, brown to dark brown, aril white *in sched.*, light brown, translucent, lobes 2.3 × 3.5 mm. Figure 18A-G.

Distribution and habitat— *Xylopia trichostemon* occurs in Brazil and Peru, growing in flooded (*várzea*) or non-flooded forests (*terra firme*), at elevations of 80–110 m. In Brazil, it has been found only in the states of Acre and Amazonas.

Vernacular Names— "*Envira-vassourinha*", "*Envira-papo-de-mutum*" (Brazil, Acre).

Phenology— Specimens with flowers were collected in September and October, and with fruits in February and March.

Notes— *Xylopia trichostemon* has as its most remarkable characters the presence of small black dots on both leaf blades surfaces (visible under light microscope), more conspicuous abaxially and on young leaves; the fertile stamens with the apex of the connective nearly triangular or mushroom-shaped, setulose to strigose at the apex tip; and the seeds with 11–12 × 8.4–8.8 mm.

Xylopia trichostemon is similar to *X. nervosa* and *X. uniflora* R.E.Fr. It can be easily differentiated from both by the striking small black dots on surfaces of the leaves (*vs*. absent on both). It can also be distinguished from *X. nervosa* by its 1–4(–7)-flowered inflorescences (*vs*. 1-flowered); ca. 170 stamens (*vs*. ca. 220); fertile stamens with the apex of the connective nearly triangular to mushroom-shaped (*vs*. enlarged, rounded, or triangular, discoid), setulose to strigose at the apex tip (*vs*. papillate); ca. 13 carpels (*vs*. ca. 7); and (7–)9–10 monocarps per fruits (*vs*. 2–3).

Xylopia trichostemon can be distinguished from *X. uniflora* by its leaf blades subchartaceous to chartaceous, smooth (*vs*. coriaceous, scabrous); 1–4(–7)-flowered inflorescences (*vs*. solitary flowers); ca. 170 stamens (*vs*. ca. 100), narrowly oblong fertile stamens (*vs*. narrowly obtriangular); ca. 13 carpels (*vs*. 2–4); (7–)9–10 monocarps per fruits (*vs*. ca. 2 monocarps); and seeds 11–12 × 8.4–8.8 mm (*vs*. 6.5–10 × 3.7–5 mm).

Xylopia trichostemon also resembles *X. polyantha*, mostly by the shape of the leaf blades, but it differs from *X. polyantha* by its striking small black dots on both surfaces of the leaves (*vs.* black dots absent); fertile stamens 1.5–1.8 mm long (*vs.* 0.6–1 mm), apex of the connective nearly triangular to mushroom-shaped (*vs.* capitate, discoid, or pentagonal), setulose to strigose at the apex tip (*vs.* papillate), and filament 0.6–0.7 mm long (*vs.* 0.1–0.2 mm).

There are few collections of *Xylopia trichostemon* in the herbaria. The fruits were unknown at the time of the original description (Fries 1937), and are being described here for the first time.

Selected Specimens Examined**— Brazil.** — ACRE: Mun. Santa Rosa, Rio Purus, left bank, Seringal Santa Helena, 09°27′49″S, 70°10′37″W, 23 Mar 1999, *D. C. Daly et al. 9989* (NY, OWU); Mun. Sena Madureira, Rio Macauã, Seringal Riozinho, Colocação Provenir, 9°43′S, 69°07′W, 31 Mar 1994, *L. de Lima et al. 541* [2 sheets] (NY, OWU). — AMAZONAS: Municipality of São Paulo de Olivença, near Palmares, 11 Sept - 26 Oct 1936, *B. A. Krukoff 8471* (F, NY, US). — **Peru.** — LORETO, Maynas Province, Indiana, Reserva Explorama (Yanamono), 3°30′S, 72°50′W, 80 m elev., 25 Sep 1990, *J. J. Pipoly et al. 12327* (B, MO, OWU); ibid., Indiana, Yanamono, Explorama Lodge, 3°28′S, 72°50′W, 106 m elev., 19 Feb 1989, *R. Vásquez & N. Jaramillo 11712* (MO, RSA).

3.3.5.1.34 XYLOPIA UNIFLORA R.E.Fr., Acta Horti Berg. 12(3): 564. 1939. TYPE: BRAZIL. Amazonas: Rio Curicuriary, Rio Negro super. afluens, circa. cataractam Cajú, 29 Feb 1936 (blühend), *A. Ducke s.n. (RB 29017)* (holotype: S-R-6872 (digital image!), isotypes: LE-00001863 (digital image!), RB-00534174!, U-0000450 (digital image!)).

Xylopia longicaudata Maas & Westra, PhytoKeys 126: 63. 2019. TYPE: COLOMBIA. Guainía: Maimachi, Serranía del Naquén, por el camino a Cerro Minas, 2°12′N, 68°13′W, 455 m, 9 Apr 1993, *S. Madriñan & C. Barbosa 974* (holotype: NY!, isotypes: L!, F 2189754!, F 2189755!, MO-5770021!, U 77731!); syn. nov.

Small trees up to 20 m tall, d.b.h. ca. 36 cm. Twigs, petioles, abaxial surfaces of leaves, inflorescences, flowers and fruits, with golden, pale rusty, rusty, brown, or hyaline hairs. **Twigs** glabrous. **Petioles** 5–11 mm long, canaliculate, margins of the groove closing, dark brown to black, glabrous; **leaf blades** (6.5–)10.5–12.5 × 2.8–3.1 cm, oblanceolate, or elliptic, or obovate, chartaceous to coriaceous, scabrous, reddish brown and glabrate or with rare hairs from midpoint to the apex and on the midrib or close to it abaxially, brown to dark brown and glabrous and slightly lustrous adaxially, apex acuminate, cuspidate, or caudate, acumen, cauda, or cusp 7–18 mm long, base cuneate to acute, or attenuate; midrib raised abaxially, keeled, the keel darker than the rest of the midrib, impressed or canaliculate adaxially, secondary veins 11–13 per side, raised on both surfaces, terciary veins conspicuous on both surfaces. **Flowers** solitary, axillary; **peduncles** 1–2 mm long, rarely tomentose to sericeous; **buds** narrowly triangular to narrowly oblong, the base slightly enlarged; **bracts** 1–2, one at the base of the peduncle and another at midpoint or close to the calyx, the basal caducous, 2–3.3 × 3.7 mm, ovate, sometimes splitted at the midpoint, clasping, abaxially tomentose close to the apex, glabrous adaxially, apex obtuse. **Sepals** connate at the base up to ⅓ of their length, 2.6–3.2 × 2.8–3.4 mm, triangular ovate to triangular, smooth, sparsely short sericeous close to the apex abaxially, glabrous adaxially, apex acute; **petals** pale orange, pale yellowish cream; **outer petals** (12–)13–20 mm long, 3.2–3.5 wide at base, 2.5–3 mm wide at midpoint, narrowly oblong, base enlarged, fleshy, short sericeous abaxially, tomentellous with the base glabrous adaxially, apex acute to slightly rounded; **inner petals** (7–)8.5–10(–14) mm long, ca. 0.7 mm wide at base, 0.6–1 mm wide at midpoint, linear from the midpoint to the apex, triangular in cross section at midpoint, nearly lanceolate, fleshy, tomentellous with the base glabrous on both surfaces, apex acuminate, base enlarged and concave; **stamens** ca. 100, **fertile stamens** 1.5–1.8 × 0.2–0.3 mm, narrowly obtriangular, glabrous, apex of the connective 0.2–0.4 mm long, triangular to mushroom-shaped, short setulose to short strigose at the apex tip, anthers 8–13-locellate, filament 0.5–0.8 mm long, obtriangular; **outer staminodes** 1.5–1.7 × 0.4–0.6 mm, nearly obtriangular, glabrous, apex of the connective triangular to mushroom-shaped, short setulose to short strigose at apex; **inner staminodes** ca. 15, 1.2–1.3 × 0.6–0.8 mm, obtriangular to obpyramidal, glabrous, apex of the connective short setulose to short strigose, without locellate anthers; **staminal cone** 1–1.4 mm in diameter, 1.2–1.3 mm high, conical; **carpels** 2–4, 4.7–5.2 mm long, ovary 1.2–1.5 mm long, filiform to fusiform, densely short sericeous, **ovules** 3–6, stigmas 3.5–3.7 mm long, nearly fusiform, enlarged to geniculate above the base, verruculose, pubescent close to the apex. **Fruits** of ca. 2 monocarps borne on a **pedicel** ca. 6 mm long, rarely tomentellous; **torus** ca. 2.6 mm in diameter, ca. 2 mm high, nearly obconical. **Monocarps** 17–28 × 7–11 mm, oblong, slightly falcate, reddish outside and orange red inside *in sched.*, black *in sicco*, obliquely wrinkled when dried, rarely pubescent or glabrate, apex obtuse, but obliquely apiculate, apiculus 1–2 mm long; **stipes** 4–5 mm long, glabrate, slightly longitudinally wrinkled when dried. **Seeds** ca. 3, 6.5–10.5 × 3.7–5 mm, oblong ellipsoid to oblong, black to vinaceous dark brown, smooth, aril white *in sched.*, pale brown to amber-colored *in sicco*, lobes 1.7–2.5 × 2–2.7 mm, rounded to ovoid. Figure 18N-Q.

Distribution and habitat— *Xylopia uniflora* was only known from Brazil. Its occurrence in Colombia and Venezuela is being reported for the first time here (Figure 10). It grows in open vegetation on sandy soils (*campinarana*), or in forests, or in the transition between the forest and rock outcrops in the Amazon Basin. In Brazil, it is only known from the type collection from the state of Amazonas.

Vernacular names— "*Majagua blanca*" (Venezuela, *O. Huber & H. Canales 405/12*, U).

Phenology— Specimens with flowers were collected in February, April, and August, and with fruits in April.

Notes— *Xylopia uniflora* is characterized by its glabrous twigs; chartaceous to coriaceous, and scabrous leaf blades; solitary flowers; sepals connate at the base up to ⅓ of their length; inner petals are 30% to 50% shorter than the outer petals, a distinct and unique character of this species; ca. 100 stamens, fertile stamens 1.5–1.8 mm long, narrowly obtriangular, with the apex of the connective triangular to mushroom-shaped, short setulose to short strigose at the apex tip (another distinct character), filament 0.5–0.8 mm long, obtriangular; 2–4 carpels, 4.7–5.2 mm long; and ca. 2 monocarps per fruit.

Xylopia uniflora is morphologically close to *X. trichostemon*, both having the apex of the connective of the fertile stamens short setulose to short strigose (see the differences under *X. trichostemon*).

Xylopia uniflora also resembles *X. nervosa*, but differs from this by its ca. 100 stamens (*vs*. ca. 220), narrowly obtriangular fertile stamens (*vs*. club-shaped), with the apex of the connective triangular to mushroom-shaped (*vs*. enlarged, rounded, or triangular, discoid), and setulose to strigose at the apex tip (*vs*. papillate); and 2–4 carpels (*vs*. ca. 7).

Xylopia uniflora is also similar to *X. ochrantha* and *X. trichostemon* regarding the length of their filaments with (0.35–)0.5–0.8 mm long, the longest filaments in the Amazonian species.

The collections of *X. uniflora* in the herbaria are constituted only by the type gathering, from Brazil, and three more collection, from Colombia and Venezuela. So, we complemented some characters with data from the original description (Fries 1939). The fruits of this species were unknown at the time of the original description (Fries 1939), but are being described here for the first time.

Xylopia longicaudata was recently described by Maas and Westra (Maas et al. 2019) based on one collection from Colombia, *S. Madriñán & C. Barbosa 974* as its type. The authors mentioned the similarity with *X. uniflora*, but distinguished *X. longicaudata* by the caudate apex of its leaves (*vs.* acuminate), and the leaf venation more raised (*vs.* less raised). We examined specimens of the type collection of both and consider that the variability of the leaf characters do not warrant their maintenance as separate species. Besides that, both have very similar solitary flowers with the most remarkable characters that distinguish *X. uniflora*, the inner petals 30% to 50% shorter than the outer petals, and fertile stamens narrowly obtriangular, with the apex of the connective triangular to mushroom-shaped, short setulose to short strigose at the apex tip, and filament 0.5–0.8 mm long. Therefore, we consider *X. longicaudata* as a synonym of *X. uniflora*. Maas and Westra (Maas et al. 2019) also included in their examined material two sterile specimens (*R. Cortés & Rodriguez 646*, and *M. P. Córdoba et al.* 678, both from COL) from Vaupés, Colombia, but we don't agree they are *X. uniflora,* we identify them as *X. nervosa*.

Specimens Examined**—** **Colombia.** — GUAINÍA: Maimachi, Serranía de Naquen, alrededores del campamento La Planada, 2°12′N, 68°12′W, 320 m elev., 14 Aug 1992, *R. Cortés et al. 372* (COL digital image!). — **Venezuela.** — AMAZONAS: Cuenca del Río Manapiare, selva alta a mas o menos hora desde el poblado de Guara em dirección SE, em la pica hacia el Caño Garrafón, 5°15′N, 66°3′W, 140 m elev., 25 Jan 1977, *O. Huber & H. Canales 405/12* (U).

3.3.5.1.35 XYLOPIA XYLANTHA R.E.Fr., Acta Horti Berg. 12(2): 286. 1937. TYPE: [BRAZIL]. BRAZILIEN. Staat of Amazonas: [São Paulo de Olivença], Basin of Rio Solimões, Municipality São Paulo de Olivença; basin of creek Belem, terra firma, high forest, 26 Oct 1936 - 11 Dec 1936 (blühend), *B. A. Krukoff 8750* (holotype: NY-00066780!, isotypes: A-00039728 (digital image!), BM-000554095 (digital image!), F-0047938F! [photo in: F!], G-00226053 (digital image!), GB-0047049 (digital image!), K-000221095 (digital image!), LA-00000049 (digital image!), LE-00001864 (digital image!), LP-002772 (digital image!), MICH-1115464 (digital image!), MO-149695!, P-00734863 (digital image!), S-R-6875 (digital image!), U-0000451 (digital image!), US-00074232!, US-00930578!).

Trees 8–18 m tall, d.b.h. ca. 12 cm; Twigs, petioles, abaxial surfaces of leaves, inflorescences and flowers with golden, pale rusty, pale brown, or brown hairs. **Twigs** pale brown or grayish brown with beige lenticels, densely to sparsely sericeous to tomentose, glabrate when older. **Petioles** 3–6.5 mm long, canaliculate, dark brown to black, tomentose except in the groove; **leaf blades** (7.5–)9.6–15.3 × (3–)3.6–5.5 cm, elliptic, chartaceous to coriaceous, pale brown and tomentose, sericeous, or velutinous, with longer hairs on the midrib and margins abaxially, brown to reddish brown, and glabrous, slightly lustrous adaxially, apex acuminate to cuspidate, acumen or cusp 8–23 mm long, base acute, or broad cuneate, or obtuse; midrib raised abaxially, flat to slightly impressed adaxially, secondary veins (7–)9–12(–14) per side, slightly raised on both faces. **Flowers** solitary, axillary; **peduncles** 4–5 mm long; **buds** ellipsoid to slightly obovoid, yellowish *in sched.*; **bracts** 2, ovate, sericeous abaxially. **Calyx** cup-shaped, smooth, calyx tube 6–8.5 × 10–12 mm, **sepals** connate in ½ of their length or more, calyx lobes 2.5–6 mm long, sericeous abaxially, apex acute; **outer petals** 25–31 mm long, 11–12 mm wide at midpoint, elliptic to slightly obovate, crass, longitudinally keeled from the midpoint to the apex abaxially, densely short sericeous to tomentose abaxially, tomentellous at the margins and forming a longitudinal line at midpoint adaxially, apex acute; **inner petals** 20–24 mm long, 4–5 mm wide at midpoint, narrowly elliptic, longitudinally keeled abaxially, triangular or rhombic in cross section at midpoint, fleshy, tomentellous to short sericeous abaxially, apex acute; **stamens** (1.2–)1.5–1.8 mm long; **outer staminodes**; **inner staminodes**; **staminal cone**; **carpels**, ovary, **ovules**, and stigmas not seen and not described in the original description. **Fruits** and **seeds** unknown. Figure 7T-V.

Additional Illustration**—** Fries (1937: 286, Fig. 11 a–d).

Distribution and habitat**—** This species is known only from the state of Amazonas, in Brazil, growing in lowland forest (*terra firme*).

Phenology**—** Specimens with flowers have been collected in March, and between October to December (type collection is not precise).

Notes**—** *Xylopia xylantha* has as remarkable characters: elliptic leaf blades, slightly lustrous on the adaxial surface; solitary axillary flowers; elliptic to slightly obovate buds; sepals connate at ½ of their length or more, forming a long cup-shaped calyx (8.5–14.5 mm long); and outer petals 25–31 mm long, 11–12 mm wide at midpoint, elliptic to slightly obovate, keeled abaxially from the midpoint to the apex.

The long cup-shaped calyx makes this species very distinctive, and this character is shared with *X. crinita, X. excellens*, and *X. macrantha* Triana & Planch. (from the coastal region of Colombia, not included in this treatment). The cup-shaped calyx is also shared with *X. egleriana*, but *X. xylantha* presents a smooth calyx (*vs*. verruculose in *X. xylantha*), and a calyx tube rim absent (*vs*. persistent).

Xylopia xylantha can be distinguished from *X. crinita* by its petioles with 3–6.5 mm long (*vs*. 1.5–2.5 mm), leaf blades with (3–)3.6–5.5 mm wide (*vs*. (1.2–)2–3 mm), elliptic (vs. lanceolate elliptic to lanceolate); calyx sericeous (*vs*. densely tomentose to velutinous); outer petals (17–)20–22 mm long (*vs*. 25–31 mm long), and 5–6 mm wide at midpoint (*vs*. 11–12 mm).

Xylopia xylantha can also be differentiated from *X. excellens* by its elliptic leaf blades (*vs*. oblong), and opaque on the adaxial surface (*vs*. slightly lustrous); buds ellipsoid to slightly obovoid (*vs*. oblong); and outer petals 11–12 mm wide at midpoint (*vs*. 6–9 mm wide at midpoint).

There are only two collections of *Xylopia xylantha* in the herbaria, including the type collection, so, we have completed our description above with data from the original description (Fries 1937). The fruits were unknown at the original description (Fries 1937) and remain so.

Specimens Examined— **Brazil.** — AMAZONAS: Presidente Figueiredo, estrada da Usina hidrelétrica de Balbina, próximo ao Igarapé do Barreto, 1°–2°S, 59°–60°W, 31 Mar 1986, *C. A. Cid Ferreira et al. 7034* (INPA, MG, U).

3.3.6 Doubtful and Excluded Names

Unona carminativa Arruda, Diss. Pl. Brazil 48. 1810. This is a nomen nudum which was cited by Arruda da Câmara (1810) as published before in "*Cent. Plant. Pern.*" (= *Centuria plantarum pernambucensium*). It is presumed that he intended to publish a series with this name, but this work was never published. Probably, Arruda was working on this at the end of his life and did not finish it to publish it before his death (Kirkbride Jr. 2007).

= XYLOPIA SERICEA A.St.-Hil.

Uvaria febrifuga Humb. & Bonpl., Monogr. Anonac. 117. t. 21. 1817. Originaly a name in schedule, and a nomen nudum quoted by Dunal (1817) as a synonym of *Unona xylopioides* Dunal.

= XYLOPIA AROMATICA (Lam.) Mart.

Uvaria ferruginea Poepp., Acta Horti Berg. 10(1): 121. 1930. Originaly a name in schedule, and a synonym of *X. poeppigii* R.E.Fr., quoted by Fries (1930).

= XYLOPIA CUSPIDATA Diels

Uvaria fluminensis Vell., Fl. Flum. 238. 1829 ["1825"]. TYPE: [BRAZIL], (lectotype: tab. 121. in Fl. Flum. Icon. 5. 1831 ["1827"]). Maas et al. (2011) listed *Uvaria fluminensis* as a taxonomic synonym of *X. sericea*. But, based on the short original description, and the plate, that shows a branch with terminal fruit composed by twelve oblong monocarps and more around 10 scars of monocarps insertion in the torus and constricted between the seeds, we noticed these characters do not fit within *X. sericea*. *Xylopia sericea* has axillary inflorescences and fruits (as the most species of the genus, which have axillary or cauliflorous flowers and inflorescences), and 2–6 monocarps per fruit, and the monocarps are not constricted between the seeds. So, because of these differences we excluded *Uvaria fluminensis* as a synonym of *X. sericea*.

Xylopia carminativa (Arruda) R.E.Fr., Kongl. Svenska Vetensk.-Akad. Handl. 34(5): 32. 1900. A new name proposed by Fries (1900) to *Unona carminativa* Arruda, Diss. Pl. Brazil 48. 1810, a nomen nudum quoted by Arruda (1810).

= XYLOPIA SERICEA A.St.-Hil.

Xylopia chivantinensis Aristeg., Index to specimens filed in the New York Botanical Garden vascular plant type herbarium 1985: 161. Originaly a name in schedule, but a nomen nudum quoted by Holmgren et al. (1985) in the list of the type specimens filed in the New York Botanical Garden herbarium.

= XYLOPIA POLYANTHA R.E.Fr.

Xylopia ferruginea Poepp., Kongl. Svenska Vetensk.-Akad. Handl. 34(5): 30. 1900. Originaly a name in schedule, and a nomen nudum cited as a synonym of *X. frutescens* Aubl. var. *ferruginea* R.E.Fr. mentioned by Fries (1900).

= XYLOPIA FRUTESCENS Aubl. VAR. FERRUGINEA R.E.Fr.

Xylopia manausensis Aristeg., Index to specimens filed in the New York Botanical Garden vascular plant type herbarium 1985: 161. Originaly a name in schedula, but a nomen nudum quoted by Holmgren et al. (1985) in the list of the type specimens filed in the New York Botanical Garden herbarium.

= XYLOPIA CRINITA R.E.Fr.

Xylopia pilosa Benth., Kongl. Svenska Vetensk.-Akad. Handl. 34(5): 35. 1900. A name in schedule originaly, and a nomen nudum cited as a synonym of *X. benthamii* R.E.Fr. cited by Fries (1900).

= XYLOPIA BENTHAMII R.E.Fr.

Xylopia ruscifolia Humb. & Bonpl., Monogr. Anonac. 121. t. 18. 1817. A nomen nudum quoted as "*ined.*" by Dunal (1817) and a synonym of *X. ligustrifolia*.

= XYLOPIA LIGUSTRIFOLIA Dunal

Xylopicrum carminativum (Arruda) Kuntze, Rev. Gen. Pl. 1: 8. 1891. A new combination proposed by Kuntze (1891) when considered *Xylopicrum* a valid genus name against *Xylopia*, and transferred all published names in *Xylopia* to *Xylopicrum*. And also quoted by Fries (1900) as a synonym of *Xylopia carminativa* (Arruda) R.E.Fr.

= XYLOPIA SERICEA A.St.-Hil.

3.3.7 Acknowledgments

The authors are grateful to Fundação de Amparo à Pesquisa do Estado de Mato Grosso (FAPEMAT) for the doctoral grant awarded to AFPP and for partially funding the field work and visits to herbaria (Process no. 161293/2014). The authors are grateful to Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) because this study was financed in part by the CAPES - Finance Code 001, and this institution also awarded to AFPP the Doutorado Sanduíche no Exterior (PDSE) fellowship (Process no. 88881.135436/2016-01). We are also grateful to Ohio Wesleyan University (OWU) for kindly hosting AFPP during the PDSE fellowship period. We are also grateful to the curators and staff of the herbaria mentioned in the text; Regina Carvalho and Madson Sousa for preparing the illustrations; Raimundo Luciano Soares Neto for preparing the distribution maps; Guilherme Pontes Leitão for helping to prepare the figure plates; and to Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) for the research and collect permits to AFPP at Parque Nacional da Tijuca, Parque Nacional do Cabo Orange, and Parque Nacional do Viruá.

3.3.8 Literature Cited

Andrade-Lima, D. 1981. Present-day forest refuges in northeastern Brazil. Pp. 245-251 in *Biological diversification in the tropics*, ed. G. T. Prance. New York: Columbia University Press.

Arruda da Câmara, M. 1810. *Dissertação sobre as plantas do Brazil: que podem dar linhos proprios para muitos usos da sociedade, e suprir a falta do canhamo, indagadas de ordem do Principe Regente Nosso Senhor*. Rio de Janeiro: Na Impressão Regia.

Aublet. F. 1775. *Histoire des plantes de la Guiane Françoise: rangées suivant la méthode sexuelle, avec plusieurs mémoires sur différens objects intéressans, relatifs à la culture & au commerce de la Guiane Françoise, & une notice des plantes de l'Isle-de-France*. London & Paris: P. F. Didot.

Baillon, H. 1864. Note sur quelques *Xylopia* Africains. *Adansonia* 4: 140–147.

Baillon, H. 1868. Mémoire sur la famille des Anonacées. *Adansonia* 8: 295–344.

Bagstad, K. J., and D. M. Johnson. 1999. Taxonomy of *Xylopia barbata* (Annonaceae) and related species from the Amazon/Orinoco Region. *Contributions from the University of Michigan Herbarium* 22: 21–28.

Bentham, G. 1862. On African Anonaceae. *Transactions of the Linnean Society of London* 23: 463–480.

Berry, P. E. and D. M. Johnson. 1993. A new species of *Xylopia* (Annonaceae) from Southern Venezuela. *Novon* 3: 99-101.

Bigarella, J. J., D. Andrade-Lima, and P. J. Riehs. 1975. Considerações a respeito das mudanças paleoambientais na distribuição de algumas espécies vegetais e animais no Brasil. *Anais da Academia Brasileira de Ciências* 47: 411–464.

Brizicky, G. K. 1962. Taxonomic and nomenclatural notes on *Zanthoxylum* and *Glycosmis* (Rutaceae). *Journal of the Arnold Arboretum* 43: 80–93.

Browne, P. 1756. *The civil and natural history of Jamaica*, in three parts. London: T. Osborne and J. Shipton in Gray's-Inn.

de Candolle, A. L. P. P. 1832. Mémoire sur la famille des Anonacées, et en particulier sur les espèces du pays des Birmans. *Mémoires de la Société de Physique et d'Histoire Naturelle de Genève* 5: 177–221.

Chatrou, L., M. D. Pirie, R. H. J. Erkens, T. L. P. Couvreur, K. M. Neubig, J. R. Abbott, J. B. Mols, J. W. Maas, R. M. K. Saunders, and M. W. Chase. 2012. A new subfamilial and tribal classification of the pantropical flowering plant family Annonaceae informed by molecular phylogenetics. *Botanical Journal of the Linnean Society* 169: 5–40.

Couvreur, T. L. P., A. J. Helmstetter, E. J. M. Koenen, K. Bethune, R. D. Brandão, S. A. Little, H. Sauquet, and R. H. J. Erkens. 2019. Phylogenomics of the major tropical plant family Annonaceae using targeted enrichment of nuclear genes. *Frontiers in Plant Science* [1941]: 1-15. DOI: 10.3389/fpls.2018.01941.

Dias, M. C. 1988. *Estudos taxonômicos do gênero Xylopia L. (Annonaceae) no Brasil extra-amazônico.* Dissertação de Mestrado. Campinas, São Paulo: Universidade Estadual de Campinas.

Diels, L. 1905. Anonaceae. In: Pilger, R. Beiträge zur Flora des Hylaea nach den Sammlungen von E. Ule. *Verhandlungen des Botanischen Vereins der Provinz Brandenburg und die angrenzenden Lander 47*: 125–136.

Diels, L. 1924. Anonaceae. Pp. 137-141. In: Plantae Tessmannianae peruvianae I, Mildbraed, J., *Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem* 9.

Diels, L. 1927. Anonaceae II. Pp. 169-177. In: Plantae Tessmanniae Peruvianae II, Mildbraed, J., *Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem* 10.

Doyle, J. A., P. C. Bygrave, and A. Le Thomas. 1998. Combined analyses of morphological and *rbc*L data: implications for phylogeny and morphological evolution in Annonaceae. *Annonaceae Newsletter* 12: 20-24.

Dunal, M. F. 1817. *Monographie de la famille Anonacées*. Paris: Treuttel et Würtz.

Engler, A. and L. Diels. 1901. VI. Anonaceae. Pp. 1–96 [pl. 1–30] in *Monographieen Afrikanischer Pflanzen-Familien und Gattungen*, ed. Engler, A. Leipzig: Wilhelm Engelmann.

Fries, R. E. 1900. Beiträge zür Kenntnis der Süd-Amerikanischen Anonaceen. *Kungliga Svenska Vetenskapsakademiens Handlingar* 34(5): 1-59.

Fries, R. E. 1930. Revision der Arten einiger Annonaceen-Gattungen I. *Acta Horti Bergiani* 10: 1-128.

Fries, R. E. 1931. Revision der Arten einiger Annonaceen-Gattungen II. *Acta Horti Bergiani* 10: 129-341.

Fries, R. E. 1934. Revision der Arten einiger Annonaceen-Gattungen III. *Acta Horti Bergiani* 12: 1-220.

Fries, R. E. 1937. Revision der Arten einiger Annonaceen-Gattungen IV. *Acta Horti Bergiani* 12: 221-288.

Fries, R. E. 1938. Annonaceae. In Macbride, J. F. Flora of Peru. *Publications of the Field Museum of Natural History, Botanical Series* 13: 700–766.

Fries, R. E. 1939. Revision der Arten einiger Annonaceen-Gattungen V. *Acta Horti Bergiani* 12: 289-577.

Fries, R. E. 1947. Die Annonaceen der vierten Regnellschen Expedition. *Arkiv för Botanik* 33A: 1–20.

Fries, R. E. 1948. New or noteworthy Annonaceae from tropical America. *Kungliga Svenska Vetenskapsakademiens Handlingar* Ser. 3, 24(10): 3-20.

Fries, R. E. 1950. Three new species of Annonaceae from northern South America. *Arkiv för Botanik* 1: 445–451.

Fries, R. E. 1952. A new *Xylopia* from Suriname (Annonaceae). *Acta Botanica Neerlandica* 1: 243.

Fries, R. E. 1957. New species of Annonaceae from the Upper Amazon Basin. *Arkiv för Botanik* 3: 599–606. (“1956”)

Fries, R. E. 1959. Annonaceae. Pp. 1-171 in *Die natürlinchen Pflanzenfamilien*, ed. 2, 17aII, eds. Engler, A. and K. Prantl. Berlin: Duncker und Humblot.

Heusden, E. C. H. van. 1992. Flowers of Annonaceae: morphology, classification, and evolution. *Blumea Supplement* 7: 1–218.

Holmgren, P., D. Johnson, J. A. Kallunki, S. Keller, N. Murray, J. F. Pruski, and M. A. Wetter. 1985. *Index to specimens filed in the New York Botanical Garden Vascular Plant Type Herbarium.* New York: Meckler Publishing.

Hooker, J. D. and T. Thomson. 1855. *Flora Indica*, vol. 1. London: W. Pamplin.

Hooker, J. D. and T. Thomson. 1872. *The Flora of British India*, vol. 1, part 1. London: L. Reeve & Co.

Jarvis, C. E., F. R. Barrie, D. M. Allan, and J. L. Reveal. 1993. A list of Linnaean generic names and their types. *Regnum Vegetabile* 127: 1-100.

Johnson, D. M. and N. A. Murray. 2018. A revision of *Xylopia* L. (Annonaceae): the species of Tropical Africa. *PhytoKeys* 97: 1–252.

Kirkbride Jr., J. H. 2007. A 19th Century Brazilian botanical dictionary. *Taxon* 56(3): 927–937.

Kuntze, O. 1891. *Revisio generum plantarum*, Pars 1. Leipzig: Arthur Felix.

Lamarck, J. B. A. P. M. de. 1785. *Encyclopédie méthodique. Botanique,* vol. 1. Paris: Chez Panckoucke.

Linnaeus, C. 1759. *Systema Naturae*. v. 2. 10. ed. Stockholm: Impensis Direct Laurentii Salvii.

Linnaeus filius, C. 1782. *Supplementum plantarum Systematis Vegetabilium Editionis decimae tertiae, Generum Plantarum Editionis sextae, et Specierum Plantarum Editionis secundae. Editum a Carolo a Linné*,...Brunsvigae [Brunswick]: Imprensis Orphanotrophei. (“1781”)

Lobão, A. Q. 2016. Flora das cangas da Serra dos Carajás, Pará, Brasil: Annonaceae. *Rodriguésia* 67(5): 1205-1209.

Maas, P. J. M., E. C. H. van Heusden, J. Koek-Noorman, A. K. van Setten, and L. Y. T. Westra. 1986. Studies in Annonaceae VII. New species from the Neotropics and miscellaneous notes. *Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen, Series C, Biological and Medical Sciences* 89(3): 249–278.

Maas, P. J. M., H. Kamer, L. Junikka, R. Mello-Silva, and H. Rainer. 2002. Annonaceae from Central-eastern Brazil. *Rodriguésia* 52(80): 61-94. (“2001”)

Maas, P. J. M., J. Koek-Noorman, and L. Y. T. Westra. 1993. Studies in Annonaceae XVIII. New species from the Neotropics and miscellaneous notes. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 115: 77-95.

Maas, P., A. Lobão, and H. Rainer. 2015. Annonaceae. In: Lista de Espécies da Flora do Brasil. Jardim Botânico do Rio de Janeiro. Available from: <http://floradobrasil.jbrj.gov.br/jabot/floradobrasil/FB110555> (last accessed June 2018).

Maas, P. J. M., L. Y. T. Westra, H. Rainer, A. Q. Lobão, and R. H. J. Erkens. 2011. An updated index to genera, species, and infraspecific taxa of Neotropical Annonaceae. *Nordic Journal of Botany* 29: 257-356.

Maas, P. J. M., L. Y. T. Westra, L. W. Chatrou, N. Verspagen, H. Rainer, N. A. Zamora, and R. H. J. Erkens. 2019. Twelve new and exciting Annonaceae from the Neotropics. *PhytoKeys* 126: 25–69.

Macbride, J. F. Flora of Peru. *Publications of the Field Museum of Natural History, Botanical Series* 13(2): 700–766.

Maciel, J. R., A. Sánchez-Tapia, M. F. de Siqueira, and M. Alves. 2017. Palaeodistribution of epiphytic bromeliads points to past connections between the Atlantic and Amazon forests. *Botanical Journal of the Linnean Society 183: 348–359.*

Martius, C. F. P. 1841. Annonaceae. Pp. 1-64 in *Flora brasiliensis*, vol. 13, ed. C. F. P. Martius. Lipsiae: apud Frid. Fleischer in Comm.

Moraes, P. L. R. 2012. Linnaeus's Plantæ Surinamenses revisited. *Phytotaxa* 41: 1-86.

Mori, S. A., B. M. Boom, and G. T. Prance. 1981. Distribution patterns and conservation of eastern Brazilian coastal forest tree species. *Brittonia* 33: 357-370.

Morrone, J. J. 2014. Biogeographical regionalization of the Neotropical region. *Zootaxa* 3782: 1–110.

Necker, N. J. de. 1790. *Elementa Botanica*, Tomus II. Paris: Typis Societatis Typographicae Neowedensis.

Oliver, D. 1868. *Flora of tropical Africa*, Volume 1. London: L. Reeve and Co.

Plukenet, L. 1691. *Phytographia.* London: T. Osborne and J. Shipton in Gray's-Inn.

Poiret, J. L. M. 1808. *Xylopia setosa*. P. 812 in: *Encyclopédie méthodique. Botanique.* 8. ed. Lamarck, J. B. A. P. M. Paris: Chez H. Agasse.

Pombo, M. M., D. M. Johnson, L. W. Chatrou, and C. E. Zartman. 2017. *Xylopia annoniflora* (Annonaceae): a new species from central Amazonia. Phytotaxa 317(2): 131-136.

Pontes, A. F., and R. Mello-Silva. 2005. Annonaceae do Parque Nacional da Serra da Canastra, Minas Gerais, Brasil. *Boletim de Botânica da Universidade de São Paulo* 23: 71-84.

Quantum GIS Development Team. 2018. Quantum GIS Geographic Information System. Open Source Geospatial Foundation Project. Aavailable from: https://qgis.org. (last accessed June 2018).

Radford, A. E., W. C. Dickison, J. R. Massey, and C. R. Bell. 1974. *Vascular plant systematics*. New York: Harper & Row.

Richard, A. 1841. Anonaceae. Pp. 27-56, in *Histoire physique, politique et naturelle de l'Ile de Cuba. Botanique, plantes vasculaires*, ed. Sagra, R. de la. Paris: Arthur Bertrand. ("1845")

Richardson, J. E., L. W. Chatrou, J. B.Mols, R. H. J. Erkens, and M. D. Pirie. 2004. Historical biogeography of two cosmopolitan families of flowering plants: Annonaceae and Rhamnaceae. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences* 359: 1495–1508.

Safford, W. E. 1913. *Pseudannona*, a new genus of Annonaceae from the Mascarene Islands; together with notes on *Artabotrys uncinatus* and its synonymy. *Journal of the Washington Academy of Sciences* 3: 16–19.

Sandwith, N. Y. 1930. Contributions to the flora of tropical America III. Annonaceae collected by the Oxford University Expedition to British Guiana, 1929. *Bull. Misc. Inform.* 1930: 466-480.

Sagot, P. A. 1881. Catalogue des Plantes Phanérogames et Cryptogames Vasculares de la Guiane Française. Anonaceae. *Annales des sciences naturelles. Botanique et biologie végétale.* Ser. 6, t. 11: 134-139. ("1880")

Saint-Hilaire, A. F. C. P. de. 1825. Anonaceae. Pp. 28-43 in *Flora Brasiliae Meridionalis*, vol. 1. Paris, apud A. Belin.

Spruce, R. 1861. On the mode of branching of some Amazon trees. *Journal of the proceedings of the Linnean Society. Botany* 5: 3-14.

Stafleu, F. A., and R. S. Cowan. 1976. *Taxonomic literature: a selective guide to botanical publications and collections with dates, commentaries and types*, vol. 1: A-G, ed. 2, Regnum Vegetabile 94. Utrecht: Bohn, Scheltema and Holkema.

Stafleu, F. A., and R. S. Cowan. 1983. *Taxonomic literature: a selective guide to botanical publications and collections with dates, commentaries and types*, vol. 4: P-Sak, ed. 2, Regnum Vegetabile 110. Utrecht and Antwerpen: Bohn, Scheltema and Holkema.

Stafleu, F. A., and R. S. Cowan. 1985. *Taxonomic literature: a selective guide to botanical publications and collections with dates, commentaries and types*, vol. 5: Sal-Ste, ed. 2, Regnum Vegetabile 112. Utrecht and Antwerpen: Bohn, Scheltema and Holkema.

Steyermark, J. A., P. J. M. Maas, P. E. Berry, D. M. Johnson, N. A. Murray, and H. Rainer 1995. Annonaceae. Pp. 413–469 in Flora of the Venezuelan Guayana, vol. 2., eds. Steyermark, J. A., P. E. Berry, and B. K. Holst. St Louis: Missouri Botanical Garden.

Stull, G. W., D. M. Johnson, N. A. Murray, T. L. P. Couvreur, J. E. Reeger, and C. M. Roy. 2017. Plastid and seed morphology data support a revised infrageneric classification and an African origin of the Pantropical genus *Xylopia* (Annonaceae). *Systematic Botany* 42: 211-225.

Thiers, B. 2019. [continuously updated] *Index Herbariorum: A global directory of public herbaria and associated staff.* New York Botanical Garden's Virtual Herbarium. Available from: http://sweetgum.nybg.org/science/ih/ (last accessed April 2019).

Thomas, D. C., L. W. Chatrou, G. W. Stull, D. M. Johnson, D. J. Harris, U. Thongpairoj, and R. M. K. Saunders. 2015. The historical origins of palaeotropical intercontinental disjunctions in the pantropical flowering plant family Annonaceae. *Perspectives in Plant Ecology, Evolution and Systematics* 17: 1–16.

Turland, N. J., J. H. Wiersema, F. R. Barrie, W. Greuter, D. L. Hawksworth, P. S. Herendeen, S. Knapp, W.-H. Kusber, D.-Z. Li, K. Marhold, T. W. May, J. McNeill, A. M. Monro, J. Prado, M. J. Price, and G. F. Smith (eds.). 2018. *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile* 159. Glashütten: Koeltz Botanical Books.

Willdenow, C. L. 1799. *Species plantarum*, Tomus II, Part II, Editio quarta. Berlin: Impensis G. C. Nauk.

TABLE 1. Initial hypothesis of *Xylopia brasiliensis* and *X. frutescens* complexes, and the current circumscription of these species and allies (Source: Pontes-Pires et al. in preparation, Manuscript 1).

INITIAL HYPOTHESIS		**CURRENT CIRCUMSCRIPTION**
X. brasiliensis **complex**	***X. frutescens*** **complex**	***X. amazonica***
X. amoena	***X. amazonica***	***X. brasiliensis***
X. brasiliensis	***X. densiflora***	***X. discreta***
X. calophylla	***X. discreta***	***X. frutescens***
X. micans	***X. frutescens***	***X. ligustrifolia***
X. pittieri	***X. ligustrifolia***	***X. pittieri***
X. pulcherrima	***X. polyantha***	*X. amoena* syn. nov.
	X. sericea	*X. calophylla* syn. nov.
	X. trichostemon	*X. micans* syn. nov.
		X. pulcherrima syn. nov.
		X. polyantha
		X. densiflora syn. nov.
		X. sericea
		X. trichostemon

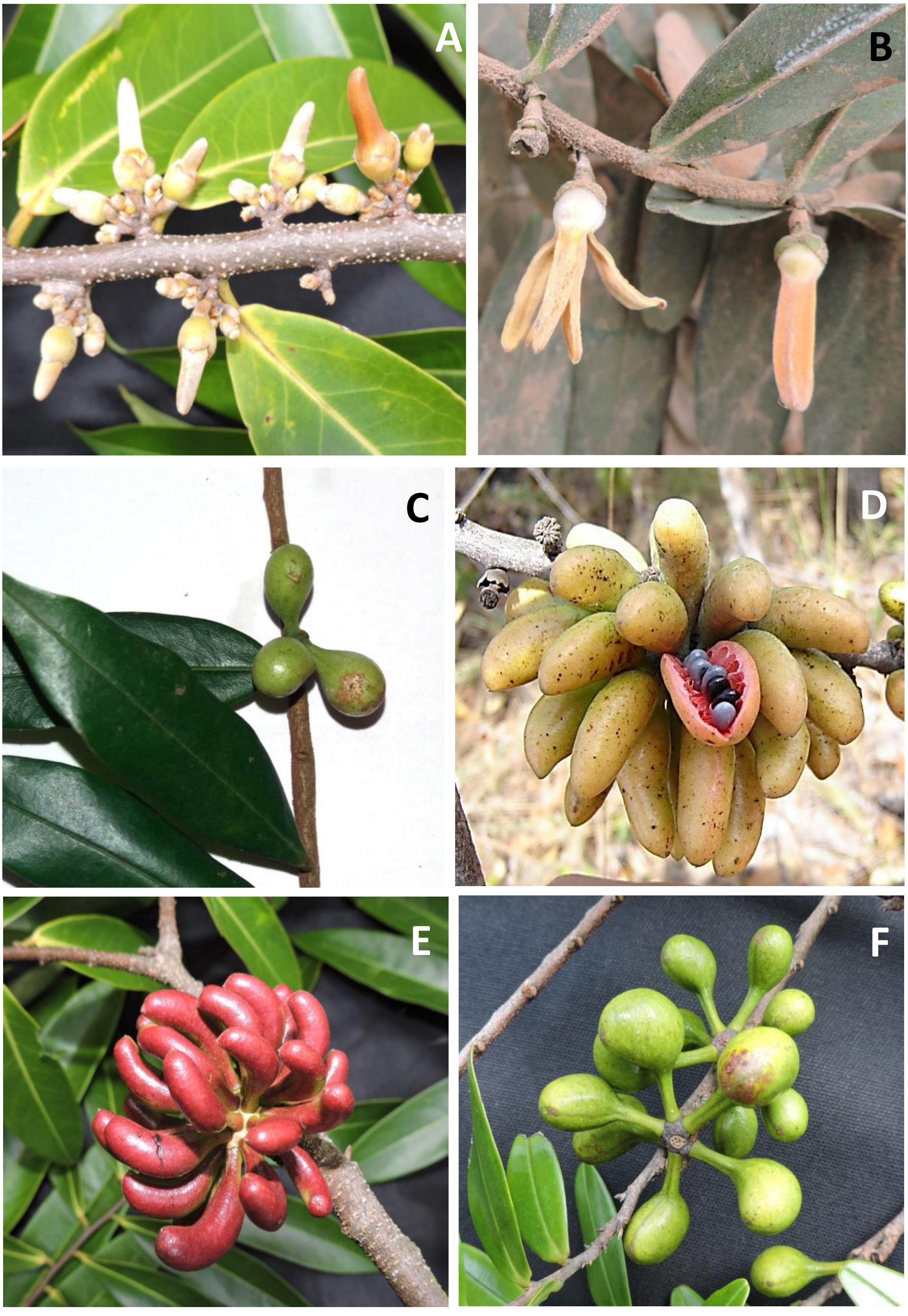
A
B
C
D
E
F

FIG. 1. Buds, flower, fruits, monocarps, and seeds. A, E. *Xylopia cayennensis.* B, F. *X. emarginata.* C. *X. amazonica.* D. *X. aromatica.* F. *X. emarginata.* A: *A. F. Pontes-Pires et al. 934*; B: *A. F. Pontes-Pires et al. 954*; C: *A. F. Pontes-Pires et al. 981*; E: *A. F. Pontes-Pires et al. 929*; F: *A. F. Pontes-Pires et al. 927*. Photos by A. F. Pontes-Pires.

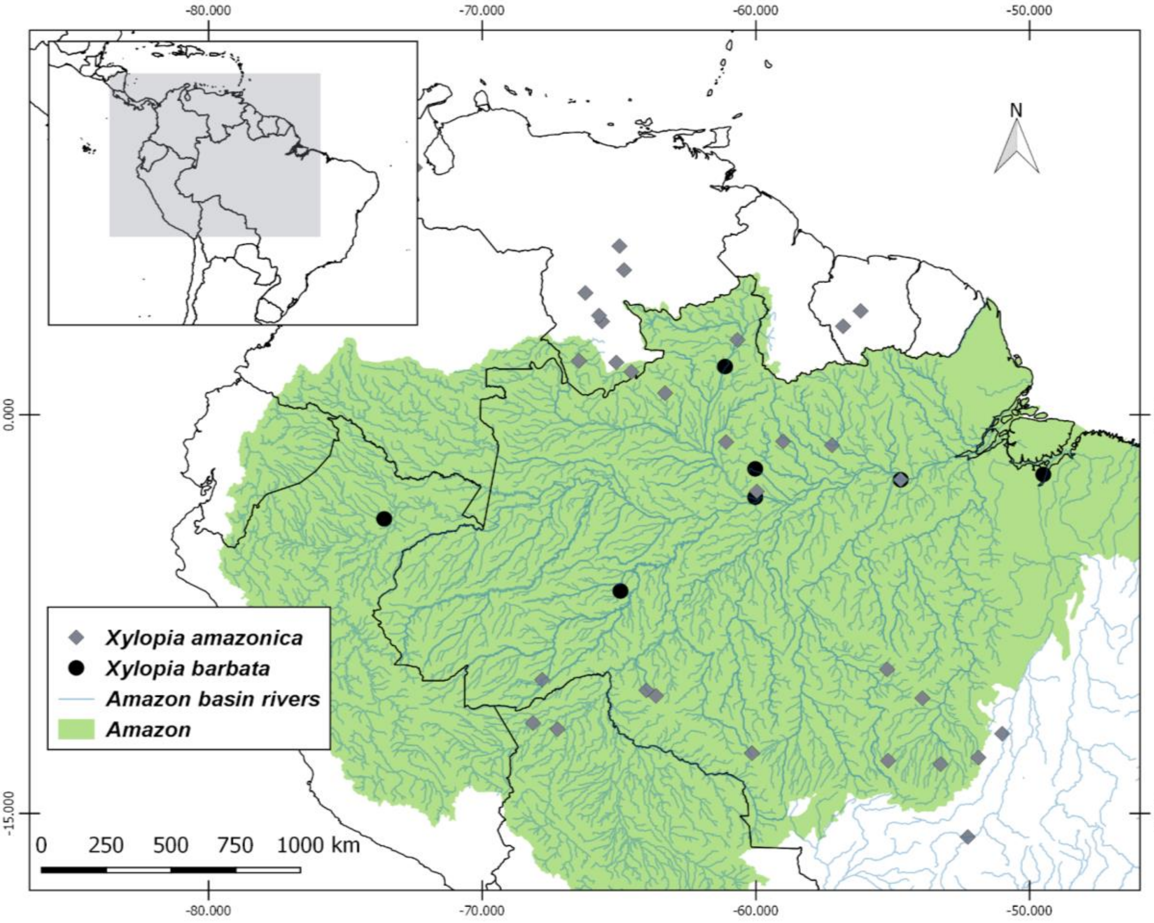

FIG. 2. Geographic distribution map showing the localities of occurrence for *Xylopia amazonica* and *X. barbata*.

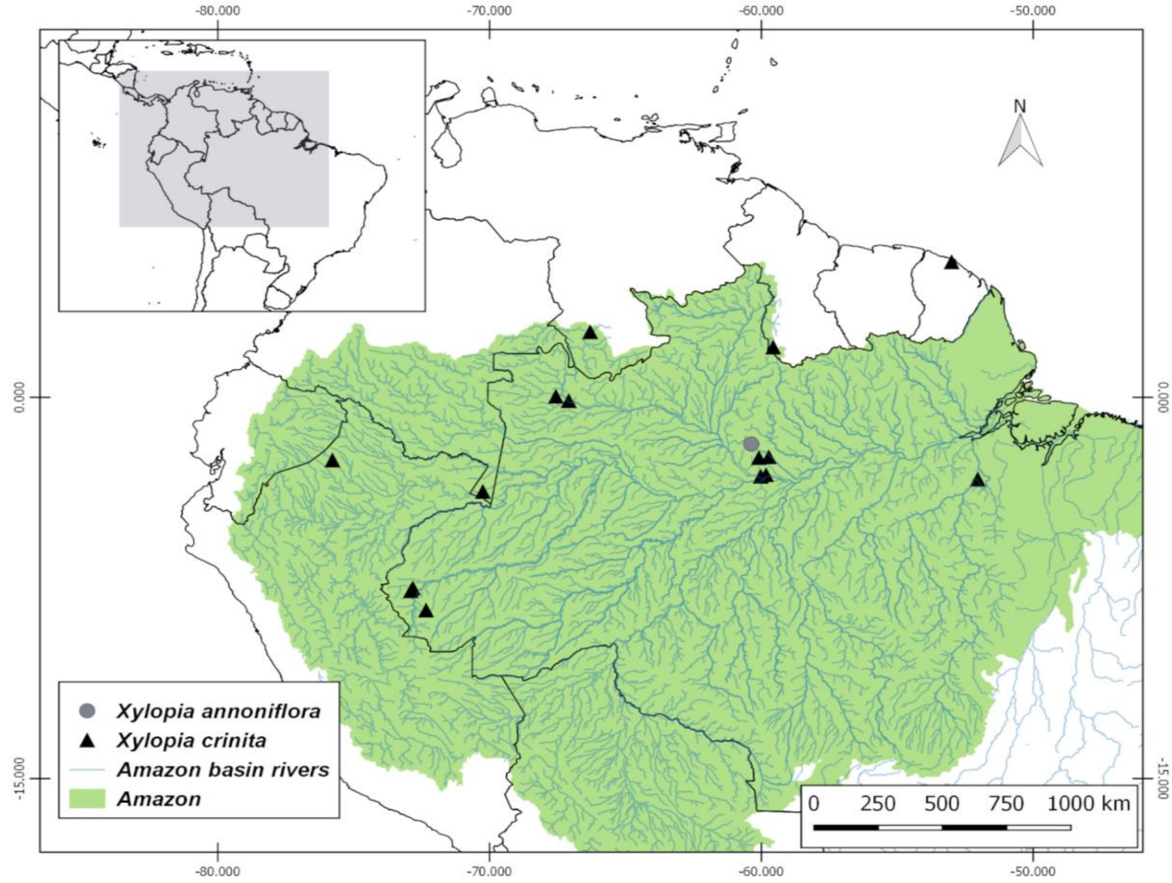

FIG. 3. Geographic distribution map showing the localities of occurrence for *Xylopia annoniflora* and *X. crinita.*


A
B
C
D
E
F

FIG. 4. Buds and flowers. A. *Xylopia aromatica.* B. *X. polyantha*. C. *X. benthamii* var. *benthamii*. D. *X. ochrantha*. E. *X. frutescens* var. *frutescens*. F. *X. frutescens* var. *ferruginea.* B: *A. F. Pontes-Pires et al. 921* (JPB); C: *A. F. Pontes-Pires et al. 919* (JPB); D: *A. F. Pontes-Pires et al. 949*; E: *A. F. Pontes-Pires et al. 941*; F: *A. F. Pontes-Pires et al. 937*. Photos by A. F. Pontes-Pires.

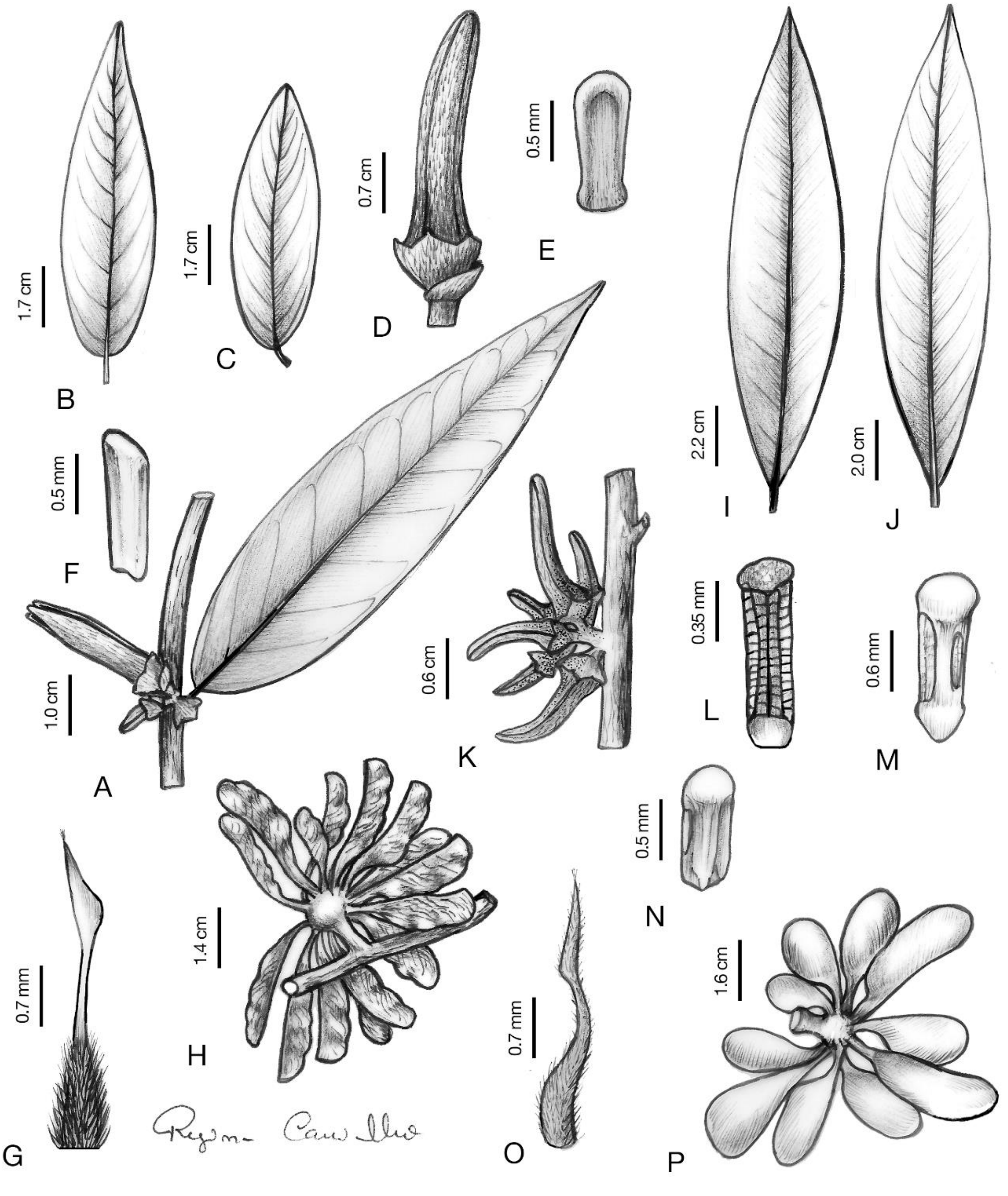

FIG. 5. A-H. *Xylopia aromatica*. A. Branch with leaf and inflorescence. B-C. Leaves (variation of shape, length and width). D. Flower bud. E-F. Outer staminodes. G. Carpel. H. Fruit with monocarps. I-P. *Xylopia cayennensis*. I. Leaf (abaxial surface). J. Leaf (adaxial surface). K. Inflorescence. L. Fertile stamen. M. Outer staminode. N. Inner staminode. O. Carpel. P. Fruit with monocarps. A, C-D: *P. G. Windisch et al. 7130* (RB); B, H: *J. A. Ratter & R. A. de Castro 170* (RB); E-G: *A. F. Pontes-Pires & F. R. Borges 891* (JPB); I, J, L-O: *A. F. Pontes-Pires et al. 934* (JPB); K: *A. F. Pontes-Pires & R. A. Pontes 952* (JPB); P: *T. van Andel et al. 2209* (NY).

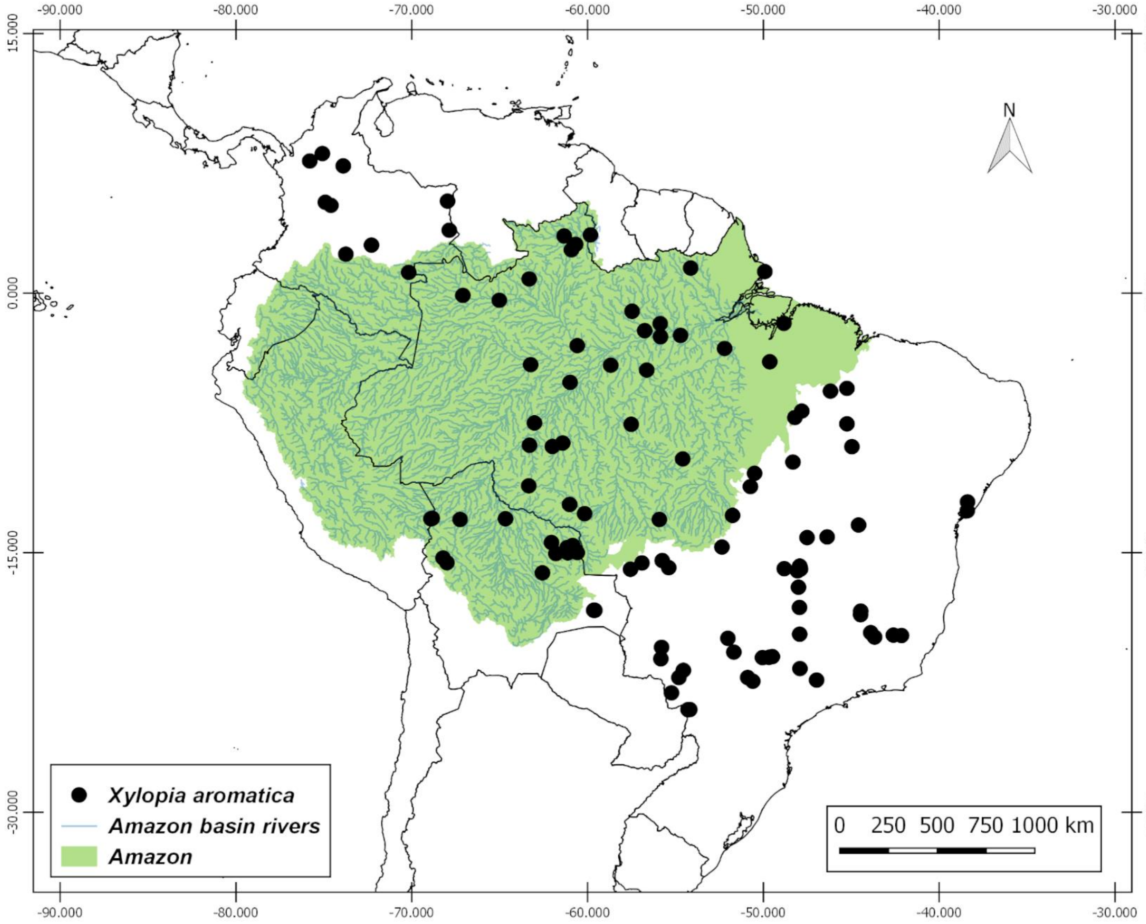

FIG. 6. Geographic distribution map showing the localities of occurrence for *Xylopia aromatica.*

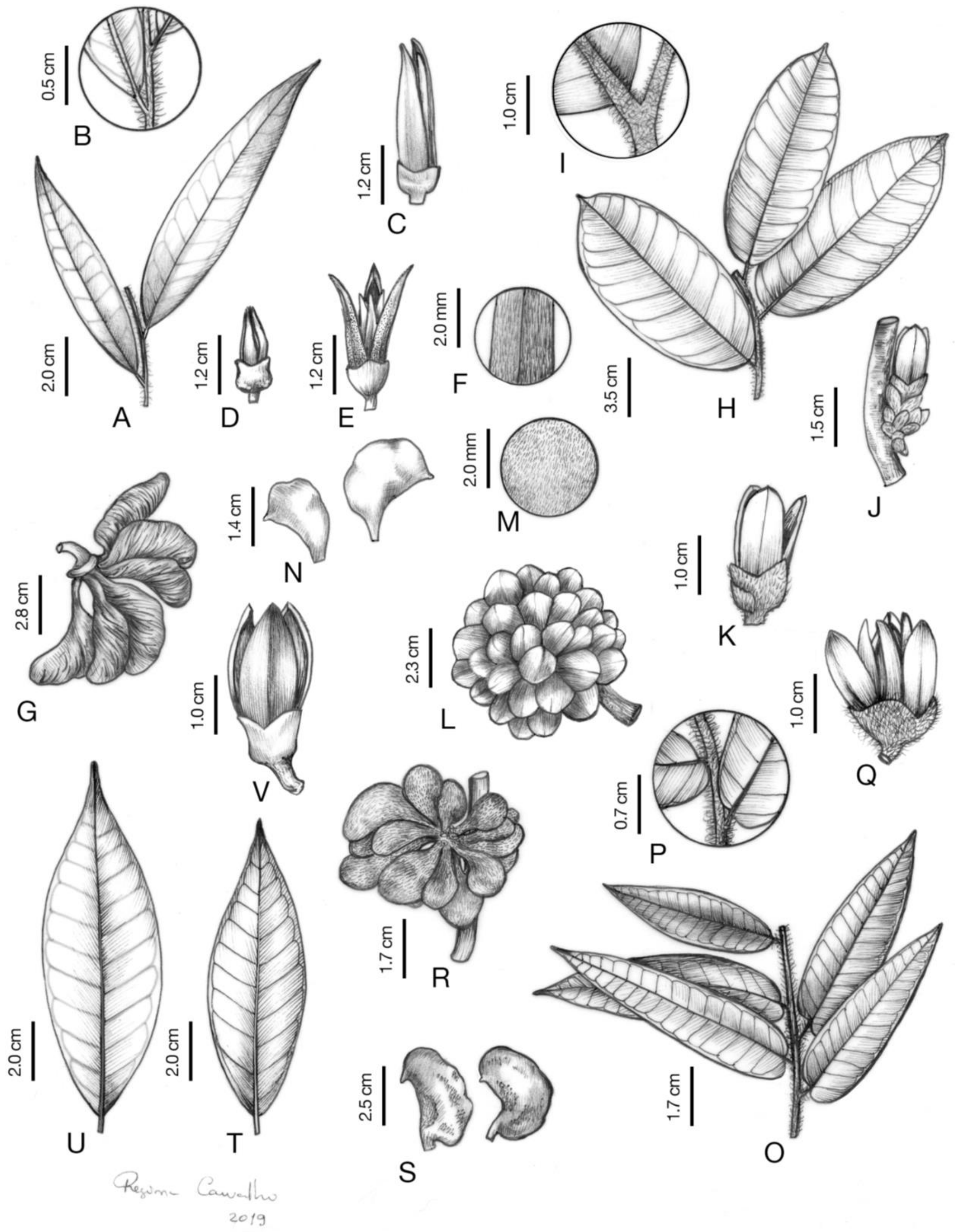

FIG. 7. A-C, G. *Xylopia benthamii* var. *benthamii*. A. Portion of the branch with leaves (abaxial surface). B. Detail of the indument on the branch. C. Flower opening. G. Fruit with monocarps. D-F. *Xylopia benthamii* var. *ulei*. D. Flower bud. E. Flower. F. Detail of the indument on the abaxial surface of the outer petals. H-N. *Xylopia excellens*. H. Portion of the branch with leaves (abaxial surface). I. Detail of the indument on the branch. J. Inflorescence. K. Flower opening. L. Fruit with monocarps. M. Detail of the indument on the monocarps surface. N. Monocarps (lateral view). O-S. *Xylopia crinita*. O. Branch with leaves. P. Detail of the indument on the branch. Q. Flower. R. Young fruit with monocarps. S. Mature monocarps. T-V. *Xylopia xylantha*. T. Leaf

(abaxial surface). U. Leaf (adaxial surface). V. Flower opening. A-B: *J. Pruski et al 3223* (MO); C: *D. Clarke 1417* (US); D-F: *T. B. Croat et al. 84505* (MO); G: *R. Vásquez & N. Jaramillo 13026* (MO); H-J: *A. Ducke 23902* (RB), isotype; K: *A. Ducke 23902* (S), holotype; L-N: *A. Ducke 23902* (RBCarpo 1117); O-P: *J. M. Pires 683* (INPA), isotype; Q: *J. M. Pires 683* (IAN), holotype; R: *D. Sabatier & M. F. Prevost 4359* (NY); S: *G. T. Prance et al. 3100* (NY); T-V: *B. A. Krukoff 8750* (US-00074232), isotype.

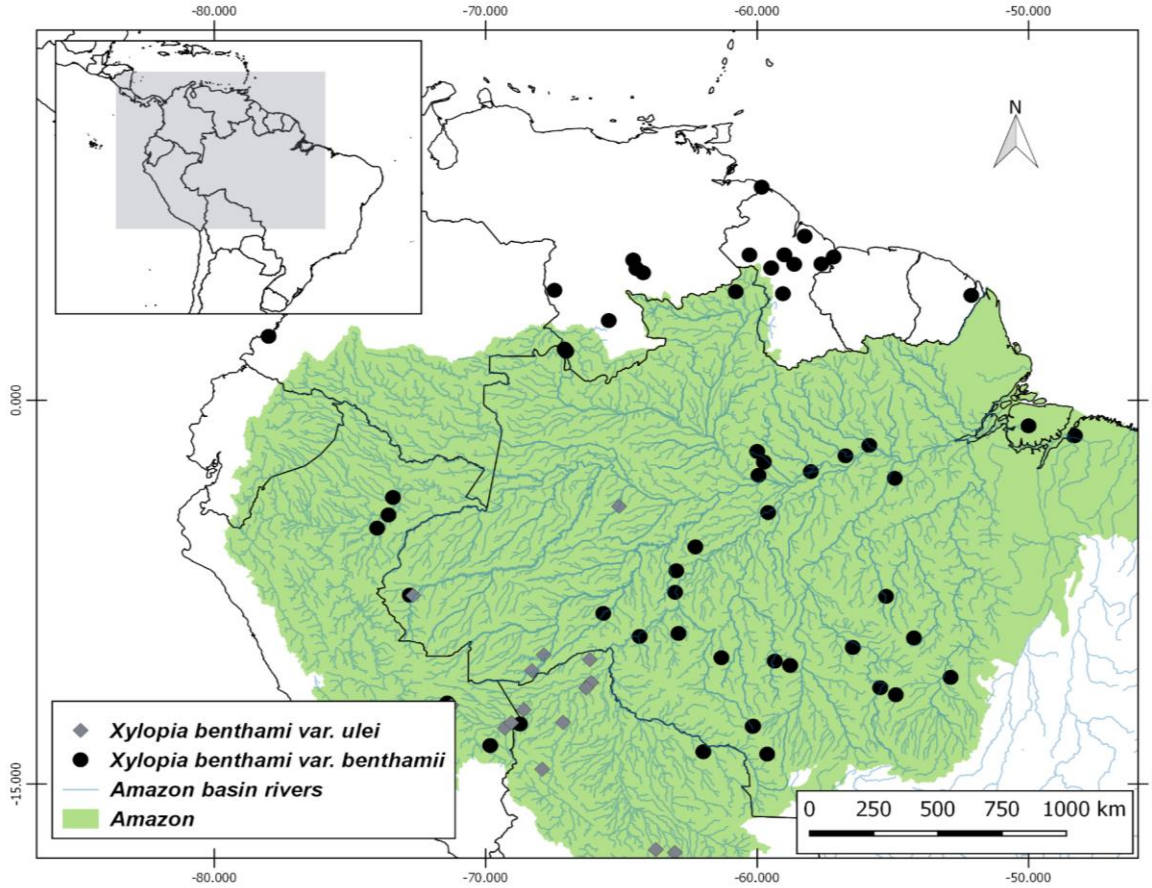

FIG. 8. Geographic distribution map showing the localities of occurrence for *Xylopia benthamii* var. *benthamii* and *X. benthamii* var. *ulei*.

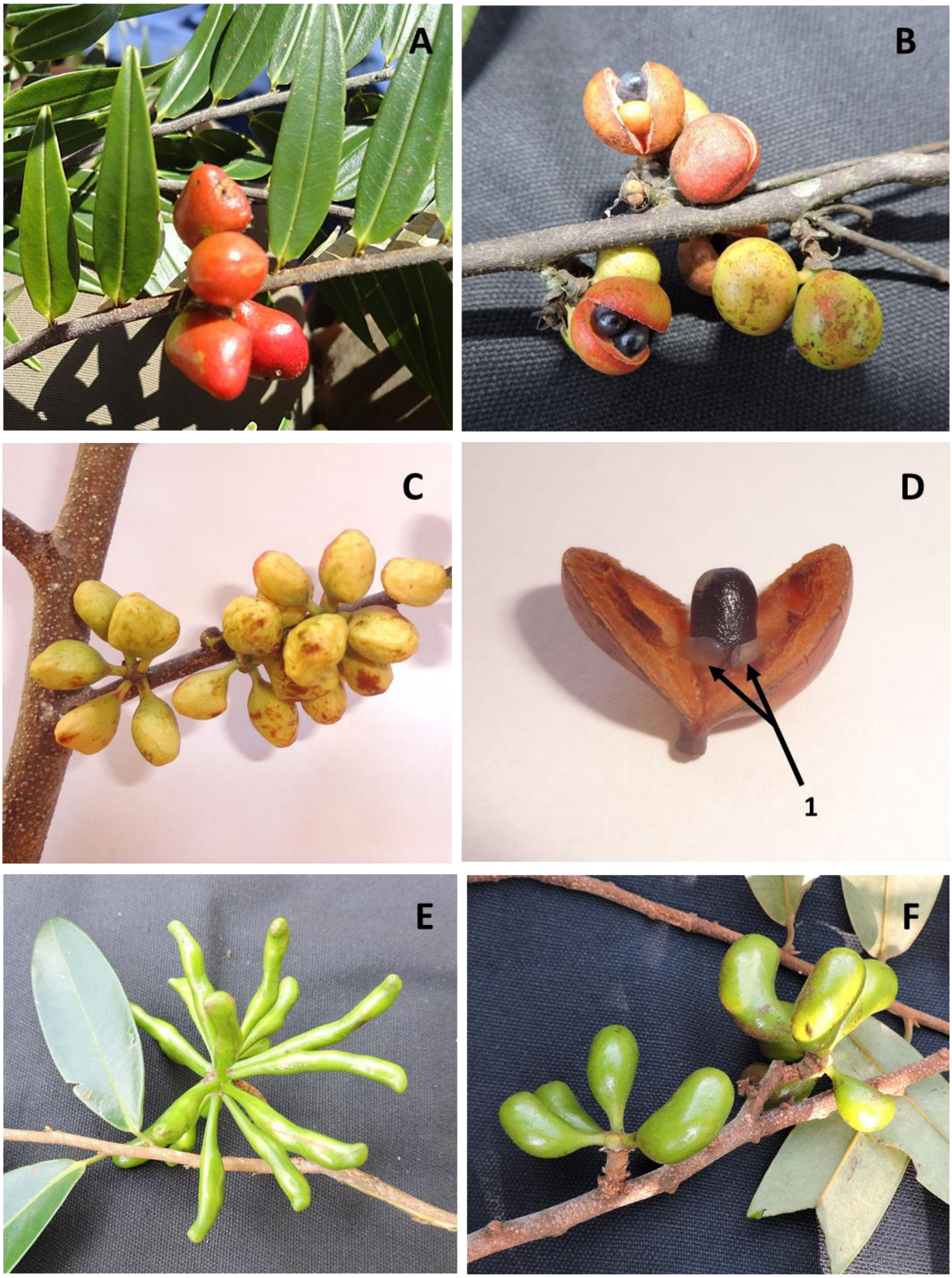

FIG. 9. Fruits, monocarps, and seeds. A. *Xylopia discreta*. B. *X. frutescens* var. *ferruginea*. C-D. *X. frutescens* var. *frutescens*. E. *X. nitida*. F. *X. pittieri*. A: *A. F. Pontes-Pires et al. 977*; B: *A. F. Pontes-Pires et al. 932*; C-D: *A. F. Pontes-Pires et al. 946*; E: *A. F. Pontes-Pires et al. 933*; F: *A. F. Pontes-Pires et al. 928*. 1 = aril bilobed. Photos by A. F. Pontes-Pires.

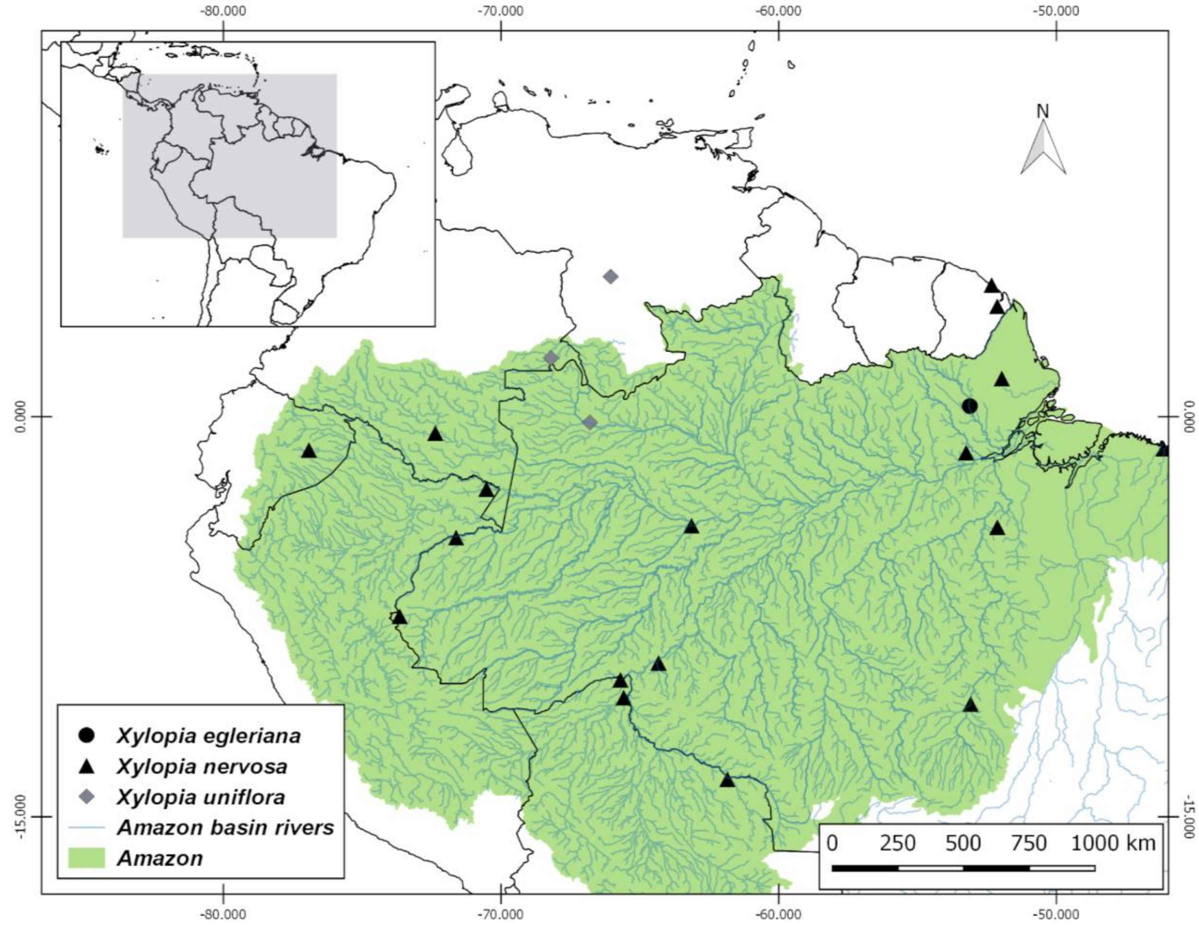

FIG. 10. Geographic distribution map showing the localities of occurrence for *Xylopia egleriana*, *X. nervosa* and *X. uniflora*.

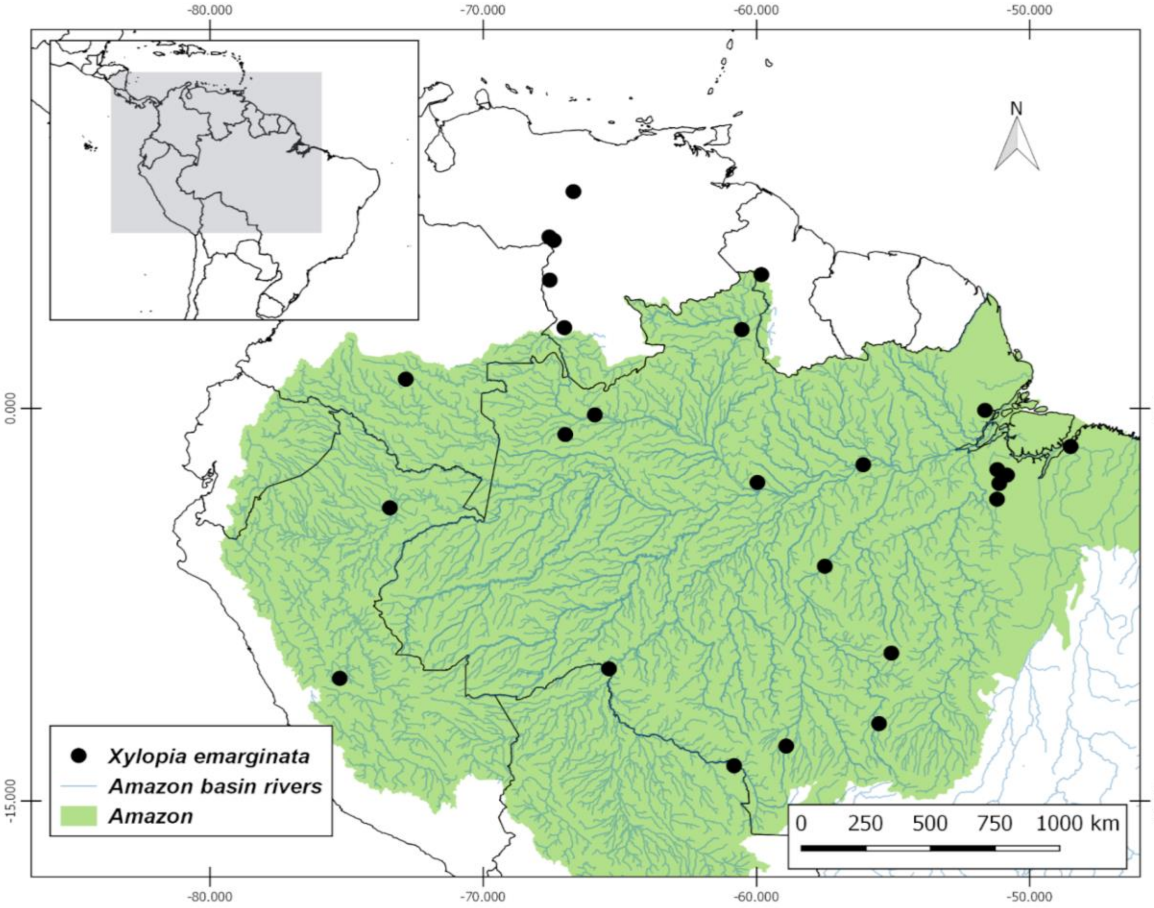

FIG. 11. Geographic distribution map showing the localities of occurrence for *Xylopia emarginata*.

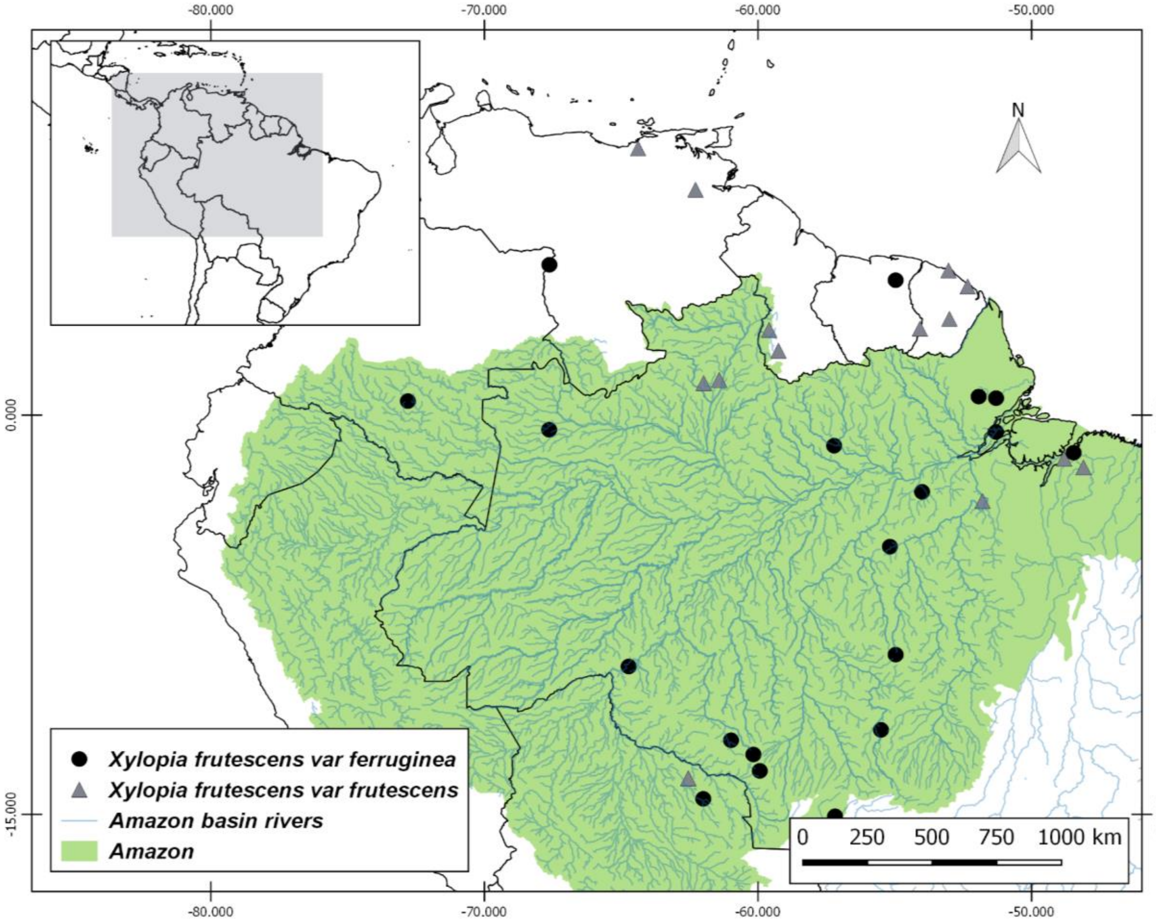

FIG. 12. Geographic distribution map showing the localities of occurrence for *Xylopia frutescens* var. *frutescens* and *X. frutescens* var. *ferruginea.*

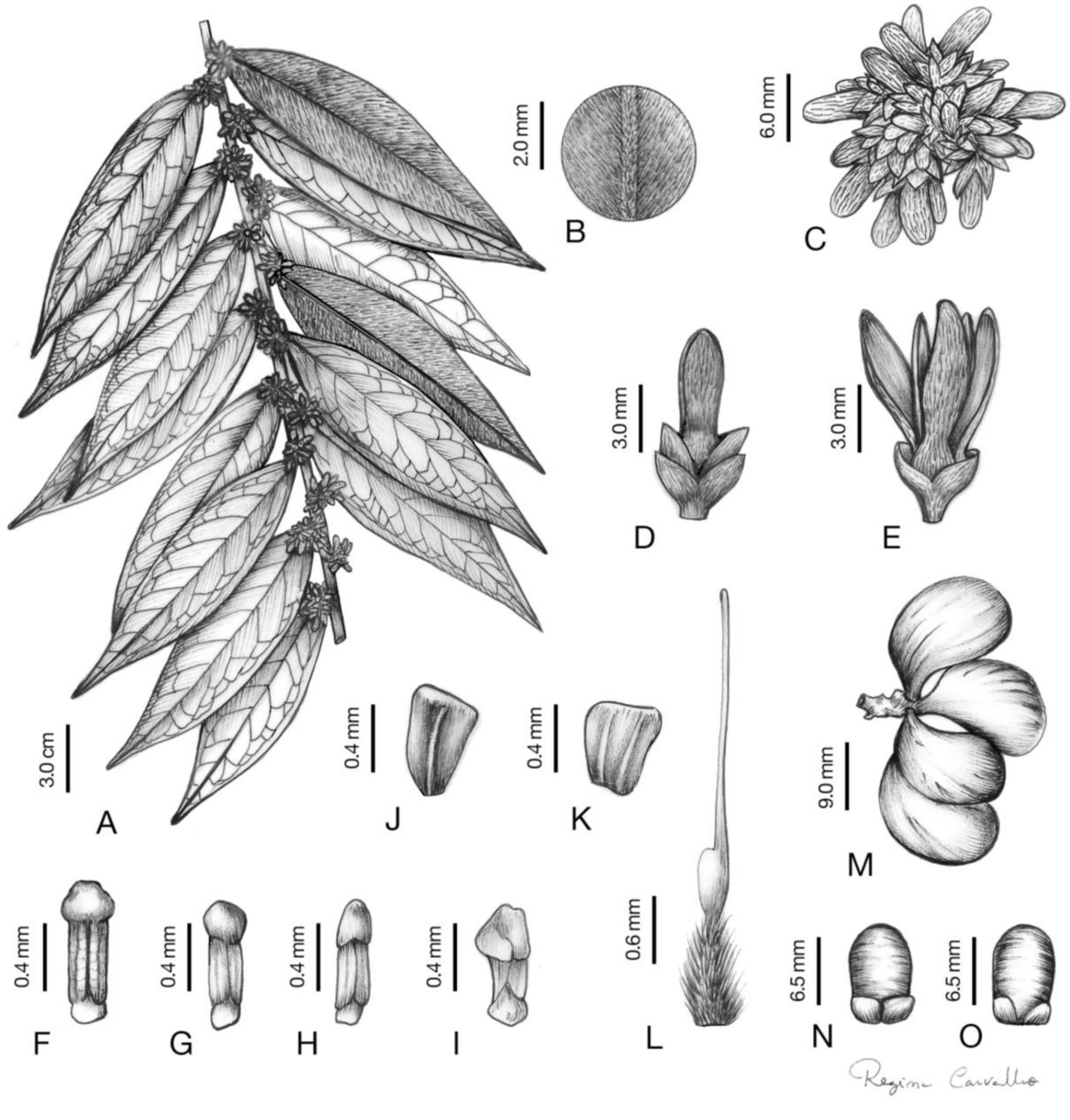

FIG. 13. *Xylopia glomerulosa*. A. Branch with leaves and inflorescences. B. Detail of the indument on the abaxial face of a leaf from the branch. C. Detail of the glomerular inflorescence. D. Flower bud, with bilobed middle bract persistent. E. Flower at the beginning of anthesis. F. Fertile stamen. G-I. Outer staminodes. J-K. Inner staminodes. L. Carpel. M. Fruit with monocarps. N. Seed with bilobed aril, ventral view. O. Seed with bilobed aril, dorsal view. A-B: *C. Grández & N. Jaramillo 2873* (MO), holotype; C: *R. Vásquez et al. 14382* (MO); D, G-I, L: *C. Grández & N. Jaramillo 2873* (OWU), isotype; E: *R. Vásquez & N. Jaramillo 14514* (MO); F, J-K: *R. Vásquez et al. 14382* (OWU); M: *R. Vásquez & N. Jaramillo 8598* (MO); N-O: *R. Vásquez & R. Rojas 22716* (MO, sheet 2).

FIG. 14. Geographic distribution map showing the occurrence localities of *Xylopia glomerulosa*.

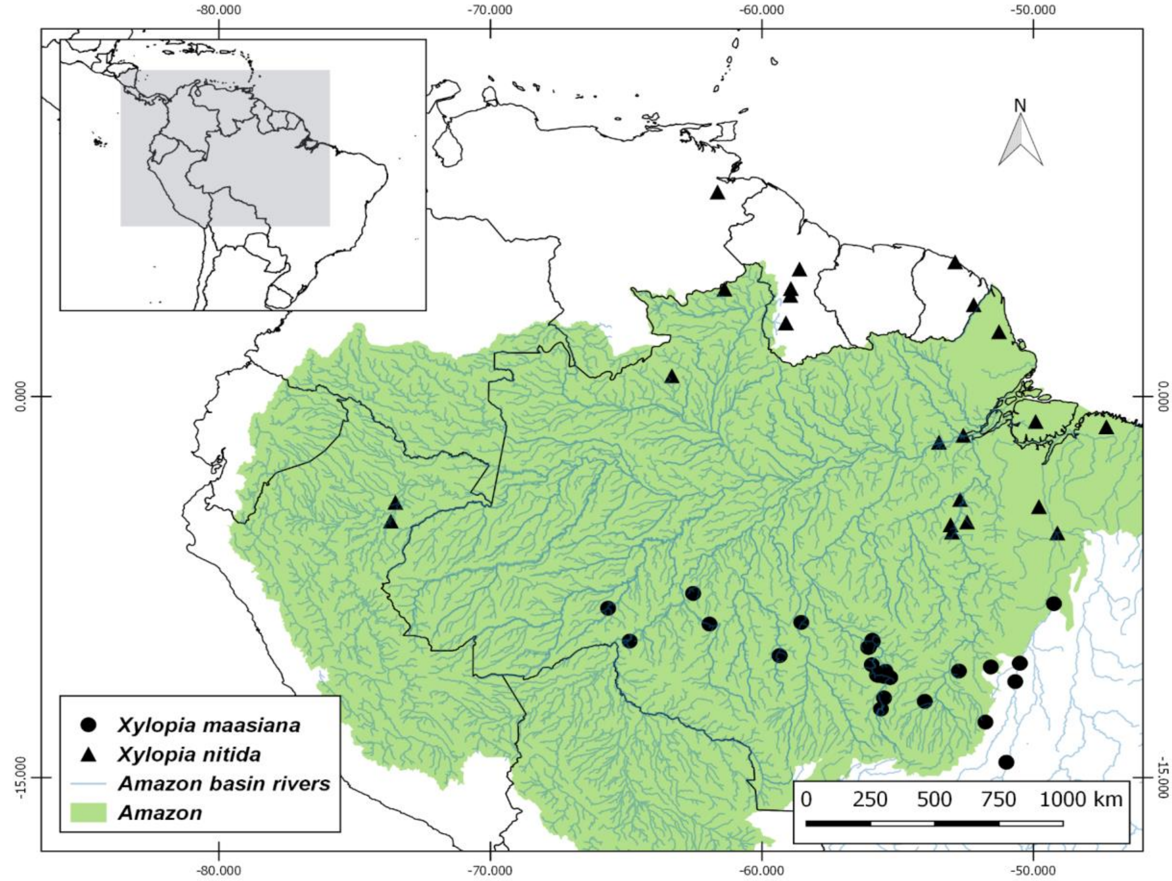

FIG. 15. Geographic distribution map showing the localities of occurrence for *Xylopia maasiana* and *X. nitida*. (Source: Pontes-Pires et al. in prep.)

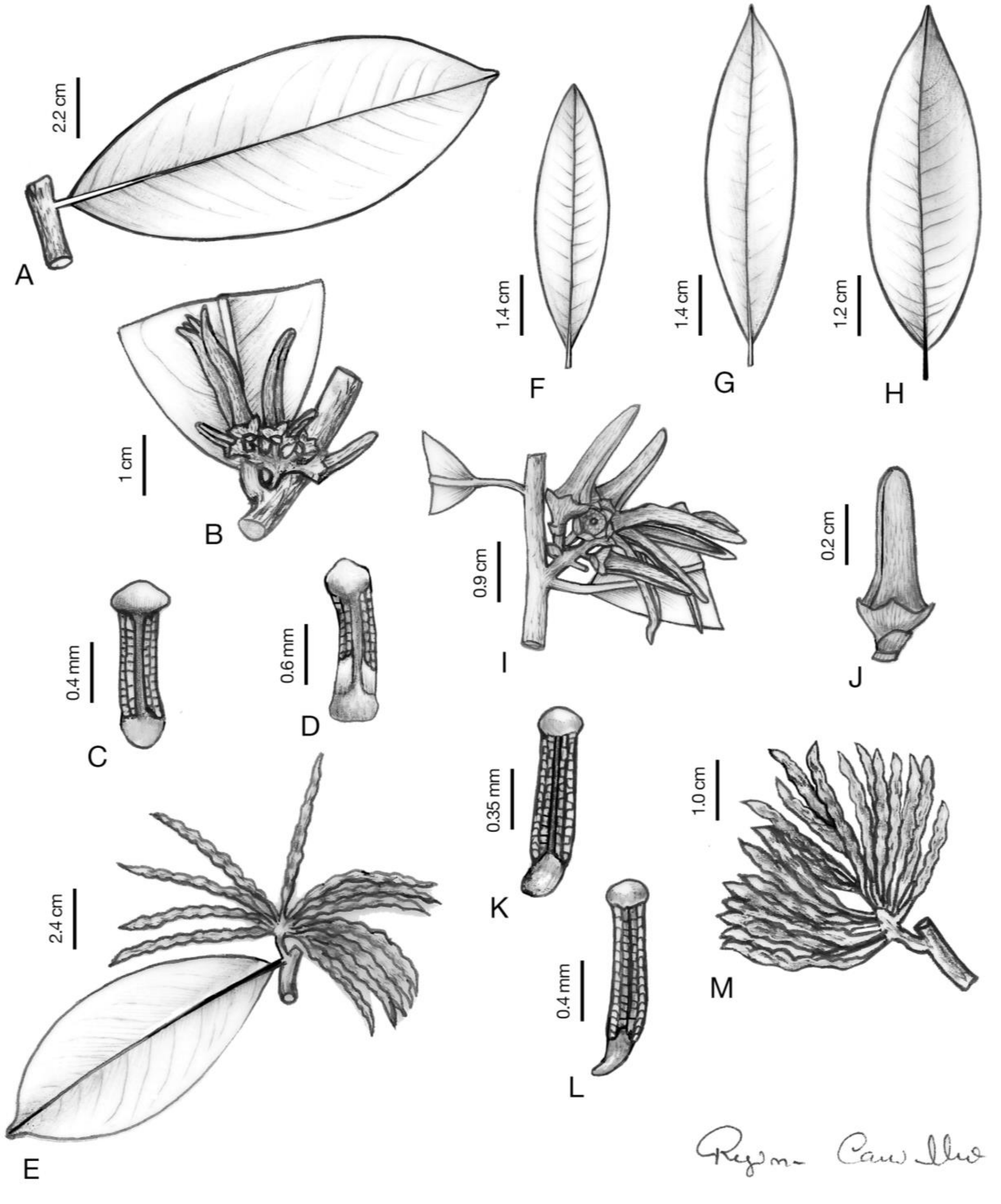

FIG. 16. A-E. *Xylopia multiflora*. A. Portion of the branch with one leaf (abaxial surface). B. Inflorescence. C. Fertile stamen. D. Outer staminode. E. Portion of the branch with fruit with monocarps. F-M. *Xylopia nitida*. F, H. Leaves (adaxial surface). G. Leaf (abaxial surface). I. Inflorescence. J. Flower bud. K-L. Fertile stamens. M. Fruit with monocarps. A: *A. L. S. da Silva et al. 629* (RB); B: *G. T. Prance et al. 13972* (NY); C-D: *A. A. Santos & J. F. Lacerda Jr. 3418* (INPA); E: *L. O. A. Teixeira et al. 1297* (RB); F: *P. J. M. Maas et al. 7512* (RB); G, J: *B. G. S. Ribeiro & O. C. Nascimento 68* (IAN); H, M: *R. L. Fróes 23508* (RB); I: *S. Mori et al. 22201* (NY); K-L: *V. F. Kinupp s.n.* (INPA 208836).

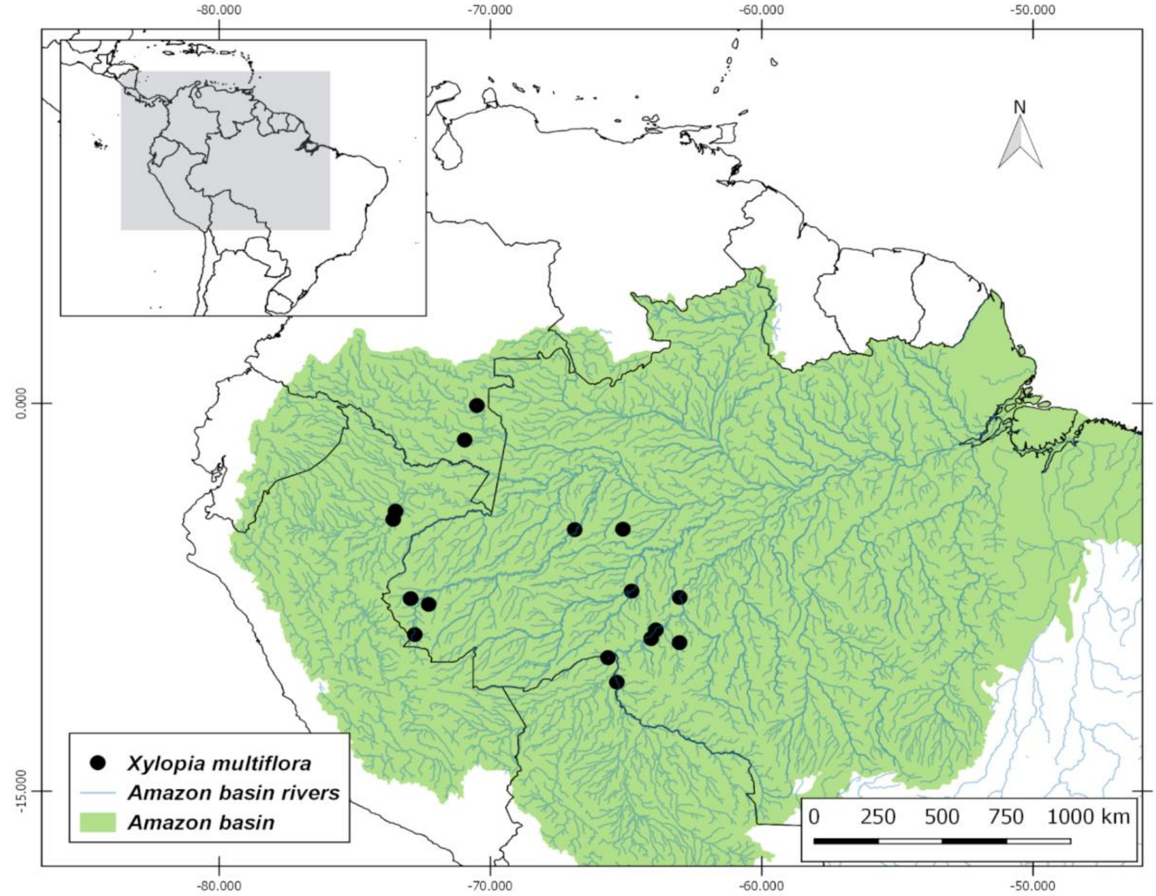

FIG. 17. Geographic distribution map showing the localities of occurrence for *Xylopia multiflora*.

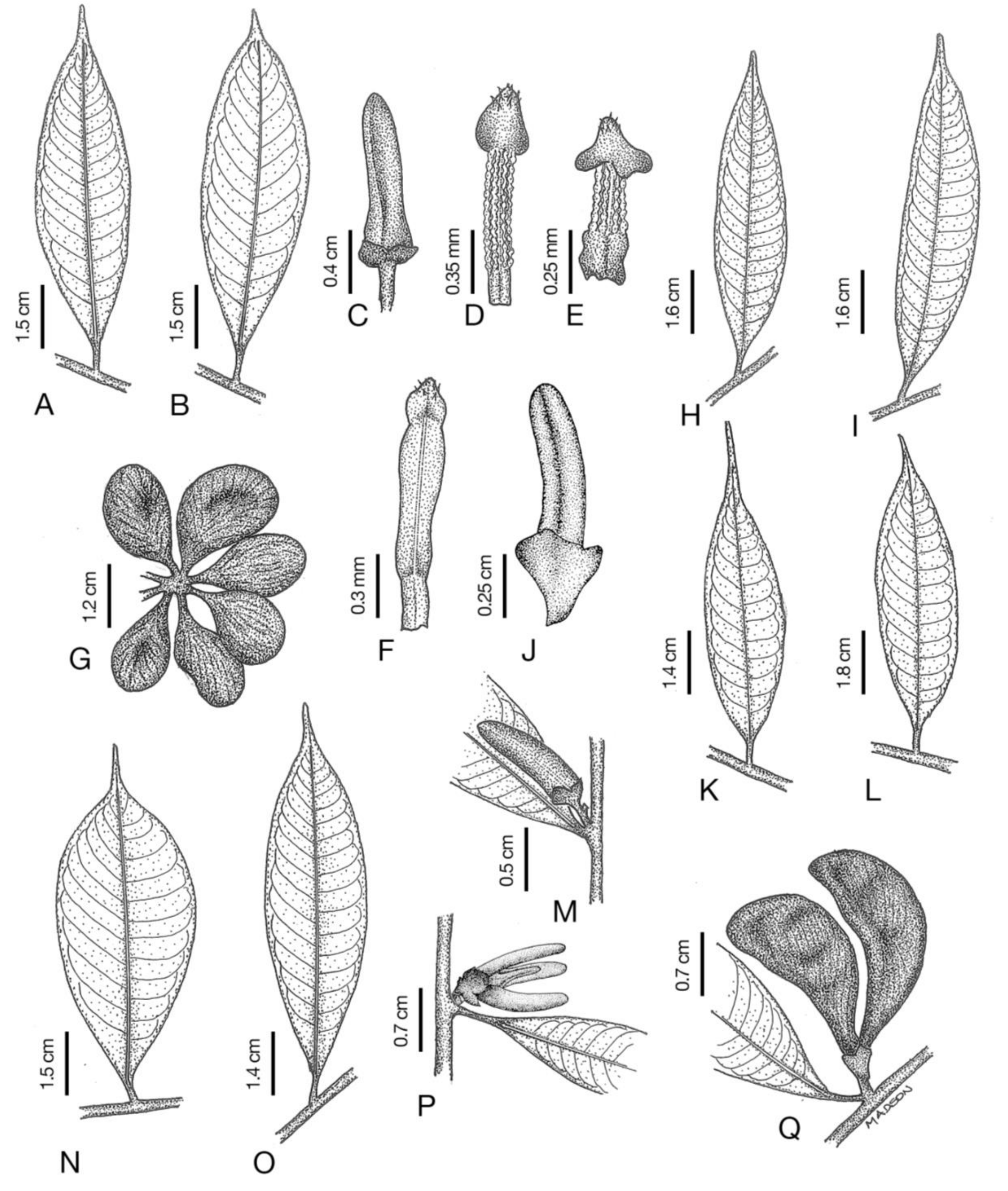

Fig. 18. A-G. *Xylopia trichostemon*. A. Leaf (abaxial surface). B. Leaf (adaxial surface). C. Flower bud. D. Fertile stamen. E. Inner staminode. F. Outer staminode. G. Fruit with monocarps. H-J. *Xylopia surinamensis*. H-I. Leaves (adaxial surface). J. Flower bud. K-M. *Xylopia nervosa*. K-L. Leaves (adaxial surface). M. Flower bud in the axil of the leaf. N-Q. *Xylopia uniflora*. N-O. Leaves (abaxial surface). P. Solitary flower in the axil of the leaf. Q. Fruit with monocarps. A-B: *J. J. Pipoly et al. 12327* (B); C-F: *J. J. Pipoly et al. 12327* (OWU); G: *R. Vásquez & N. Jaramillo 11712* (MO); H: *Wood Herbarium Surinam 139* [*G. Stahel*] (NY), isolectotype; I: *T. B. Croat & G. Ferry 102314* (MO), isolectotype; J: *Wood Herbarium Surinam 139* [*G. Stahel*] (OWU), isolectotype; K: *M. F. Prevost 1873* (U digital image); L-M: *J. M. Pires et al. 50840* (MG); N: *S. Madriñan & C. Barbosa 974* (MO); O-P: *A. Ducke s.n.* (RB 29017), isotype; Q: *S. Madriñan & C. Barbosa 974* (U).

3.3.9 Appendix 1. List of Exsiccatae— Specimens are listed alphabetically by the name of the first collector, followed by the collection number, or herbarium number when collection number is unavailable, and the number of the accepted species in the taxonomic treatment is in parentheses.

A. A. Abraham 309 (5a); *M. L. Absy 2* (3); *P. Acevedo-Rodríguez et al. 5699* (3); *D. D. Ackerly 158* (3), *183* (3); *M. Aguilar & D. Castro 503* (3), *693* (5a); *M. Aguilar et al. 1139* (25); *J. G. S. Alarcón & E. F. Barbosa 12* (28), *40* (28); *A. L. K. M. Albernaz 148* (4); *M. Alexiades 1195* (5b); *S. Altamirano & H. Ramos 4104* (11); *S. Altamirano et al. 3330* (30); *I. L. do Amaral 843* (3), *1132* (3), *1214* (5a), *1436* (3), *1445* (3); *I. L. Amaral et al. 308* (15); *T. van Andel et al. 2209* (6); *W. R. Anderson 7244* (3), *10708* (3); *Anonymous collector 5949* (3); *S. A. Antoniazzi et al. s.n.*, 10 Sep 2014 (17); *T. M. Antonio 4695* (3); *W. G. D'Arcy & T. M. Antonio 13511* (3); *A. Araújo et al. 9* (8); *A. Araújo M. et al. 906* (1), *3050* (28); *W. G. D'Arcy & J. J. D'Arcy 6804* (3); *A. L. Arbeláez 814* (28); *N. Arévalo & M. P. Díaz 1* (23), *77* (23), *80* (23), *98* (18); *G. C. G. Argent 6778* (1); *P. A. C. L. Assunção 115* (11), 729 (25); *G. Aymard 8005* (9); *G. Aymard & L. Delgado 6889* (5a), *8201* (5a); *G. Aymard et al. 9938* (1), *9885* (28), *12654* (5a).

B. W. 4378 (13b); *V. P. Baca & W. Inuma 88* (8); *T. R. Bahia 107* (12), *137* (16); *C. F. Baker 3694* (3); *W. L. Balée & B. G. Ribeiro* 265 (19); *L. Barrabé & F. Crozier 80* (13a); *C. Barbosa et al. 8167* (13b); *E. Barbosa & J. M. Silva 1640* (3); *H. de M. Bastos 44* (1); *J. P. Battisti et al. s.n.*, 11 Aug 2015 (17); *S. G. Beck & R. Haase 9924* (3); *H. Beltran & R. Foster 502* (7); *A. M. Benko-Iseppon 373* (4); *C. C. Berg et al. P18474* (30), *P18553* (5a), *P19802* (17); *R. Bernal et al. 808* (3); *L. C. Bernacci 2326* (17); *A. L. Bernardi 6775* (25); *P. Berry & G. Aymard 7511* (23); *N. C. Bigio et al. 1672* (17), *1847* (5a); *G. A. Black 47-1171A* (4), *51-13909* (1), *55-18756* (4); *C. Blanco 758* (13a); *K. E. Blum & J. D. Dwyer 2473* (3); *K. E. Blum & E. L. Tyson 1865* (3), *1970* (3); *J. Blydenstein & C. Saravia T. 919* (3); *J. G. W. Boher 1889* (3); *J. Bóno 5181* (3); *B. Boom 4936* (1); *B. Boom & M. Grillo 6279* (3); *B. Boom & S. Wentzel 6624* (30); *P. I. S. Braga & J. R. Nascimento 3306* (19); *D. S. de Brito et al. 34* (3); *J. M. de Brito & P. A. C. L. Assunção 160* (15); *N. L. Britton et al. 2408* (3), *6725* (3); *W. E. Broadway 5214* (3); *A. Z. Bronholi et al. s.n.*, 30 Oct 2014 (3); *M. L. Brotto 63* (3); *M. L. Brotto & F. Marinero 467* (3); *J. de Brujin 1122* (28), *1563* (28); *B. S. Bunting et al. 11505* (1).

I. Cabrera R. 767 (25); *A. Chaviel 464* (30); *R. Callejas & O. Marulanda 6904* (3), *6952* (3); *R. Callejas et al. 9375* (28); *D. G. Campbell et al. 6625* (28), *8146* (19); *D. Cárdenas & J. Manaidego 4238* (19); *D. Cárdenas et al. 2685* (28), *18871* (18); *J. M. Cardiel et al. 1049* (11); *F. Cardoso et al. s.n.*, 1 Apr 2000 (20); *L. M. M. Carreira 544* (3); *J. G. Carvalho Sobrinho et al. 943* (31), *963* (5a); *A. Castilho 2308* (11), *3893* (11); *M. Castro et al. 43* (3); *W. Castro et al. 3* (5a); *P. A. Cavalcante 617* (3); *T. B. Cavalcanti et al. 36* (3); *C. E. Cerón & N. Gallo 5161* (15); *L. Chacon 614* (3); *L. W. Chatrou et al. 310* (3), *399* (25), *410* (8), *416* (19), *447* (5b), *454* (5b); *A. Chaviel 155* (3); *C. A. Cid Ferreira 3963* (5a), *4078* (3), *5739* (12), *6733* (5a), *10073* (7), *10660* (7); *C. A. Cid Ferreira & J. Lima 3594* (15); *C. A. Cid Ferreira & B. W. Nelson 2841* (8); *C. A. Cid Ferreira et al. 282* (31), *483* (5a), *795* (2), *1617* (5a), *1922* (5a), *2441* (3), *4321* (3), *4392* (13b), *4440* (3), *4495* (13b), *4730* (13a), *5122* (18), *5606* (3), *5693* (3), *5853* (8), *6082* (3), *6317* (1), *6489* (1), *6512* (1), *7034* (35), *7133* (11), *7638* (3), *7767* (3), *7787* (3), *7853* (13b), *7861* (1), *8719* (1), *9064* (29), *9606* (5a), *9700* (5a), *9991* (25), *10538* (5b), *10714* (18); *D. Clarke 1417* (5a); *H. D. Clarke et al. 10858* (11); *A. F. Clewell 4587* (3); *D. Coêlho s.n.,* Feb 1974 (1); *D. Coelho & J. Coelho s.n.*, 16 Jan 1991 (20); *D. Coêlho & C. Damião 865* (1); *D. F. Coêlho & J. L. dos Santos 422* (9); *D. Coêlho & W. Volter s.n.*, May 1988 (1); *L. F. Coêlho s.n.*, 26 Aug 1955 (1); *L. S. Coêlho 56* (3); *A. Cogollo & R. Borja 2124* (28); *M. Colella & E. Guayamare 1741* (7), *2155* (31); *M. Colella et al. 1217* (3); *M. C. A. Conceição 786* (6); *M. R. Cordeiro 1061* (1); *M. D. Correa et al. 2219* (3); *R. Córtes et al. 372* (34); *R. S. Cowan & R. Foster 1292* (3); *R. S. Cowan & T. R. Soderstrom 2135* (5a); *Cremers 5127* (12); *T. B. Croat 8886* (3), *10776* (3), *11224* (3), *15183* (3), *19620* (15), *19970* (14), *19009A* (8), *44531* (3), *54064* (3), *59224* (3); *T. B. Croat & G. Ferry 102314* (32), *T. B. Croat et al. 84505* (5b); *J. S. de La Cruz 3412* (5a); *J. Cuatrecasas et al. 27533* (15); *A. Custódio Filho & M. Kirizawa 810* (3).

D. C. Daly 1087 (3); *D. C. Daly et al. 1172* (21), *3872* (12), *4026* (19), *5461* (1), *5771* (15), *7113* (8), *9936* (8), *9989* (33), *10493* (18); *G. A. Damasceno Junior et al. 3092* (3); *F. R. Dário et al. 1028* (1); *G. Davidse 5036* (3); *G. Davidse & A. C. González 1566* (11), *12449* (3), *12604* (11), *12945* (3), *12981* (3), *13854* (3), *15470* (3), *15875* (27); *16285* (3), *16313* (13a), *19492* (3); *G. Davidse & O. Huber 14902* (3); *G. Davidse & R. W. Pohl 2314* (3); *G. Davidse et al. 18397* (3), *18619* (1); *C. Davidson & G. Martinelli 10358* (3); *N. C. Dávila et al. 6151* (4); *F. Delascio 12449* (25); *F. Delascio & R. Liesner 6976* (3); *F. Delascio et al. 11199* (11); *L. Delgado 1259* (27); *P. Delprete et al. 7936* (15); *D. C. Dias et al. s.n.*, 19 Sep

2014 (17); *C. Diaz & N. Jaramillo 1336* (14); *C. Díaz & H. Ramírez 9355* (25); *W. Diaz 1103* (9); *W. Diaz & L. Delgado 669* (3); *W. Diaz & E. Marin 5924* (3); *W. Diaz et al. 4633* (5a), *6641* (3); *C. Dick 32* (1); *C. H. Dodson & J. Torres 2948* (5a); *J. van Donselaar 2810* (13b), *3080* (13b); *A. P. Duarte 19* (30), *7001* (18); *A. Ducke 2969* (3), *4848* (3), *12389* (3); *A. Ducke s.n.*, 12 Mar 1909 (4), 18 Jan 1910 (1), 17 Sep 1910 (1), 1 Jan 1915 (3), 6 Jan 1920 (5a), 30 Mar 1922 (5a), 25 Mar 1926 (4), 23 Sep 1932 (9), ; *J. A. Duke 4193* (3), *5690* (3), *5900* (3), *10423* (3), *11791* (3); *15189* (3); *A. van Dulmen & N. Matapi 131* (15); *J. D. Dwyer 4142* (3), *4210* (3), *4348* (3), *6830* (3); *J. D. Dwyer & J. H. Kirkbride Jr. 7428* (3); *B. Dubs 1665* (17); *R. Duno et al. 243* (3).

J. E. Ebinger 403 (3); *C. Ehringhaus 127* (5a), *718* (5b); *G. Eiten & L. T. Eiten 9779* (3); *G. Eiten et al. 3090* (3), *5933* (3); *S. Elcoro 200* (3); *S. Elcoro et al. 841* (27); *A. Eliceche 414* (3); *R. C. Ek 746* (20); *E. L. Ekman 14101* (3); *M. Emmerich 3753* (17), *4199* (17); *F. Encarnacíon 26047* (20); *M. E. Engels et al. 5814* (5a).

M. Fariñas et al. 314 (3); *C. Farney et al. 537* (3); *C. Faveri PSACF_EX5869* (13a); *A. Fernandes & V. Rodrigues s.n.*, 12 Apr 1984 (3); *A. Fernandez 4213* (3), *4571* (9), *7313* (5a); *A. Fernández et al. 6308* (13b), *17424* (3); *L. V. Ferreira 54* (4); *E. A. Filho & D. F. Coelho s.n.*, Sep 1965 (17); *M. Fleury 209* (3), *738* (3); *E. Foldats & J. Velazco 9132* (5a), *9243* (5a); *J. P. Folsom 3433* (3); *J. P. Folsom et al. 7767* (3); *R. Fonnegra et al. 7176* (3); *E. Forero et al. 9400* (3); *Forest Bureau 2313* (13b), *4151* (13b); *Forest Department of British Guiana WB 554* (13a); *R. C. Forzza 296* (1), *9004* (5a); *R. C. Forzza et al. 6905* (4); *R. B. Foster 11714* (8); *R. B. Foster & B. d'Achille 11950* (8); *R. B. Foster & S. Baldeon 12620* (5b); *R. B. Foster & W. A. Foster 4047* (8); *P. F. Foster et al. 398* (3), *461* (3), *804* (30); *P. Franco et al. 5920* (3); *J. C. Freitas et al. 133* (6); *R. L. Fróes 20550* (12), *23508* (20), *23870* (15), *25487* (4), *31645* (1), *33005* (11); *Y. Fujimoto 25* (3).

P. A. Garber 39 (3); *M. Garvizú & A. M. Carrión 211* (3); *T. D. Gaui 46* (7); *A. Gentry 1627* (3), *13337* (5a); *A. Gentry & Curso de Posgrado de la Universidad de San Marco 68611* (5a); *A. Gentry & D. Daly 118276* (3); *A. Gentry & P. Nuñez 69463* (3); *A. Gentry & A. Perry 77822* (18); *A. Gentry & L. Pui-Ross 14270* (3); *A. Gentry & J. Revilla 20467* (5a); *A. Gentry & D. N. Smith 45548* (3); *A. Gentry et al. 10635* (3), *19963* (11), *20990* (8), *21058* (12), *22040* (23), *22250* (8), *25933* (5a), *39469* (5a), *70213* (5b), *74058* (3), *77153* (5a); *L. J.*

Gillespie 2640 (3); *W. T. Gillis 10057* (3); *R. K. Godfrey 67333* (3); *I. Goldstein & L. Salas 275* (1); *L. L. Giacomin et al. 2983* (5); *G. Gottsberger 12-23568* (3)*; C. Grández 3050* (8); *C. Grández & N. Jaramillo 709* (5a), *4986* (11); *C. Grández & J. Ruíz 2088* (8), *2096* (12); *J. J. de Granville B-3721* (3); *J. J. de Granville et al. 9585* (13b); *J. J. de Granville et al. s.n.*, 16 Sep 1985 (3); *J. M. Greenman & M. T. Greenman 5131* (3); *Grenand 574* (3); *A. Grijalva et al. 408* (28); *E. Gudiño et al. 998* (8); *M. L. Guedes et al. 11254* (3); *R. Guillén & R. Choré 1736* (3), *2453* (3), *3589* (3); *R. Guillén & S. Coria 2130* (3); *R. Guillén & C. Medina 3704* (3), *3705* (3); *R. Guillén & Roca 4379* (3); *R. Guillén et al. 151* (3), *4427* (28); *E. Gutiérrez et al. 443, 1304* (3); *R. Gutiérrez et al. 1042* (3).

R. Hahn & R. Tredwell 78 (8); *W. J. Hahn et al. 1351* (3), *3886* (5a); *R. F. Haidar & M. Q. Matos 214* (3); *R. F. Haidar et al. 1373* (30); *B. L. Haines & M. D. Correa A. 530* (3); *C. W. Hamilton & K. Krager 3224* (3); *C. W. Hamilton & Y. Palmer 2966* (3); *B. E. Hammel 18209* (3); *R. M. Harley & R. Souza 10044* (28), *10240* (17), *10266* (1); *R. M. Harley et al. 21849* (3), *24816* (3); *G. Hatschbach 23893* (3), *23508* (3); *G. Hatschbach et al. 13329* (3), *63762* (13b); *N. Helme & L. Kruger 844* (3); *A. J. Henderson 208* (3); *A. Henderson et al. 347* (28); *G. S. Henicka et al. 91* (17); *T. W. Henkel & R. James 3567* (13a), *3827* (3); *T. W. Henkel & R. Williams 2098* (3); *T. W. Henkel et al. 2577* (3); *E. P. Heringer & G. Eiten 15114* (3); *E. P. Heringer et al. 1776* (3); *H. A. van Hermann 3275* (3); *H. Herrera 385* (3); *H. Herrera & L. Arosema 1826* (3); *C. Hexaire 3143* (23), *3759* (23), *4373* (23); *P. C. Heyligers 186* (13a); *S. R. Hill et al. 13019* (15); *B. Hoffman 1451* (3), *6198* (6); *B. K. Holst & R. Liesner 2436* (20); *B. K. Holst et al. 3411* (15); *M. J. G. Hopkins et al. 637* (9), *806* (3); *J. H. Howell 49* (3); *S. E. Hoyos-Gomez et al. 1040* (5b); *I. Huamantupa et al. 14703* (19); *O. Huber & H. Canales 405/12* (34); *A. A. Hunter & P. H. Allen 49* (3); *F. Hurtado et al. 1376* (19).

H. S. Irwin et al. 479 (3), *8695* (3), *8795* (3), *9747* (3), *13641* (3), *13914* (3), *16650* (3), *18773* (3), *24398* (3), *25166* (3), *26946* (3), *55410* (1), *55566* (3), *55845* (1); *Itaipú Binacional 693* (3); *N. M. Ivanauskas 4065* (1),

M. J. Jansen-Jacobs 1974 (3); *M. J. Jansen-Jacobs et al. 1036* (3), *3117* (9), *4892* (20), *5496* (7); *A. Jardim 2392* (1); *J. Jaramillo 14914* (23); *J. Jaramillo & E. Grijalva 11321* (15); *N. Jaramillo & N. Katip 798* (12); *A. Jardim & B. Geiser 9* (3); *A. Jardim & F. Mamani 3661*

(3); *A. Jardim et al. 38* (3); *S. Jiménez & E. Gutiérrez 1284* (3); *H. Johansen 27* (3); *I. M. Johnston 33* (3).

J. A. Kallunki & J. R. Pirani 386 (3); *R. Kayap 32* (8); *C. Kelloff 1292* (5a); *T. J. Killeen 4500* (1); *T. J. Killeen et al. 5373* (3), *5635* (3), *6923* (3), *7845* (3); *E. P. Killip & A. C. Smith 28391* (8), *28612* (8); *G. Klug 901* (8), *2845* (3), *3048* (8); *C. Knab-Vispo & G. Rodriguez 321* (9), *361* (9), *424* (9); *S. Knapp & J. Mallet 2985* (3); *S. Knapp et al. 7394* (24); *A. Knob et al. 1349* (19); *V. F. Kinupp s.n.*, 6 Apr 2000 (20); *R. Kral 69326* (3); *R. Kral et al. 71750* (3), *75766* (3); *J. Korning & K. Thomsen 47461* (8); *C. Koziski 275* (3); *A. Krapovickas & C. L. Cristóbal 34553* (3); *A. Krapovickas & A. Schinini 32703* (3), *36453* (3)*; B. A. Krukoff 4638* (8), *6426* (5a), *6486* (3), *8352* (28), *8471* (33), *8496* (15), *8930* (23); *K. Kubitzki 75-44* (15); *J. G. Kuhlmann 56* (9), *1736* (4); *L. P. Kvist et al. 166* (5a).

E. A. Lao 80 (3); *M. Lautert et al. s.n.*, 2 Oct 2014 (17); *R. L. Lazor & M. D. Correa A. 2818* (3); *N. R. Ledezma et al. 1005* (13a); *M. Lemoine 7891* (3); *W. H. Lewis et al. 13463* (5a); *R. L. Liesner 7562* (3), *8539* (12), *17839* (1), *19478* (30), *23688* (30), *23871* (30); *R. Liesner & A. González 11007* (30), *13193* (13a); *H. C. de Lima et al. 3167* (7), *6736* (18); *L. de Lima et al. 541* (33); *J. C. Lindeman & A. C. de Roon 810* (5a); *J. C. Lindeman et al. 289* (5a), *364* (5a); *J. C. Lindeman & A. C. de Roon 826* (5a), *A. Lisbôa s.n.*, 16 Aug 1909 (3); *P. L. B. Lisbôa 1405* (3); *E. L. Little 25012* (3); *E. L. Little Jr. 17585* (3); *A. Lobão et al. 858* (7); *L. C. B. Lobato et al. 1428* (28), *1755* (1), *1837* (12), *2848* (17); *R. López et al. 575* (3); *S. R. Lorie et al. 60* (12), *204* (5b), *647* (5b); *A. A. Loureiro 36* (7); *A. A. Loureiro s.n.*, 5 May 1973 (4); *F. C. A. Lucas 564* (30); *J. L. Luteyn 1443* (3).

P. J. M. Maas et al. 5953 (24), *6008* (24), *6013* (24), *6662* (3), *6812* (31), *6913* (13b), *7147* (3), *7498* (20), *7512* (20), *9026* (7); *9133* (5a), *9200* (18), *9218* (8), *9350* (19), *9631* (19), *9635* (5a); *M. Macêdo 1850* (3), *2991* (3); *M. Macedo & S. Assunção 2519* (17); *M. Macedo et al. 4165* (17); *U. N. Maciel 97* (3); *U. N. Maciel & M. R. Cordeiro 137* (4); *U. N. Maciel et al. 428* (6); *H. Magnago et al. 109* (28); *B. Maguire 24818* (1); *B. Maguire & C. K. Maguire 40038* (30); *B. Maguire et al. 35824* (3), *43861* (5a), *56094* (3), *56513* (1); *V. Maioli et al. 595* (5a), *718* (17), *777* (5a); *V. F. Mansano 602* (13b); *L. Marcano-Berti 581* (20), *222979* (3); *E. Marín 317* (5a), *346* (1), *398* (3), *897* (1), *1157* (3); *G. Martinelli et al. 7108* (5a), *7211* (5a); *O. Marulanda & S. Márquez 1826* (28); *F. D. de A. Mattos & J. Guedes 55* (12); *F. D.*

de A. Mattos et al. 65 (12); *G. Mayer 234* (19); *S. McDaniel & M. Rimachi Y. 20177* (14), *20292* (5a); *T. McDowell 1986* (3); *T. McDowell & D. Gopaul 2260* (5a); *T. McDowell et al. 2072* (20); *A. Medeiros s.n.*, Feb 2009 (1); *W. Meijer et al. 32* (3); *M. R. F. Melo 330* (3); *J. M. S. Miralha 82* (30); *J. M. S. Miralha et al. 288* (7); *A. Molina R. 14914* (3); *M. Monsalve R. 1408* (30); *A. Monteagudo et al. 4157* (11); *O. P. Monteiro s.n.*, 18 Nov 1975 (20); *O. P. Monteiro et al. 20* (15); *R. A. Montes 904* (3); *M. Moraes R. 799* (15); *M. Moraes et al. 1614* (3); *S. A. Mori 20493* (3), *22755* (6); *S. A. Mori & T. D. Pennington 17985* (6); *S. A. Mori et al. 21599* (13a), *21618* (20), *22201* (20), *24192* (20), *26484* (20); *B. Mostacedo et al. 2136* (3); *C. D. A. Mota 649* (1); *C. D. A. da Mota s.n.*, 24 Jun 1976 (23); *R. Mouzinho & L. F. Cêlho s.n.*, 4 Aug 1997 (15); *H. Murphy 274* (3); *N. A. Murray & D. M. Johnson 1475* (3), *1559* (8); *J. C. Mutis 3980* (13a).

J. R. Nascimento & M. A. S. Costa 737 (20); *J. R. Nascimento & E. da C. Pereira 540* (1); *J. R. Nascimento & J. Souza 180* (1); *O. C. Nascimento 680* (3); *A. G. Nave et al. 1370* (1), *1654* (1); *M. H. Nee 38093* (5b), *7446* (3), *8217* (3), *8896* (3), *11559* (3); *11654* (3), *39414* (5b), *38652* (3), *41548* (3); *M. Nee & E. Chávez 51619* (5a), *D. A. Neill 4065* (3), *4545* (3); *D. A. Neill et al. s.n.*, 13 Feb 1989 (23); *B. W. Nelson et al. 390* (5a); *B. W. Nelson et al. 392* (1), *397* (1); *C. H. Nelson 813* (3); *C. H. Nelson & E. Romero 4084* (3); *P. Nuñez 5897* (15); *P. Nuñez et al. 9750* (3), *11349* (5a).

R. A. Oldeman 1529 (25), *3070* (19), *B1221* (32); *B. Oldemen 1327* (25); *A. A. Oliveira et al. 136* (5a), *142* (1), *341* (1), *449* (7), *1135* (7), *1924* (7); *J. Oliveira et al. 63* (6), *192* (6), *509* (19); *R. L. Oliver et al. 3558* (3).

M. Pacheco et al. 102 (1); *P. Palacios 2543* (11); *W. Palacios 1485* (25); *B. S. Pena 695* (1); *R. O. Perdiz et al. 1024* (25), *1258* (4), *1271* (4), *1282* (4), *1286* (4), *1634* (25); *M. P. N. Pereira 119* (15); *L. A. Pereira et al. 1414* (19); *G. Pereira-Silva et al. 15543* (17), *16131* (5a); *A. J. Pérez & W. Santillán 4438* (28); *A. Perry et al. 474* (5b); *Pessoal do L.P F./Brasília 971* (20), *1147* (20), *1183* (21), *1217* (20), *1246* (20), *1270* (20), *1310* (20); *T. M. Petersen 11093* (3), *14775* (3); *D. Philcox & A. Ferreira 4368* (3); *D. Philcox et al. 3080* (3); *D. S. Pifano & M. O. D. Pivari 330* (3); *J. J. Pipoly et al. 11369* (5a), *11570* (30), *12327* (33), *12470* (8), *12697* (12), *14832* (19); *J. R. Pirani et al. 1241* (3), *1259* (28), *1265* (30); *J. M. Pires 51820* (11), *51832* (13b), *51917* (6); *J. M. Pires & P. B. Cavalcante 52003* (6), *52154*

(13b), *52683* (6); *J. M. Pires et al. 16932* (9), *50840* (19), *51447* (32), *51582* (3); *M. D. Pirie et al. 136* (24); *T. C. Plowmann et al. 9232* (3), *9597* (3); *O. Poncy et al. 1834* (20); *A. F. Pontes-Pires & F. R. Borges 891* (3), *895* (11), *905* (11); *A. F. Pontes-Pires & J. R. Lima 913* (13a); *A. F. Pontes-Pires & R. S. Mergulhão 916* (7), *918* (25); *A. F. Pontes-Pires & R. A. Pontes 952* (6), *954* (11), *964* (13b); *A. F. Pontes-Pires et al. 826* (5a), *858* (5a), *859* (5a), *883* (13b), *884* (13b), *919* (5a), *921* (28), *925* (11), *929* (6), *930* (5a), *931* (13b), *934* (6), *938* (13a), *939* (13b), *962* (11), *971* (4), *973* (25), *975* (13a), *977* (9), *978* (25); *G. T. Prance 5543* (4), *16221* (9); *G. T. Prance & T. D. Pennington 2072* (13b); *G. T. Prance & J. Ramos 7009* (18); *G. T. Prance et al. 1439* (11), *2230* (1), *3100* (7), *3940* (11), *5646* (21), *5838* (18), *5972* (18), *6535* (28), *6808* (28), *7680* (8), *8548* (11), *8671* (18), *8851* (4), *9534* (1), *10450* (3), *10932* (3), *11484* (3), *12329* (23), *13972* (18), *14195* (5a), *14205* (17), *17842* (1), *19104* (28), *20011* (9), *22802* (28), *22936* (5a), *24652* (15), *24871* (11), *24497* (15), *30052* (3), *30199* (20), *59162* (1), *59220* (30), *P17726* (11), *P25067* (1); *E. B. M. Prata et al. 461* (5a); *M. F. Prévost & P. Grenand 1999* (19); *L. C. Procópio & J. C. L. de Oliveira 432* (6); *G. R. Proctor 31801* (3); *J. Pruski et al. 3223* (5a).

R. Quevedo et al. 919 (3), *1059* (13b), *2610* (11), *2377* (26).

B. V. Rabelo et al. 2857 (6), *2985* (20); *N. Ramírez 2156* (3); *T. P. Ramamoorphy 611* (3); *A. E. Ramos 105* (3); *R. Ramos et al. 940* (3); *J. A. Ratter 5710* (3); *J. A. Ratter et al. 875* (1), *1717* (3), *4432* (17), *6883* (30); *A. F. Regnell 254* (3); *E. Rentería et al. 1993* (9); *J. Revilla 975* (8), *7049* (28); *J. Revilla & J. Forero 4209* (3); *B. G. S. Ribeiro & O. C. Nascimento 68* (20); *J. E. L. S. Ribeiro et al. 1131* (5a), *1421* (5a), *1674* (1); *Riedel 1566* (4); *L. A. M. Riley 137* (3); *M. Rimachi Y. 1788* (8), *4309* (28), *4592* (14), *5133* (5a), *8242* (5a), *9067* (14), *12012* (8); *S. B. Robbins 5938* (3); *W. A. Rodrigues 1011* (7), *4773* (3), *7249* (31), *7933* (7), *10023* (1), *10811* (31), *10903* (3); *W. A. Rodrigues s.n.*, 7 Nov 1955 (4); *W. A. Rodrigues & J. Chagas 9995* (1); *W. A. Rodrigues & J. Lima 2205* (4); *W. A. Rodrigues & D. Coêlho 10092* (1); *W. A. Rodrigues et al. 10600* (1); *S. Rojas & R. Zúñiga 185* (3); *G. A. Romero & E. Melgueiro 2016* (3); *R. Romero-Castañeda 8347* (3); *N. A. Rosa & M. R. Santos 1817* (25), *1947* (17); *C. S. Rosário et al. 1136* (1); *C. S. Rosário et al. s.n.*, 11 Apr 2013 (3); *A. Rosas Jr. et al. 329* (5a); *W. W. Rowlee 92* (3); *J. Ruan & J. Mendoza 520* (14); *A. Rozza et al. 449* (17), *498* (17), *506* (30); *A. Rudas et al. 3799* (7); *J. Ruíz 513* (14); *J. Ruíz & H. Murphy 219* (12); *H. H. Rusby 1225* (3).

D. Sabatier & M. F. Prevost 2210 (20), *3032* (20), *4202* (6), *4359* (7); *M. Saldias & L. Arroyo 3563* (3); *M. Saldias & J. C. Cornejo 1062* (3); *R. P. Salomão et al. 991* (1), *1343* (11); *T. M. Sanaiotti s.n.*, 1 Jul 1989 (4); *L. Sanchéz 500* (11); *J. C. Sandino 3999* (3); *N. Y. Sandwith 353* (5a); *E. Sanoja 168* (3), *982* (3), *1262* (3); *E. Sanoja et al. 3327* (27); *A. A. Santos & J. F. Lacerda Jr. 3418* (18); *A. A. Santos et al. 3509* (13b), *3586* (18); *E. A. Santos 1063* (13a); *J. U. Santos 858* (1); *J. U. Santos et al. 263* (3); *M. R. Santos 38* (1), *607* (1); *G. dos Santos et al. 637* (4); *J. L. dos Santos 278* (3), *731a* (3)*; J. L. dos Santos & S. Souza 216* (8)*; J. U. M. dos Santos & C. S. Rosário 445* (3), *R. R. de Santos & R. Souza 1177* (1); *L. F. Sardelli et al. s.n.*, 5 Sep 2014 (17); *D. Sasaki et al. 79* (17), *1294* (17), *2328* (1); *G. E. Schatz et al. 1000* (3), *1010* (3); *R. J. Schmalzel 1824* (3), *1950* (3); *R. Schnell 12236* (9); *J. P. Schulz 7993* (13b); *R. S. Secco et al. 156* (3); *A. S. L. da Silva et al. 629* (18)*; A. S. L. da Silva & M. C. da Silva 2406* (20); *E. L. S. Silva 723* (3); *J. A. Silva et al. 735* (3), *784* (28); *M. Silva 2157* (28); *M. Silva & R. Souza 2375* (21), *2459* (21); *M. F. Silva et al. 740* (18); *M. G. Silva & A. Pinheiro 4275* (25); *M. R. Silva 509* (3); *M. R. Silva et al. 708* (3); *N. T. Silva 1819* (20), *1861* (5a), *5238* (20); *N. T. Silva s.n.*, without collection date (MG 150071) (6); *N. T. Silva & U. Brasão 60977* (11); *J. A. C. da Silva 503* (3)*, 564* (3)*; M. F. da Silva 495* (7), *517* (19); *M. F. da Silva et al. 909* (19); *M. F. F. da Silva 57* (3); *M. L. P. da Silva 2239* (3)*; M. L. P. da Silva et al. 2336* (3)*; M. N. Silva 171* (9), *246* (13b); *M. N. da Silva 79* (3); *A. S. L. da Silva & M. C. da Silva 2386* (11), *2416* (11); *M. G. da Silva & J. Maria 3278* (28), *3282* (11); *M. G. da Silva & C. S. R. Silva 3663* (3); *M. F. Simon et al. 1347* (5a), *1364* (5a), *1542* (19), *2624* (18); *D. R. Simpson 768* (8); *A. F. Skutch 3917* (3), *4339* (3); *A. C. Smith 2150* (5a), *2436* (3), *2596* (9), *3271* (9); *S. G. Smith 1275* (3); *D. N. Smith & W. Brack-Egg 6927* (3); *E. Soares 97* (1), *198* (3), *493* (3); *M. de L. Soares et al. 629* (18); *J. G. Soler & E. F. Barbosa 40* (1), *104* (1); *J. C. Solomon 6493* (5b), *7901* (5b), *17719* (3); *J. C. Solomon et al. 6983* (3); *N. Soria 5178* (3); *J. A. Souza 158* (1); *J. A. Souza s.n.,* 18 Aug 1976 (1); *V. C. Souza et al. 18683* (5a); *M. A. D. de Souza & C. F. da Silva 181* (1); *M. A. D. Souza et al. 321* (31); *C. A. Sothers & P. Stumpe 155* (11); *A. Soto et al. 348* (3), *365* (3); *C. R. Sperling et al. 5985* (21), *5987* (21), *6278* (3); *R. Spichiger & P. A. Loizeau RS5136* (3); *R. Spruce s.n.*, Nov-Mar 1849–1850 (4); *Stahel 138a* (9); *P. C. Standley 26286* (3); *H. ter Steege et al. 281* (5a); *B. Stergios 10787* (9), *11041* (3); *B. Stergios & M. Yánez 15127* (1); *B. Stergios et al. 19471* (1), *18507* (22), *19525* (1); *W. D. Stevens 8170* (3), *8180* (3)*, 12766* (3); *W. D. Stevens & E. Duarte M. 28354* (3); *W. D. Stevens & O. M. Montiel J. 36716* (3); *W. D. Stevens et al. 28668* (3); *W. C. Steward et al. 377* (26), *467* (3), *P20256* (31); *J. A. Steyermark 58068* (1), *60786* (30), *60788* (30), *61113*

(13a), *88433* (30); *J. A. Steyermark & F. Delascio 129039* (3); *J. A. Steyermark & R. Liesner 127416* (3); *J. A. Steyermark et al. 131201* (3); *A. L. Stoffers et al. 77* (5a), *351* (3); *J. J. Strudwick & G. L. Sobel 3005* (3); *K. J. Systma & W. G. D'Arcy 3205* (3).

A. S. Tavares 255 (5a); *L. O. A. Teixeira et al. 259* (3), *1230* (17), *1297* (18); *M. Timaná & P. Smith 1278* (5b); *S. Tiwari & A. Mengharini 695* (5a); *W. W. Thomas et al. 3873* (1), *3880* (3), *3904* (13b), *4116* (28), *4172* (3), *4316* (3), *4423* (30), *4519* (3), *4776* (13b), *5102* (19), *11131* (21), *15936* (3); *C. A. Todzia et al. 2297* (28); *M. Toledo & J. Justiniano 1127* (25); *D. Toriola-Marbot & M. Hoff 250* (13a); *B. M. Torke et al. 1276* (3); *O. Tostain 579* (20); *B. Trujillo & J. Pulido 15416* (3); *S. Tsugaru & Y. Sano B–642* (3); *E. Turner & V. Kapos 313* (3); *T. G. Tutin 204* (5a); *E. L. Tyson 923* (3); *E. L. Tyson & M. Kuns 1001* (3).

L. E. Urrego S. et al. 646 (27); *L. Urriola 35* (3).

L. Valenzuela & J. Farfán 9945 (5b); *A. Valera 118* (1); *L. Valverde & T. N. Cruz 37* (3); *I. G. Vargas & C. Jordan 6191* (30), *6196* (5a), *6227* (3); *I. G. Vargas & S. Surubí 6669* (19); *I. G. Vargas C. et al. 2793* (3), *2832* (28), *3459* (3), *4049* (3); *I. G. Vargas et al. 1091* (5b); *L. Vargas et al. 945* (19); *R. Vásquez 10525* (28), *15873* (18); *R. Vásquez & N. Arevalo 8998* (18); *R. Vásquez & N. Jaramillo 5851* (14), *7736* (23), *7977* (23), *8020* (5a), *8504* (5a), *8598* (14), *9680* (8), *10238* (18), *10800* (8), *11712* (33), *13026* (5a), *13263* (8), *13982* (18), *14069* (18), *15259* (4), *15268* (4), *15622* (5a), *17886* (23); *R. Vásquez & R. Rojas 22716* (14), *R. Vásquez et al. 4048* (4), *5967* (5a), *5969* (5a), *7543* (18), *14282* (8), *14320* (25), *14344* (5a), *14514* (14), *15799* (14), *17779* (5a), *18361A* (20), *21113* (12), *22685* (8), *34673* (14); *Veillon 100* (1); *J. Velazco 585* (3), *976* (11), *1151* (11); *D. Villarroel et al. 786* (5b); *M. G. Vieira et al. 208* (12), *613* (3), *703* (13b), *997* (3), *1016* (5a); *R. C. Vieira & C. Egypto 158* (3); *J. S. Vigo 8121* (8); *R. Vilhena et al. 162* (4).

J. W. Walker 257 (3); *D. Warming 4/97* (22); *H. van der Werff & C. van Hardeveld 6929* (3); *G. L. Webster & W. S. Armbruster 23679* (3); *J. Wesemberg et al. 11* (22); *R. L. Wilbur et al. 12115* (3); *L. Williams 15796* (5a); *Wood Herbarium Surinam 139* [*G. Stahel*] (32); *R. E. Woodson Jr. & R.W. Schery 1018* (3); *R. E. Woodson et al. 1447* (3); *J. J. Wurdack 34409* (30).; *J. J. Wurdack & L. S. Adderley 43456* (5a); *K. J. Wurdack et al. 4304* (5a).

M. Yanez 172 (22), *561* (25).

O. Zambrano et al. 1955 (3); *H. R. W. Zanin s.n.*, 14 Jul 2015 (17); *D. C. Zappi et al. 3047* (30); *C. E. Zartman et al. 5924* (1); *J. L. Zarucchi 3101* (21), *3259* (3); *J. L. Zarucchi & C. E. Barbosa 3465* (3); *J. L. Zarucchi et al. 1125* (3), *2614* (5a); *L. Zelaya 189* (3); *F. Zenteno R. et al. 9096* (15); *Ziburski 88/4* (3).

4 CONCLUSÕES

O estudo filogenético molecular conduzido neste trabalho, o mais abrangente em amostragem de espécies neotropicais de *Xylopia* realizado até o momento, confirma o monofiletismo de *Xylopia* seção *Xylopia*. Porém, o monofiletismo do grupo das espécies Neotropicais não foi confirmado, já que duas espécies africanas estão incluídas dentro do clado *Xylopia* seção *Xylopia*, entre as espécies dos Neotrópicos.

Todavia, muitos clados importantes obtiveram suporte, como por exemplo, o Clado Core Neotropical (Clado F), incluindo 20 das 25 espécies analisadas; e um clado basal (Clado B) na evolução do gênero, incluindo as espécies *Xylopia decorticans*, *X. laevigata*, *X. langsdorffiana*, *X. ochrantha* e *X. peruviana*. Além disso, as análises filogenéticas deram suporte ao esclarecimento das relações filogenéticas entre as espécies *Xylopia brasiliensis*, *X. frutescens*, *X. pittieri*, e espécies relacionadas.

As estimativas do tempo de divergência indicam a origem do gênero *Xylopia* há 40.03 milhões de anos atrás, após a fragmentação da Gondwana, sugerindo, portanto, um ou mais eventos de dispersão a longa distância entre a África e os Neotrópicos. As principais diversificações dentro de *Xylopia* seção *Xylopia* (do Clado H ao Z) aconteceram do Mioceno ao Pleistoceno, e podem estar relacionadas às mudanças tectônicas, hidrológicas e climáticas do Mioceno.

Um grande problema para a taxonomia do gênero, a dificuldade no entendimento e reconhecimento das espécies da Amazônia, região onde o gênero é mais diverso nos Neotrópicos, foi minimizado com a revisão taxonômica das espécies que ocorrem na região, aqui apresentada. Na revisão, foram reconhecidas 35 espécies de *Xylopia* na Bacia Amazônica, das quais duas eram espécies novas para a ciência. As espécies do gênero foram revisadas, recircunscritas e delimitadas, os possíveis complexos de espécies esclarecidos e não reconhecidos, problemas nomenclaturais resolvidos, e elaboradas chave de identificação, descrições botânicas e ilustrações das espécies.

REFERÊNCIAS

AUBLET. F. **Histoire des plantes de la Guiane Françoise: rangées suivant la méthode sexuelle, avec plusieurs mémoires sur différens objects intéressans, relatifs à la culture & au commerce de la Guiane Françoise, & une notice des plantes de l'Isle-de-France**. London & Paris: P. F. Didot, 1775. 655 p.

BAILLON, H. Note sur quelques *Xylopia* Africains. **Adansonia**, France, v. 4, p. 140–147, 1864.

BAILLON, H. 1868. Mémoire sur la famille des Anonacées. **Adansonia**, France, v. 8, p. 295–344, 1868.

BAGSTAD, K. J.; JOHNSON, D. M. Taxonomy of *Xylopia barbata* (Annonaceae) and related species from the Amazon/Orinoco Region. **Contributions from the University of Michigan Herbarium**, Michigan, v. 22, p. 21–28, 1999.

BENTHAM, G. On African Anonaceae. **Transactions of the Linnean Society of London**, London, v. 23, p. 463–480, 1862.

BERRY, P. E.; JOHNSON, D. M. A new species of *Xylopia* (Annonaceae) from Southern Venezuela. **Novon**, Saint Louis, v. 3, n. 2, p. 99-101,1993.

BFG. Growing knowledge: an overview of seed plant diversity in Brazil. **Rodriguésia**, Rio de Janeiro, v. 66, n. 4, p. 1085-1113, 2015.

BRIZICKY, G. K. Taxonomic and nomenclatural notes on *Zanthoxylum* and *Glycosmis* (Rutaceae). **Journal of the Arnold Arboretum**, Cambridge, v. 43, p. 80–93, 1962.

BROWNE, P. **The civil and natural history of Jamaica.** London: T. Osborne and J. Shipton in Gray's-Inn, 1756. 567 p.

BURNHAM, R. J.; JOHNSON, K. R. South American palaeobotany and the origins of neotropical rainforests. **Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences**, London, v. 359, p. 1595–1610, 2004.

DE CANDOLLE, A. L. P. P. Mémoire sur la famille des Anonacées, et en particulier sur les espèces du pays des Birmans. **Mémoires de la Société de Physique et d'Histoire Naturelle de Genève**, Genève, v. 5, p. 177–221, 1832.

CARDOSO, D., SÄRKINEN, T.; ALEXANDER, S.; AMORIM, A. M. ; BITTRICH, V.; CELIS, M.; DALY, D. C.; FIASCHI, P.; FUNK, V. A.; GIACOMIN, L. L.; GOLDENBERG, R.; HEIDEN, G.; IGANCI, J.; KELLOFF, C. L.; KNAPP, S.; LIMA, H. C. DE; MACHADO, A. F. P.; SANTOS, R. M. DOS; MELLO-SILVA, R.; MICHELANGELI, F. A.; MITCHELL, J.; MOONLIGHT, P.; MORAES, P. R. L. DE; MORI, S. A.; NUNES, T. S.; PENNINGTON, T. P.; PIRANI, J. R.; PRANCE, G. T.; QUEIROZ, L. P. DE; RAPINI, A.; RIINA, R.; RINCON, C. A. V.; ROQUE, N.; SHIMIZU, G., SOBRAL, M.; STEHMANN, J. R.; STEVENS, W. D.; TAYLOR, C. M.; TROVÓ, M.; VAN DEN BERG, C.; VAN DER

WERFF, H.; VIANA, P. L.; ZARTMAN, C. E.; FORZZA, R. C. Amazon plant diversity revealed by a taxonomically verified species list. **Proceedings of the National Academy of Sciences of the United States of America**, Washington, v. 114, n. 40, p. 10695-10700, 2017.

CHATROU, L.; PIRIE, M. D.; ERKENS, R. H. J.; COUVREUR, T. L. P.; NEUBIG, K. M.; ABBOTT, J. R.; MOLS, J. B.; MAAS, J. W.; SAUNDERS, R. M. K.; CHASE, M. W. A new subfamilial and tribal classification of the pantropical flowering plant family Annonaceae informed by molecular phylogenetics. **Botanical Journal of the Linnean Society**, London, v. 169, p. 5–40, 2012.

COUVREUR, T. L. P.; HELMSTETTER, A. J.; KOENEN, E. J. M.; BETHUNE, K.; BRANDÃO, R. D.; LITTLE, S. A.; SAUQUET, H.; ERKENS, R. H. J. Phylogenomics of the major tropical plant family Annonaceae using targeted enrichment of nuclear genes. **Frontiers in Plant Science**, v. 1941, 2019. DOI: 10.3389/fpls.2018.01941.

DIAS, M. C. **Estudos taxonômicos do gênero Xylopia L. (Annonaceae) no Brasil extra-amazônico.** Dissertação (Mestrado), Universidade Estadual de Campinas, Campinas, 1988. 183 p.

DOYLE, J. A.; BYGRAVE, P. C.; LE THOMAS, A. Combined analyses of morphological and *rbc*L data: implications for phylogeny and morphological evolution in Annonaceae. **Annonaceae Newsletter**, v. 12, p. 20-24, 1998.

DOYLE, J. A.; LE THOMAS, A. Cladistic analysis and pollen evolution in Annonaceae. **Acta Botanica Gallica**, v. 141, n. 2, p. 149-170, 1994.

DOYLE, J. A.; LE THOMAS, A. Phylogenetic analysis and character evolution in Annonaceae. **Bulletin du Museum National d'Histoire Naturelle**, Paris, v. 18, p. 279-334, 1996.

DUNAL, M. F. **Monographie de la famille Anonacées**. Paris: Treuttel et Würtz, 1817. 144 p.

ENGLER, A.; L. DIELS. VI. Anonaceae. *In*: ENGLER, A. (ed.).**Monographieen Afrikanischer Pflanzen-Familien und Gattungen**. Leipzig: Wilhelm Engelmann, 1901. 96 p. [pl. 1–30]

FRIES, R. E. Beiträge zür Kenntnis der Süd-Amerikanischen Anonaceen. **Kungliga Svenska Vetenskapsakademiens Handlingar**, Stockholm, n. 34, n. 5, p. 1-59, 1900.

FRIES, R. E. Revision der Arten einiger Annonaceen-Gattungen I. **Acta Horti Bergiani**, Stockholm, v. 10, n. 1, p. 1-128, 1930.

FRIES, R. E. 1931. Revision der Arten einiger Annonaceen-Gattungen II. **Acta Horti Bergiani**, Stockholm, v. 10, n. 2, p. 129-341. 1931.

FRIES, R. E. Revision der Arten einiger Annonaceen-Gattungen III. **Acta Horti Bergiani**, Stockholm, v. 12, n. 1, p. 1-220, 1934.

FRIES, R. E. Revision der Arten einiger Annonaceen-Gattungen IV. **Acta Horti Bergiani**, Stockholm, v. 12, n. 2, p. 221-288, 1937.

FRIES, R. E. 1939. Revision der Arten einiger Annonaceen-Gattungen V. **Acta Horti Bergiani**, Stockholm, v. 12, n. 3, p. 289-577, 1939.

FRIES, R. E. Annonaceae. *In:* ENGLER, A.; PRANTL,K. (eds.). **Die natürlinchen Pflanzenfamilien**. 2. ed. 17aII. Berlin: Duncker und Humblot, 1959. 170 p.

HOOKER, J. D.; THOMSON, T. **Flora Indica**. Vol. 1. London: W. Pamplin, 1855. 280 p.

HOOKER, J. D.; THOMSON, T. **The Flora of British India**. Vol. 1. Pt 1. London: L. Reeve & Co., 1872. 208 p.

JARVIS, C. E.; BARRIE, F. R.; ALLAN, D. M.; REVEAL, J. L. A list of Linnaean generic names and their types. **Regnum Vegetabile**, Königstein, v. 127, p. 1-100, 1993.

JOHNSON, D. M.; MURRAY, N. A. A revision of *Xylopia* L. (Annonaceae): the species of Tropical Africa. **PhytoKeys**, v. 97, p. 1–252, 2018.

KOEK-NOORMAN J.; WESTRA, L. T. TH.; MAAS, P. J. M. Studies in Annonaceae XII. The role of morphological characters in subsequent classifications of Annonaceae: a comparative survey. **Taxon**, v. 39, p. 16-32, 1990.

KUNTZE, O. 1891. **Revisio generum plantarum**. Pt 1. Leipzig: Arthur Felix, 1891. 374 p.

LAMARCK, J. B. A. P. M. de. **Encyclopédie méthodique**. **Botanique.** Vol. 1. Paris: Chez Panck-oucke, 1785.

LINNAEUS, C. **Systema Naturae**. Vol. 2. 10. ed. Stockholm: Impensis Direct Laurentii Salvii, 1759.

LINNAEUS FILIUS, C. **Supplementum plantarum Systematis Vegetabilium Editionis decimae tertiae, Generum Plantarum Editionis sextae, et Specierum Plantarum Editionis secundae. Editum a Carolo a Linné**,...Brunsvigae [Brunswick]: Imprensis Orphanotrophei, 1782. ("1781")

LORENZI, H. **Árvores brasileiras: manual de identificação e cultivo de plantas arbóreas nativas do Brasil**. Vol 1. 4. ed. Nova Odessa: Instituto Plantarum, 2002a. 370 p.

LORENZI, H. **Árvores brasileiras: manual de identificação e cultivo de plantas arbóreas nativas do Brasil.** Vol 2. 2. ed. Nova Odessa: Instituto Plantarum, 2002b. 370 p.

MAAS, P.; LOBÃO, A.; RAINER, H. Annonaceae. *In:* **Lista de Espécies da Flora do Brasil.** Rio de Janeiro, Jardim Botânico do Rio de Janeiro, 2015. Disponível em: <http://floradobrasil.jbrj.gov.br/jabot/floradobrasil/FB110555> Acesso em: 05 jun. 2018.

MARTIUS, C. F. P. Annonaceae. *In:* MARTIUS, C. F. P. (ed.). **Flora brasiliensis**. Vol. 13. Lipsiae: apud Frid. Fleischer in Comm., 1841. 64 p.

MELLO-SILVA, R.; LOPES, J. C.; PIRANI, J. R. Flora da Serra do Cipó, Minas gerais: Annonaceae. **Boletim de Botânica da Universidade de São Paulo**, São Paulo, v. 30, p. 37-56, 2012.

NECKER, N. J. DE. **Elementa Botanica**, Tomus II. Paris: Typis Societatis Typographicae Neowedensis, 1790. 460 p.

OLIVER, D. **Flora of tropical Africa**. Vol. 1. London: L. Reeve and Co., 1868. 479 p.

PLUKENET, L. **Phytographia**. Londres: T. Osborne and J. Shipton in Gray's-Inn., 1691.

RICHARD, A. Anonaceae. *In:* SAGRA, R. DE LA (ed.). **Histoire physique, politique et naturelle de l'Ile de Cuba. Botanique, plantes vasculaires**. Paris: Arthur Bertrand, 1841. 336 p. ("1845")

RICHARDSON, J. E.; CHATROU, L. W.; MOLS, J. B.; ERKENS, R. H. J.; PIRIE, M. D. Historical biogeography of two cosmopolitan families of flowering plants: Annonaceae and Rhamnaceae. **Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences**, London, v. 359, p. 1495-1508, 2004.

SAGOT, P. A. Catalogue des Plantes Phanérogames et Cryptogames Vasculares de la Guiane Française. Anonaceae. **Annales des sciences naturelles. Botanique et biologie végétale.** Ser. 6, t. 11, p. 134-139, 1881. ("1880")

SPRUCE, R. On the mode of branching of some Amazon trees. **Journal of the proceedings of the Linnean Society. Botany**, London, v. 5, n. 17, p. 3-14, 1861.

TER STEEGE, H.; VAESSEN, R. W.; CÁRDENAS-LÓPEZ, D.; SABATIER, D.; ANTONELLI, A.; DE OLIVEIRA, S. M.; PITMAN, N. C. A.; JØRGENSEN, P. M.; SALOMÃO, R. P. The discovery of the Amazonian tree flora with an updated checklist of all known tree taxa. **Scientific Reports**, v. 6, p. 1–15, 2016.

STULL, G. W.; JOHNSON, D. M.; MURRAY, N. A.; COUVREUR, T. L. P.; REEGER, J. E.; ROY, C. M. Plastid and seed morphology data support a revised infrageneric classification and an African origin of the Pantropical genus *Xylopia* (Annonaceae). **Systematic Botany**, v. 42, n. 2, p. 211-225, 2017.

THOMAS, D. C.; CHATROU, L. W.; STULL, G. W.; JOHNSON, D. M.; HARRIS, D. J.; THONGPAIROJ, U.; SAUNDERS, R. M. K. The historical origins of palaeotropical intercontinental disjunctions in the pantropical flowering plant family Annonaceae. **Perspectives in Plant Ecology, Evolution and Systematics**, v. 17, p. 1–16, 2015.

WILLDENOW, C. L. **Species plantarum**. Vol. 2. Pt 2. 4. ed. Berlin: Impensis G. C. Nauk, 1799. 1340 p.

ANEXO A – NORMAS PARA A PUBLICAÇÃO NO PERIÓDICO SYSTEMATIC BOTANY

Arquivo modelo disponível em: http://sysbot.org/

AUTHOR LAST NAMES (> 2 = ET AL.): SHORT TITLE ALL CAPS < 70 CHARACTERS

Paper Title: All Major Words in Capitals, Bold Font

First Author,[1, 2] Second Author,[3] and Last Author[4, 5]

[1]Address for first author, no abbreviations, USA; e-mail address

[2]Alternate address for first author, no abbreviations, UK.

[3]Address for second author, no abbreviations, all other countries spelled out; e-mail address second author.

[4]Address for last author; e-mail address for last author.

[5]Author for correspondence