



UNIVERSIDADE ESTADUAL PAULISTA
"JÚLIO DE MESQUITA FILHO"



Filogenia de *Rhynchosia* Lour. (Leguminosae, Papilionoideae, Phaseoleae) e revisão taxonômica das espécies ocorrentes na América do Sul

LUÍSA MARIA DE PAULA ALVES BEZERRA

Tese apresentada ao Instituto de Biociências, Câmpus de Botucatu, UNESP, para obtenção do título de Doutor no Programa de Pós-Graduação em Biologia Vegetal, Interunidades entre o Instituto de Biociências do câmpus de Botucatu e Instituto de Biociências do câmpus de Rio Claro.

Botucatu – SP

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– Carlos Drummond de Andrade.

*Don't you worry, you'll find yourself
Follow your heart, and nothing else
And you can do this, oh baby, if you try
All that I want for you,
Is to be satisfied*

(Simple Man - Lynyrd Skynyrd)

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Resumo

Rhynchosia Lour. é o maior e mais diverso gênero da subtribo Cajaninae (Leguminosae, Phaseoleae), compreendendo aproximadamente 230 espécies com distribuição pantropical. A África é o seu principal centro de distribuição, com cerca de 140 espécies, seguido pelo continente americano, onde é registrada a ocorrência de 55 espécies. A revisão taxonômica mais recente para o gênero foi realizada em 1978, que tratou as espécies neotropicais e reconheceu 26 espécies para a América do Sul. Os representantes de *Rhynchosia* apresentam uma grande diversidade morfológica e, ainda assim, sua delimitação sempre foi dificultada pela uniformidade de alguns táxons, bem como pela semelhança com outros representantes de Cajaninae. Estudos de filogenia molecular reconhecem a monofilia da subtribo Cajaninae e suportam o para e/ou polifiletismo de *Rhynchosia*. No entanto, tais trabalhos utilizaram uma baixa amostragem deste gênero bem como dos membros da subtribo como um todo e, por isto, estes resultados não são conclusivos. Considerando que o último estudo taxonômico que englobou as espécies ocorrentes na América do Sul encontra-se desatualizado e que a delimitação de alguns táxons permanece problemática, esta tese apresenta uma revisão taxonômica para as espécies sul-americanas de *Rhynchosia*. Também foi realizada uma filogenia do gênero utilizando uma ampla amostragem de táxons de *Rhynchosia* bem como de representantes de Cajaninae, abrangendo toda a sua distribuição geográfica. Foram registradas 27 espécies de *Rhynchosia* para a América do Sul, sendo duas novas espécies aqui descritas, e seis novas sinonimizáveis e 50 lectotipificações (30 destas de segundo passo) foram propostas. Este trabalho também inclui uma chave de identificação para as espécies sul-americanas, descrição dos táxons, informações das espécies tipo e sinônimos bem como dados de distribuição geográfica e habitat. Foi acessado o estado de conservação das espécies e cinco delas foram classificadas dentro das categorias ameaçadas. As espécies sul-americanas de *Rhynchosia* ocorrem preferencialmente em ambientes do domínio Cerrado e a maioria são amplamente distribuídas na América do Sul, sendo apenas *R. franciscana*, *R. lewisii* e *R. mineira* endêmicas. Os resultados filogenéticos corroboram os estudos anteriores, suportando o monofiletismo de Cajaninae e o polifiletismo de *Rhynchosia*, que emergiu em seis linhagens diferentes, uma delas representada apenas por *R. volubilis*, espécie-tipo do gênero, com outra espécie asiática. Os resultados aqui apresentados, juntamente com novas análises que estão em andamento, irão apoiar uma nova proposta de classificação que será refletida pelas relações filogenéticas dos representantes de *Rhynchosia* com os demais táxons da subtribo Cajaninae.

Abstract

Rhynchosia Lour. is the largest and most diverse genus of Cajaninae subtribe (Leguminosae, Phaseoleae), comprising approximately 230 species with a pantropical distribution. Africa is its main distribution center, with about 140 species, followed by the American continent, where 55 species are recorded. The most recent taxonomic revision for the genus was carried out in 1978, which treated Neotropical species and recognized 26 species for South America. *Rhynchosia* taxa present a great morphological diversity but even so its delimitation has always been difficult due to the uniformity of some taxa, as well as the similarity with other representatives of Cajaninae. Molecular phylogeny studies support the monophyly of the subtribe and show a poly and/or paraphyletic *Rhynchosia*. However, as it included a low sampling of *Rhynchosia* and Cajaninae taxa as a whole, these results have not been clarified. Considering that the last taxonomic study that included the species occurring in South America is several decades old and the delimitation of taxa remains problematic, this thesis presents a taxonomic review for the South American species of *Rhynchosia*. A phylogeny of the genus was also performed using a dense sampling of *Rhynchosia* taxa as well as representatives of Cajaninae, covering its entire geographic distribution. Twenty-seven species of *Rhynchosia* were recorded for South America, two of which are new and are here described, and six new synonymizations and 50 lectotypifications (30 of which are second-step) were proposed. This study also includes an identification key to the South American taxa, full morphological descriptions, information about type specimens and synonyms as well as data of geographical distribution and habitat. The conservation status of the species was accessed and five of them were classified into the threatened categories. South American species of *Rhynchosia* preferentially occur in environments of Cerrado domain and most of them are widely distributed in South America, only *R. franciscana*, *R. lewisii* and *R. mineira* being endemic. Our results corroborate the previous studies, supporting a monophyletic Cajaninae and a polyphyletic *Rhynchosia*, which emerged as six different lineages, one of them represented by *R. volubilis*, the type species of the genus, with other Asian species. The results presented here, together with new analyzes that are in progress, will support a new classification proposal that will be reflected by the phylogenetic relationships of *Rhynchosia* with Cajaninae taxa.

Introdução Geral

Família Leguminosae

A família Leguminosae Juss. é considerada a terceira maior família de angiospermas e compreende cerca de 765 gêneros e 19.500 espécies (LPWG 2017). É a segunda família mais importante economicamente depois de Poaceae, uma vez que seus representantes apresentam grandes benefícios nutricionais e têm sua madeira e compostos secundários utilizados como base na fabricação de diversos produtos. Além disso, também são utilizados como forrageiras e adubos e apresentam propriedades medicinais (LPWG 2017).

Destaca-se também por sua importância ecológica, principalmente devido à capacidade de muitas de suas espécies de fixarem o nitrogênio atmosférico em simbiose com bactérias do gênero *Rhizobium*, formando nódulos em suas raízes. Por esta razão, estas plantas são geralmente os primeiros colonizadores em solos pouco férteis (Lackey 1981; Sprent 2001).

As leguminosas se caracterizam em geral por apresentarem folhas compostas, alternas e estipuladas. O fruto pode ser legume típico ou lomento, sâmaras ou folículos e o ovário unilocular, unicarpelar (Lewis et al. 2005; Judd et al. 2009). Seus representantes podem variar de grandes árvores, pequenas ervas, trepadeiras com gavinhas, arbustos, subarbustos, lianas e, menos comumente, ervas ou subarbustos aquáticos. As flores apresentam os diversos tipos de simetria e são adaptadas a uma ampla gama de polinizadores, como insetos, pássaros e morcegos, o que contribui para o sucesso evolutivo da família (LPWG 2017).

Apresentam distribuição cosmopolita e ocorrem em vários tipos de ambientes como florestas tropicais úmidas de planície, florestas secas, savanas, além de habitarem regiões mediterrâneas, desérticas, temperadas e até áreas de alta elevação (LPWG 2017).

Estudos envolvendo Leguminosae reconhecem a família como monofilética (Polhill 1994, Doyle et al. 1997, Lewis & Schrire 2003, LPWG 2013, 2017, Koenen et al. 2020). No entanto, estudos filogenéticos indicaram que a tradicional classificação subfamiliar (Caesalpinioideae DC., Mimosoideae DC. e Papilionoideae DC.) não refletia o conhecimento atual das relações filogenéticas na família (LPWG 2017). Dessa forma, uma nova proposta baseada em estudos taxonômicos e moleculares foi endossada pelo *Legume Phylogeny Working Group* (2017), estabelecendo seis subfamílias: Caesalpinioideae DC. emend. LPWG (que engloba a antiga Mimosoideae); Cercidoideae LPWG; Detarioideae Burmeist.; Dialioideae LPWG; Duparquetioideae LPWG; e Papilionoideae DC.

Das subfamílias de Leguminosae, Papilionoideae é a mais representativa, apresentando cerca de 14.000 espécies e 503 gêneros (LPWG 2017). Sua principal característica é a presença de flores papilionáceas, ocorrentes na maioria de seus representantes, que são bilateralmente simétricas, com cálice gamossépalo, pétalas imbricadas no botão e corola diferenciada em estandarte, alas e pétalas em quilha (Lewis et al. 2005; LPWG 2017).

Tribo Phaseoleae e subtribo Cajaninae

Das tribos pertencentes à subfamília Papilionoideae, Phaseoleae se destaca por incluir espécies de grande importância econômica e por ser uma das maiores tribos, com 89 gêneros e aproximadamente 1.567 espécies (Schrire 2005), ocorrendo principalmente nas regiões tropicais e subtropicais do globo (Lackey 1981; Doyle & Doyle 1993; Bruneau 1996). Esta tribo já foi circunscrita em oito subtribos (Diocleinae, Phaseolinae, Cajaninae, Ophrestiinae, Clitoriinae, Kennediinae, Glycininae e Erythrinae) (Lackey 1981), e é reconhecida como parafilética ou polifilética de acordo com estudos moleculares realizados (Bruneau et al. 1990, 1995; Doyle & Doyle 1993; Delgado-Salinas et al. 1993; Doyle et al. 1997, 2000; Kajita et al. 2001; Lee & Hymowitz 2001).

Estudos filogenéticos não sustentam a classificação de Erythrinae (Kajita et al. 2001; Schrire, 2005), composta, até então, pelos gêneros *Apios* Fabr., *Butea* Roxb. ex Willd., *Cochlianthus* Benth., *Erythrina* L., *Neorudolphia* Britton, *Strongylodon* Vogel e *Mucuna* Adans. (Bentham 1865; Lackey, 1981). Recentemente uma proposta de restabelecimento da tribo Diocleae foi feita por Queiroz et al. (2015) justificando que a subtribo Diocleinae é filogeneticamente mais próxima da tribo Millettieae do que de Phaseoleae.

Das oito subtribos de Phaseoleae propostas por Lackey (1981), Cajaninae é a mais representativa, possuindo cerca de 490 espécies e tradicionalmente circunscrita em 10 gêneros: *Adenodolichos* (ca. 15 spp.), *Paracalyx* S.I. Ali (6 spp.), *Flemingia* Roxb. ex W.T. Aiton (ca. 30 spp.), *Carrisoa* Baker f. (1 sp.), *Chrysoscias* E. Mey. (3-4 spp.), *Cajanus* Adans. (34 spp.), *Dunbaria* Wight & Arn. (20 spp.), *Bolusafra* Kuntze (1 sp.), *Eriosema* (DC.) Desv. (ca. 150 spp.) e *Rhynchosia* Lour. (ca. 230 spp.) (Lewis et al. 2005). Desses gêneros, apenas *Rhynchosia* e *Eriosema* ocorrem nos Neotrópicos (Schrire 2005).

Estudos recentes realizados por Vargas et al. (2018; 2019) apontaram que a subtribo Cajaninae é caracterizada por apresentar estruturas secretoras em todo o corpo da planta, como tricomas de base bulbosa e glândulas vesiculares, sendo essas últimas uma característica exclusiva e unificadora da subtribo (Vargas et al. 2018). Além disso, análises histoquímicas e

de ultraestrutura mostraram que essas estruturas secretoras e seus respectivos exsudatos atuam na defesa contra herbivoria e possíveis danos por radiação ultravioleta (Vargas et al. 2019).

Características como ausência de bractéolas e de canavanina e a presença de leucoantocianinas também são compartilhadas com a maioria de seus representantes, com exceção de *Adenodolichos* (Baudet 1978; Lackey 1977, 1981). Morfologicamente, os membros de Cajaninae se caracterizam por apresentar hábito herbáceo a subarborescente; folhas geralmente trifolioladas (podendo ser unifolioladas em *Rhynchosia* e *Eriosema* e 5-folioladas em *Adenodolichos*); flores que variam de tons amarelados a avermelhados; inflorescências geralmente racemosas (podendo ser também fasciculadas, corimbiformes ou paniculadas em *Rhynchosia*); e fruto do tipo legume com duas sementes (três ou mais em *Bolusafrá*, *Cajanus* e *Dunbaria*) (Lackey 1981; Bezerra et al. 2019).

A uniformidade morfológica observada entre os representantes de Cajaninae despertou a atenção de alguns taxonomistas. *Chrysościas*, gênero tradicionalmente circunscrito nesta subtribo, dividia opiniões, uma vez que muitos autores o consideravam como gênero independente (Schrire 2005) e outros como sinônimo de *Rhynchosia* (Gear 1978; Germishuizen 2000). No entanto, estudos de filogenia molecular apontaram que este gênero emergiu aninhado com algumas espécies de *Rhynchosia* ocorrentes na África (Manyelo 2014; Cândido et al. 2020) e, assim, *Chrysościas* passou a ser reconhecida como uma seção de *Rhynchosia* (Jaca et al. 2018). A delimitação de *Rhynchosia* em relação a *Bolusafrá* e *Carrissoa* também não é bem esclarecida. Lackey (1981) citou *Bolusafrá* como “uma trepadeira viscosa semelhante a *Rhynchosia*” e mencionou que estes dois gêneros deveriam ser reconhecidos como sinônimos de *Rhynchosia*.

O gênero *Rhynchosia*

O gênero *Rhynchosia* é o mais representativo da subtribo Cajaninae, apresentando aproximadamente 230 espécies com distribuição Pantropical (Schrire 2005). Seus principais centros de distribuição são a África, com ca. de 140 espécies, e o continente americano, com ca. de 55 espécies (Schrire 2005), que ocorrem em regiões tropicais e subtropicais dos hemisférios (Verdcourt 1971; Gear 1978).

O nome *Rhynchosia* deriva da palavra grega “*rhynchos*” que significa “bico” em referência ao formato das pétalas da quilha da espécie tipo do gênero, *Rhynchosia volubilis* Lour. (Gear 1978). Loureiro (1790) utilizou o nome *Rhynchosia* pela primeira vez e descreveu *R. volubilis* que possui origem asiática. Vail (1899), revisando o gênero para os Estados Unidos,

reconheceu *Rhynchosia* como sinônimo de *Dolicholus* Medik.. Ainda assim, esses nomes foram utilizados equivocadamente até 1959 quando, de acordo com o Código Internacional de Nomenclatura Botânica de 1935 (Rickett & Stafleu 1959), *Rhynchosia* Lour. com *R. volubilis* como espécie-tipo, foi conservado contra *Dolicholus* (Gear 1978).

Rhynchosia se caracteriza principalmente pelo hábito herbáceo, subarborescente ou trepador; ramos eretos, prostrados ou volúveis; folhas uni ou trifolioladas; inflorescências racemosas, paniculadas, corimbiformes ou fasciculadas; flores com pétalas amarelas e lacínias do cálice que podem ou não ultrapassar o comprimento da corola; e fruto do tipo legume com duas sementes (Gear 1978; Jaca 2017; Bezerra et al. 2019).

Economicamente, *Rhynchosia* tem seu uso relacionado à produção de fármacos no tratamento da diarreia, como no caso de *R. insignis* (O. Hoffm.) R.E. Fr., que tinha suas raízes utilizadas para este fim pelos indígenas no Zimbábue (Chinemana et al. 1985; Chimponda & Mukanganyama 2010); e ao potencial ornamental de algumas espécies que apresentam folhas, frutos e folhagens vistosas, como *R. hirta* (Andrews) Meikle & Verdc., *R. pycnostachya* (DC.) Meikle e *R. buettneri* Harms (Gear 1978). Pode ser utilizado também como fonte de alimentos tanto para o homem quanto para o gado, e algumas espécies têm suas sementes bicolors utilizadas na confecção de artesanatos (Gear 1978; Jaca 2017). Além disso, algumas espécies apresentam propriedades narcóticas e eram utilizadas como alucinógenos pelos antigos povos mexicanos. Seu uso também pode ser atribuído ao aumento da virilidade, como no caso de *R. pyramidalis* (Lam.) Urb., popularmente conhecida como "Pega Palo" (Schultes 1976, Gear 1978).

O primeiro grande tratamento taxonômico do gênero foi publicado por Gear em 1978, que tratou as espécies americanas, onde foram reconhecidas 51 espécies, sendo 26 para a América do Sul. Neste trabalho foram reconhecidas duas seções para as espécies do Novo Mundo, *R. sect. Copisma* (E.Mey) Endl., compreendendo 29 espécies, e *R. sect. Arcyphyllum* (Ellis) Torr. & Gray, compreendendo 23 espécies.

Rhynchosia sect. *Copisma* se caracteriza por apresentar geralmente o hábito trepador, folhas trifolioladas e lacínias do cálice que não ultrapassam o comprimento da corola (Gear 1978). Os representantes reconhecidos nesta seção ocorrem na África, Ásia e Oceania (Jaca 2017). Devido a esta ampla distribuição e diversa morfologia, Gear (1978) reconheceu quatro séries informais para *R. sect. Copisma*, com o intuito de melhor circunscrevê-las. Enquanto *R. sect. Arcyphyllum* se caracteriza por incluir indivíduos geralmente eretos ou prostrados, com

folhas uni ou trifolioladas, e lacínias do cálice que geralmente igualam ou excedem o comprimento da corola. Os representantes desta seção são exclusivamente neotropicais (Ajao 2020).

Desde esta última revisão (Gear 1978) foram realizados alguns estudos taxonômicos para o gênero que apresentaram significativa contribuição para compreensão da taxonomia das espécies de *Rhynchosia* ocorrentes na América do Sul (Fortunato 1983; Ståhl 2016; Bezerra et al. 2019; Perez et al. 2022). Dentre eles, destacam-se o tratamento taxonômico das espécies de *Rhynchosia* ocorrentes no Brasil (Bezerra et al. 2019), bem como a monografia deste gênero na Coleção Flora do Brasil 2020 (Perez et al. 2022), uma vez que o Brasil representa o principal centro de diversidade de *Rhynchosia* na América do Sul. Além disso, também foram realizados alguns tratamentos florístico-taxonômicos para alguns estados e/ou regiões do Brasil como Rio Grande do Sul (Miotto 1988), Paraná e Santa Catarina (Rogalski & Miotto 2011), Mato Grosso do Sul (Cristaldo et al. 2013) e para o nordeste brasileiro (Oliveira et al. 2018).

Filogeneticamente, *Rhynchosia* é o gênero mais relacionado com *Eriosema* (Doyle & Doyle 1993; Bruneau et al. 1995; Egan et al. 2016; Vargas 2018; Cândido et al. 2020), sendo estes os únicos gêneros da subtribo Cajaninae que ocorrem na região Neotropical, os demais ocorrem na África, Ásia e Oceania. A relação entre estes gêneros também é observada no aspecto morfológico. *Eriosema* foi descrito pela primeira vez como uma seção de *Rhynchosia*, estabelecida por de Candolle em 1825 (Gear 1978). Estes gêneros eram diferenciados principalmente pela localização do ponto de inserção do funículo da semente em relação ao hilo, sendo subcentral ou terminal em *Rhynchosia* e terminal em *Eriosema*. No entanto, com o avanço dos estudos morfológicos envolvendo estes gêneros, também foram utilizados, para diferenciá-los, caracteres relacionados ao hábito, forma do hilo, presença ou ausência de estipela, incisão do cálice, comprimento do pecíolo e peciólulo, cor da corola, constrição do fruto, tipo de inflorescência, extensão do estrofiolo e cor das sementes (Gear 1978; Fortunato 1983; Miotto 1988; Bezerra et al. 2019; Cândido et al. 2019).

A filogenia do gênero *Eriosema*, conduzida por Cândido et al. (2020), representa o mais completo estudo molecular que incluiu representantes de Cajaninae já realizado até o momento. Neste trabalho, *Eriosema* e a subtribo como um todo emergiram como monofiléticos. Já *Rhynchosia* emergiu como polifilético, e *R. volubilis*, espécie tipo do gênero, emergiu em uma linhagem separada das demais. No entanto, como o foco do trabalho era *Eriosema*, foi utilizada uma grande amostragem deste gênero, porém uma amostragem menor dos demais

representantes de Cajaninae. Desta forma, as relações genéricas e infragenéricas entre os seus representantes ainda não estão bem elucidadas.

Até o momento não foi realizado nenhum estudo filogenético abordando o gênero *Rhynchosia* como um todo. Portanto, sua precisa circunscrição, bem como as relações entre os representantes de Cajaninae, permanecem pouco compreendidas. Além disso, os últimos trabalhos de revisão taxonômica que englobaram as espécies ocorrentes na América do Sul encontram-se desatualizados, visto que cinco espécies foram descritas para esta região desde então. Ademais, alguns complexos e variedades do gênero para a América do Sul ainda estão mal compreendidos, pois apresentam dados que dificultam o reconhecimento e delimitação de alguns táxons e, por isso, precisam ser elucidados.

Diante do exposto, este trabalho tem como objetivos: i) apresentar uma revisão taxonômica para as espécies sul-americanas de *Rhynchosia*; ii) apresentar a mais completa filogenia molecular de *Rhynchosia* e da subtribo Cajaninae como um todo; iii) esclarecer as relações genéricas e infragenéricas entre os representantes da subtribo.

Os resultados aqui apresentados, juntamente com outras análises que se encontram em andamento, irão apoiar uma nova proposta de classificação que refletirá as relações filogenéticas dos representantes de *Rhynchosia* com os demais membros da subtribo Cajaninae.

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Capítulo I: Taxonomic revision of *Rhynchosia* Lour. (Leguminosae, Papilionoideae, Phaseoleae) in South America. – Capítulo nas normas da revista *Phytotaxa*.

Capítulo II: Phylogeny of the remarkable genus *Rhynchosia* Lour. (Leguminosae, Papilionoideae, Phaseoleae).

Capítulo III: A new species of *Rhynchosia* (Leguminosae, Papilionoideae) from Bahia State, Brazil. **Capítulo publicado na revista *Phytotaxa*. *Phytotaxa* 406 (2): 084–090. 2019.**

Capítulo IV: *Rhynchosia mineira* (Leguminosae: Papilionoideae), a new and critically endangered species from Minas Gerais, Brazil. **Capítulo publicado na revista *Kew Bulletin*. *Kew Bulletin* 74: 62. 2019.**

Chapter I: Taxonomic revision of *Rhynchosia* Lour. (Leguminosae, Papilionoideae, Phaseoleae) in South America

Abstract

Rhynchosia Lour. has a pantropical distribution and comprises approximately 230 species, of which ca. 55 occur in the Neotropics and 31 in South America. The only existing taxonomic review that treated the South American species of the genus is several decades old. It does not account for many new collections and several recently described species, and the delimitation of taxa remains problematic. Consequently, we undertook a comprehensive review of the South American species of *Rhynchosia* and present here a new taxonomic revision. The revision is based on our own fieldwork, extensive study of the relevant literature, and analysis of ca. 2000 herbarium collections including type specimens for all published names that have been linked to the South American taxa of *Rhynchosia*. Twenty-seven species are recorded for South America, where they are distributed in a variety of open and forested habitats, with the greatest diversity concentrated in the Cerrado domain. Most of South American taxa are widely distributed in this region and can also occur in Central and North America. *Rhynchosia minima* is the only species in South America with a larger distribution that extends to the Old World. We provide an identification key, full descriptions for all of the recorded taxa, along with information about type specimens, synonyms, geographical distributions, habitats, phenology, and conservation status, as well as distribution maps, illustrations and photos of selected species in the field. We present six new synonymizations and 50 lectotypifications, of which 30 are second-step.

Keywords: Cajaninae, Diversity, Fabaceae, Neotropics

Resumo

Rhynchosia Lour. apresenta distribuição pantropical e compreende aproximadamente 230 espécies, das quais ca. 55 ocorrem na região Neotropical e 31 na América do Sul. A única revisão taxonômica existente que tratou as espécies sul-americanas do gênero foi realizada há várias décadas. Novas espécies do gênero foram descritas desde então e a delimitação de alguns táxons permanece problemática. Desta forma, foi realizada uma nova e abrangente revisão das espécies sul-americanas de *Rhynchosia*. A revisão foi baseada em idas a campo, extenso estudo da literatura relevante e análise de ca. 2000 espécimes de herbários, incluindo as espécies-tipo de todos os nomes publicados relacionados aos táxons sul-americanos de *Rhynchosia*. Vinte e sete espécies foram registradas para a América do Sul, que ocorrem em uma variedade de campos abertos e áreas florestais, com a maior diversidade concentrada no domínio Cerrado. A maioria dos táxons de *Rhynchosia* ocorrentes na América do Sul são amplamente distribuídos nesta região, mas também podem ocorrer em países da América Central e América do Norte. *Rhynchosia minima* é a única espécie que a distribuição se estende até o Velho Mundo. Esta revisão taxonômica inclui uma chave de identificação, descrições completas de todos os táxons registrados, bem como informações sobre as espécies-tipo, sinônimos, distribuições geográficas, habitats, fenologia e estado de conservação. São apresentados também mapas de distribuição geográfica, ilustrações e fotos de espécies selecionadas em campo. São propostas aqui seis novas sinonimizicações e 50 lectotipificações, das quais 30 são de segundo passo.

Palavras-chave: Cajaninae, Diversidade, Fabaceae, Neotrópicos

Introduction

With ca. 230 species, *Rhynchosia* Loureiro (1790: 460) is the largest and most diverse genus of subtribe Cajaninae Benth (1837: 49) (Leguminosae Jussieu [1789:345], Phaseoleae [Bronn 1822: 133] Candolle [1825: 381]). It is distributed around the globe, mainly in tropical and subtropical regions (Verdcourt 1971; Grear 1978). Africa, with ca. 140 spp., is the center diversity for the genus, followed by the Americas, which harbor ca. of 55 species (Schrire 2005), of which 31 are widespread in South America (Luísa Bezerra, pers. obs.). Within South America, *Rhynchosia* is found mainly in Cerrado environments, forest edges and rocky fields (campo rupestre); Brazil is the country with the highest species richness and diversity in South America, comprising 22 species (Perez et al. 2022).

The species of *Rhynchosia* range from herbs to subshrubs or vines. The leaves are unifoliolate or trifoliolate. The inflorescences are axillary or terminal, and can be racemose, paniculate, corymbiform or fasciculate. The main diagnostic character for the genus is the legume with two seeds per mature fruit, but in some cases one of the seeds may be aborted. The seeds range in coloration from uniformly brownish to blackish or bicolored red and black or yellow to orange and black (Grear 1978; Bezerra et al. 2019a; Perez et al. 2022).

Grear (1978) undertook the last and to date most comprehensive taxonomic review of the Neotropical species of *Rhynchosia*, recognizing 51 species. Subsequently, additional taxonomic studies of the South American species have been published (Fortunato 1983; Miotto 1988; Izaguirre & Beyhaut 1997; Ståhl et al. 2016; Bezerra et al. 2019a). However, some species, complexes in South America are still poorly resolved, and new species of *Rhynchosia* continue to be described from the region.

Recent phylogenetic studies recognize *Rhynchosia* as para and/or polyphyletic (Egan et al. 2016; Cândido et al. 2020). In the phylogeny conducted by Cândido et al. (2020), the Neotropical species of *Rhynchosia* emerged as monophyletic and sister to a group of African *Rhynchosia* with *Paracalyx* nested. However, this study focused on the phylogeny of *Eriosema* and therefore used a larger sample of this genus, but a smaller sample of the other representatives of Cajaninae, not clarifying these results. A molecular phylogeny study that will include a dense sampling of representatives of *Rhynchosia* as well as the subtribe Cajaninae as a whole is being carried out to elucidate this non-monophyletic status and the infrageneric relationships in *Rhynchosia* (Luísa Bezerra, pers. comm.).

Our aim here is to provide a complete and comprehensive taxonomic review of the South America taxa of *Rhynchosia*. Therefore, an identification key to all taxa of this region, taxa descriptions, notes about the type specimens and synonyms, information of geographical distribution and habitat, geographical distribution maps, conservation status, phenological and geographical records, illustration and photos of some species in the field are included here.

History of the genus - oscillations between the names assigned to *Rhynchosia* and sectional division

The taxonomic history of *Rhynchosia* began in 1753 when Linnaeus described *Dolichos minimus* Linnaeus (1753: 726), the basionym of *Rhynchosia minima* (L.) Candolle (1825: 385).

In 1787 Medikus published the genus *Dolicholus* Medikus (1787: 354) based on the species *Dolicholus flavus* Medik., and placed *Dolicholus minimus* (L.) Medik. [= *Dolichos minimus* L.] in the synonymy of *D. flavus*. Grear (1978) rightly pointed out that the name *D. flavus* was superfluous, since the Linnaen epithet has priority. This new generic name seems to have been overlooked for almost 100 years, when Hiern (1896) followed by Kuntze (1898) transferred numerous species of *Rhynchosia* back to *Dolicholus* (Grear 1978).

Aiton (1789) described the genus *Cylista* Aiton (1789: 36) based on the species *C. villosa* Aiton (1789: 36). The next year, the morphologically similar genus *Rhynchosia* was established by Loureiro based on the Asian species *Rhynchosia volubilis* Loureiro (1790: 460). Several years later, Roxburgh (1795: 64) described a species characterized by an accrescent and scarious calyx as *Cylista scariosa*. Consequently, in Hortus Kewensis, Aiton (1812) cited two species of *Cylista*: *C. villosa* [with *Dolichos hirtus* Andrews (1807:446) as its synonym] and *C. scariosa*. However, a period of confusion ensued concerning the distinction of *Cylista* from *Rhynchosia*, and Meikle and Verdcourt (1967) recognized that the material described as *D. hirtus* (= *C. villosa*) was conspecific with a widespread plant commonly known as *Rhynchosia albiflora* (Sims 1816: t. 1859) Alston (1931: 85).

Consequently, it became evident that *Dolicholus*, *Cylista*, and *Rhynchosia* were synonymous. *Rhynchosia* Lour., with *R. volubilis* as the type species, was conserved against *Dolicholus* in 1959 (Rickett & Stafleu 1959). Regarding *Cylista*, Meikle and Verdcourt (1967) surmised that the more commonly used name *Rhynchosia* would need to be conserved against it, or else *Cylista* would need to be conserved and retypified. Ali (1967) chose the latter option and proposed the conservation of *Cylista*, retypifying the genus with *C. scariosa*. He argued that this solution was preferable, since it would preserve the usage of *Cylista* as it was at that time,

and also because it would avoid the need to publish 200 new combinations if the other option were chosen (Ali 1967). However, Ali's proposal (1967) was rejected by the Committee for Spermatophyta (Meikle 1972). Ali then transferred *C. scariosa* and the other species attributed to *Cylista* to a new genus, *Paracalyx* Ali (1968: 95), which remains accepted to the present day. Subsequently, Meikle (1972) proposed that *Cylista* Ait. be added to the list of *nomina rejicienda* under *Rhynchosia*. He also noted that several species of *R. sect. Cyanospermum* (Wight & Arnott 1834: 259) Bentham (1865: 543) were previously described as *Cylista*, and opined that if *R. sect. Cyanospermum* were to be treated as a distinct genus, the name *Cylista* should be reinstated.

The sectional classification of Neotropical *Rhynchosia* began with De Candolle (1825: 384), who recognized three sections: *Monophyllae*, *Phaseoloideae* and *Eriosema*. *Rhynchosia* sect. *Monophyllae* was composed of species with unifoliolate leaves, while *R. sect. Phaseoloideae* and *R. sect. Eriosema* comprised species with trifoliolate leaves, the leaves being long and short-petiolate respectively. De Candolle (1825) himself considered the possibility that *R. sect. Eriosema* should be treated as a distinct genus.

Torrey & Gray (1838) divided *Rhynchosia* into two sections: *Arcyphyllum* (Elliott 1818: 371) Torrey & Gray (1838: 283) and *Eurhynchosia* (Wight & Arnott 1834: 259) Torr. & A. Gray characterized mainly by characteristics related to the habit and calyx. Endlicher (1840) synonymized *R. sect. Eurhynchosia* to *R. sect. Copisma* (Meyer 1836: 132) Endlicher (1840: 1300). Bentham in Martius' *Flora Brasiliensis* (1862) recognized two sections, *R. sect. Archyphyllum*, with six species, and *R. sect. Copisma*, with four species.

In 1865, Bentham & Hooker established eleven sections based primarily on characteristics relating to the hilum and strophiole (Bentham & Hooker 1865; Gear 1978). Only three of the sections included Neotropical species: *R. sect. Arcyphyllum*, *R. sect. Copisma* and *R. sect. Phaseoloides* Benth. & Hook., the last characterized by the constricted pods and bicolored seeds. Gear (1978) stated that only a few sections of Bentham & Hooker (1865) could be retained as originally characterized since the characters used were not necessarily correlated with one another.

Baker (1922) in his review of the South African species of *Rhynchosia* included the Old World species *R. densiflora* Candolle (1825: 386) and *R. connata* Baker (1923: 115) in the sect. *Arcyphyllum*. However, Jaca et al. (2018) segregated them from sect. *Arcyphyllum*, making the section exclusively Neotropical.

In his revision of the Neotropical species of *Rhynchosia*, Grear (1978) recognized two sections for this region: *R. sect. Arcyphyllum* and *R. sect. Copisma*. He maintained the original circumscriptions of the sections, but identified some additional diagnostic characters. The former section he characterized by the calyx not exceeding the corolla, the calyx lobes small and subulate, the stems mostly twining, and the leaves trifoliolate. The latter section he characterized by the calyx subfoliaceous to foliaceous, generally equaling or exceeding the corolla, the calyx lobes long and lanceolate, the stems mostly erect or prostrate, and the leaves unifoliolate or trifoliolate (Grear 1978). To further group the species, Grear (1978) established six informal series, two within sect. *Arcyphyllum* and four within sect. *Copisma*.

Fortunato (2000) recognized three sections for the Neotropical species of *Rhynchosia* based on phenetic analysis: *R. sect. Copisma*, *R. sect. Rhynchosia*, and *R. sect. Arcyphyllum*. Therefore, the present work represented the first circumscription of sect. *Rhynchosia* that included Neotropical taxa, but the arrangement probably does not reflect a natural classification.

The most recent taxonomic treatment that included South American species of *Rhynchosia* was carried out by Bezerra et al. (2019a), who focused only on Brazilian species. This work consists in a new comprehensive taxonomic revision of the South American species of *Rhynchosia*.

Material and Methods

This revision is based on careful study of the relevant literature, field work throughout Brazil, and morphological analysis of specimens at the following herbaria: A, ALCB, ARIZ, B, BAA, BAB, BHCN, BLA, BM, BR, BOTU, C, CEN, CEPEC, CTES, E, EAC, F, FLOR, G, GH, GOET, HAL, HAS, HUEFS, ICN, INPA, IPA, K, LD, LE, LIL, M, MBM, MEXU, MICH, MO, MPU, MVFA, NO, NY, P, PACA, PEUFR, PH, RB, S, SI, SMDB, SP, U, UB, UC, UEC, US, VIC, VIES, YU (acronyms follow Thiers, 2022, continuously updated). Type specimens were studied in hand or through examination of high resolution images available from digital platforms such as speciesLink (<http://www.splink.org.br>), JABOT (<http://jabot.jbrj.gov.br/v3/consulta.php>), and JSTOR (plants.jstor.org), or from the website of individual herbaria. For nomenclatural data, the websites Tropicos (<http://www.tropicos.org/>), The Plant List (<https://wfo.plantlist.org/plant-list>) and International Plant Names Index (<http://www.ipni.org/>) were consulted. Protologues were extracted from the Biodiversity Heritage Library (<http://www.biodiversitylibrary.org/>). Type materials and digital images

examined in person or as images are indicated respectively with “—!” and “[digital image!]”. Collections without location, collection numbers and/or date are indicated as “s.loc.,” “s.n.” and “s.d.” in that order. Herbarium specimens gathered by the authors were prepared following the methodology of Fidalgo & Bononi (1989) and deposited in BOTU Herbarium and duplicates were sent to other herbaria.

Observations of minute morphological structures were made using a stereomicroscope (Zeiss) with an attached camera. Measurements were taken with a caliper. All morphological data was organized in an Excel spreadsheet. Morphological terminology for vegetative and floral features was adapted from Gonçalves & Lorenzi (2011), while Kirkbride et al. (2003) was followed for fruits. The identification key was developed based on easy to view morphological characteristics.

Information about geographic distributions, habitat, and phenology were obtained from herbarium specimen labels, the published literature, and field observations. The distribution maps were created in QGIS (version 3.16.3) from geographic coordinates extracted from locality data. Conservation status assessments employ the IUCN Red List categories and criteria (IUCN Standards and Petitions Committee, 2022), and values for EOO (extent of occurrence) were estimated by the GeoCAT “Geospatial Conservation Assessment Tool” (GeoCAT.kew.org; Bachman et al. 2011).

Results and Discussion

Morphology of South American *Rhynchosia* species

Habit

Fig. 1 A–B

The species of *Rhynchosia* occurring in South America can be herbs, subshrubs, climbing or creeping vines, with growth forms that vary from erect to twining (Fig. 1A), or prostrate (Fig. 1B). In many species, such as *R. arenicola* Hassler (1907: 167), *R. balansae* Micheli (1883: 31), *R. diversifolia* Micheli (1883: 33), *R. hauthalii* Harms ex Kuntze (1898: 60), *R. lineata* Bentham (1862: 202), and *R. senna* Gillies ex Hooker & Arnott (1833: 199), a specialized root system is present, which confers protection against cutting or burning (Gear 1978). The stem can be angular or striated, simple or branched.

Glands and indument

Fig. 1 C–E

Abundantly distributed secretory structures, such as vesicular glands (Fig. 1C) and bulbous-based trichomes (Fig. 1D), are a unifying feature of subtribe *Cajaninae* (Vargas et al. 2018), of which *Rhynchosia* is a member. Vesicular glands are present in all South American species of *Rhynchosia*, and they usually cover all the structures of the plant. Bulbous-based trichomes are also commonly found, but not in all species. The location of bulbous-based trichomes may be diagnostic for some taxa.

Non-glandular trichomes are also found in *Rhynchosia* and range from white to yellow, with the exception of *R. leucophylla* (Bentham 1849: 525) Bentham (1862: 202) (Fig. 1E), which has cinereous trichomes. The indument formed by these trichomes may be pilose, villous, pubescent or hirsute.

Leaves, stipules and stipels

Fig. 1 F

Leaves are petiolate or subsessile and usually trifoliolate (Fig. 1F). The only South American species with unifoliolate leaves is *Rhynchosia platyphylla* Bentham (1862: 201). The leaflets are highly variable both within and between species. Leaflet shape can be linear, lanceolate, deltoid, ovate, elliptical, rhombic, obovate or rounded. *Rhynchosia corylifolia* Mart. ex Benth. (Bentham 1862: 202), is the only studied species of the genus that has the surface of the leaflets bullate.

Stipules are also highly variable and taxonomic important. They are free and paired, and can be persistent or deciduous. When persistent, they are externally pubescent or hirsute and internally glabrous. They show great variability in size and shape, which can be lanceolate, triangular, elliptical, or ovate. The presence or absence of stipels may also be a diagnostic for some species. They appear in pairs mainly in the rack of the terminal leaflet and are filiform to setiform.

Inflorescence

Fig. 1 G–I

Grear (1978) characterized the basic inflorescence of *Rhynchosia* as an axillary raceme, but noted that it may be reduced to a single- or few-flowered quasi-fascicle in some species or modified to resemble a terminal paniculate in others. In the South American species, the pedicel may be conspicuous or inconspicuous, sometime serving as a diagnostic character and the bracts are deciduous. Bracteoles are absent in *Rhynchosia*. We classify the inflorescences of the South American species as corymbiform, fasciculate, racemose or paniculate.

The species with corymbiform inflorescence are *R. arenicola*, *R. clausenii*, *R. corylifolia* and *R. mineira* Bezerra & Fort.-Perez (2019b: 62). In this type of inflorescence, the flowers are congested and all reach essentially the same height, thus resembling a bouquet (Fig. 1G). The inflorescence equals or is less than the length of the leaf in all of these species, with the exception of *R. corylifolia*, in which the inflorescence exceeds the leaf.

The species with fasciculate inflorescences are *R. diversifolia* and *R. senna*. In this type, the pedicel is inserted directly in the leaf axils, without a main axis (Fig. 1 H). The inflorescence has 2 to 8 flowers and does not exceed the length of the leaf.

The species with exclusively racemose inflorescences are *R. balansae*, *R. caaguazuensis* Hassler (1907: 168), *R. hauthalii*, *R. lateritia* Burkart (1952: 545), *R. leucophylla*, *R. lineata*, *R. minima* (Linnaeus 1753: 726) Candolle (1825: 385), *R. nainceckensis* Fortunato (1982: 497), and *R. reticulata* (Swartz 1788: 105) Candolle (1825: 385). Racemose inflorescences are indeterminate with a main axis bearing pedicellate flowers (Fig. 1 I). They may be axillary or terminal, lax or crowded, and may or not exceed the length of the subtending leaf.

Paniculate inflorescences are commonly observed in *R. burkartii* Fortunato (1983: 49), *R. calycosa* Hemsley (1880: 48), *R. edulis* Grisebach (1874: 123), *R. erythrinoides* Schlechtendal & Chamisso (1830: 587), *R. franciscana* Queiroz & Cardoso (2018: 975), *R. lewisii* Bezerra & Fort.-Perez (2019c: 84), *R. mantaroensis* Macbride (1930: 105), *R. melanocarpa* Grear (1978: 43), *R. phaseoloides* (Swartz 1788: 105) Candolle (1825: 385), *R. platyphylla*, *R. rojasii* Hassler (1909: 77) and *R. schombugkii* Benthams (1862: 203). They are indeterminate with a branched axis, axillary or terminal, often lax, and always equal or exceed the length of the subtending leaf.

Flowers

Fig. 1 J

The flowers of *Rhynchosia* (and subtribe *Cajaninae* generally) are bilaterally symmetric and papilionaceous (Fig. 1 J; Grear 1978; Bezerra et al. 2019a; LPWG 2017), with the petals imbricate in bud. The petals are differentiated as the standard petal, wing petals, and keel petals. In South American species, the petals are usually light to dark yellow and often have red nectar guides. The calyx is 5-lobed with a campanulate tube and vesicular glands always present; some species also have bulbous-based trichomes. In many species the calyx is well developed and characteristically exceeds the length of the corolla.

The androecium is diadelphous, with nine stamens joined together in a tube that surrounds the gynoecium and one free stamen, and the anthers are uniform and dorsifixed. The ovary is unicarpellate and unilocular, sessile to subsessile, pilose to pubescent, and predominantly biovulate (occasionally uniovulate by abortion). The style is filiform and the stigma apical and minute.

Fruit and seeds

Fig. 1 K–L

The fruit is 2-valved and highly variable in shape and pubescence. The shape may be oblong, falcate, elliptical, ovate or obovate, flat or compressed, with or without constrictions between seeds. The fruits range from glabrescent to pilose or pubescent. Vesicular glands are often present and, in some species, may be accompanied by bulbous-based trichomes. There are usually two seeds per pod, but single-seeded pods also occur by abortion of one of the seeds. Seed shape varies from suborbicular to oblong and its color ranges from brown to black, or in several species the seeds are bicolored, red and black (yellow-orange and black in one species), with the red portion surrounding the hilum and almost equal to or less than the black. The hilum is linear to ovate and the insertion of the funiculus central, sub-central or terminal.

Taxonomic treatment

Rhynchosia Lour., Fl. Cochinch. 425, 460. 1790, *nom. cons.*

Type species: *Rhynchosia volubilis* Lour., Fl. Cochinch. 2: 460. 1790. CHINA, “Habitat inculta prope Cantonem Sinarum”, *s.d* (fl.), *Loureiro 562-1* (Holotype: P 00150846 [digital image!]).

Dolicholus Medik, Vorles. Churpfälz. Phys.-Ökon. Ges. 2: 354. 1787. *nom. rej.*

Type species: *D. flavus* Medik., *nom. illegit.* (*Dolichos minimus* L.).

Cylista Aiton, Hort. Kew. 3: 36, 512. 1789. *nom. rej.*

Type species: *C. villosa* Ait., = *Rhynchosia hirta* (Andrews) Meikle & Verdcourt. *Arcyphyllum* Elliott, J. Acad. Nat. Sci. Philadelphia. 1(2): 371–372. 1818.

Polytropia C. Presl, Symb. Bot. 1: 21. 1831.

Cyanospermum Wight & Arn., Prodr. Fl. Ind. Orient. 1: 259. 1834.

Nomismia Wight & Arn., Prodr. Fl. Ind. Orient. 1: 236. 1834.

Pitcheria Nutt., J. Acad. Nat. Sci. Philadelphia 7: 92. 1834.

Chrysoscias E.Mey., Pl. Afr. Austr. 139. 1836.

Copisma E.Mey., Comm. Pl. Afr. Austr. 132. 1836.

Hidrosia E.Mey., Pl. Afr. Austr. 89 (1836)

Orthodanum E. Mey., Comment. Pl. Africae Austr. 131. 1836.

Phaseolus subg. *Rhynchosia* Eaton & Wright, N. Amer. Bot. 353. 1840.

Sigmodostyles Meisn., J. Bot. 2: 93. 1843.

Stipellaria Klotz., Schomb. Faun. Fl. Brit. Gui. 3: 1203. 1848, *nom. nud.*

Baukea Vatke, Linnaea 43: 104. 1881.

Leycephyllum Piper, J. Washington Acad. Sci. 14: 363. 1924.

Leucopterum Small, Man. S.E. Fl.: 713. 1933.

Erect herbs or subshrubs or prostrate or twining vines, sometimes with an underground system. Stems simple or branched. Stipules free, persistent or deciduous. Leaves unifoliolate or trifoliolate, sessile or petiolate; stipels present or absent. Leaflets variously shaped, with yellow vesicular glands on both surfaces or just abaxially. Inflorescences racemose, corymbiform, fasciculate or paniculate, terminal or axillary, few- to many-flowered. Bracts linear to lanceolate, deciduous. Corolla papilionaceous, yellow, sometimes with red nectar guides, glabrous or indumented; calyx campanulate, 5-lobed, indumented, with vesicular glands or bulbous-based trichomes; calyx lobes equaling, exceeding or not the length of the corolla, linear, lanceolate to ovate; standard oblong to obovate or orbicular, 2-auriculate and clawed at base; wing petals oblong to obovate, uni-auriculate and clawed at base; keel petals fused,

falcate, clawed at base. Stamens 10, diadelphous, the vexillary one free, anthers uniform and dorsifixed. Ovary sessile to subsessile, pilose to pubescent, biovulate, sometimes uniovulate by abortion; style filiform, stigma apical, subcapitate. Fruit 2-valved, dehiscent, oblong, falcate, elliptical, ovate to obovate, indumented or glabrescent, sericeous, pilose, pubescent to hirsute, constrict or not, plump or flat-compressed, with vesicular glands or bulbous-based trichomes. Seeds usually two per pod, sometimes one by abortion, suborbicular, reniform, ovate to oblong, brown to black or bicolored black and red, yellow or orange; hilum long, linear to ovate, insertion on the funicle central, sub-central or terminal.

Etymology:—The name *Rhynchosia* is derived from the Greek word "*rhynchos*" which means "beak" in reference to the shape of the keel petals of the type species, *Rhynchosia volubilis* Loureiro (1790: 460) (Grear 1978).

Geographic distribution, habitat and species number updates:—Ca. 230 species distributed in tropical and subtropical areas around the globe, with 27 species in South America. The South American species are distributed in a variety of open and forested habitats, with the greatest diversity concentrated in the Cerrado domain (Fig. 2). Most of South American taxa are widely distributed in this region and can also occur in Central and North America. However, *R. caaguazuensis* is endemic to Paraguay and *R. franciscana*, *R. lewisii*, *R. mineira* and *R. platyphylla* are endemic to Brazil. *Rhynchosia minima* is the only species that has a cosmopolitan distribution.

In Grear's (1978) revision of the Neotropical species of *Rhynchosia*, 26 species were recognized for South America. Since then, five new species were described from South America, *R. nainceckensis*, *R. edensis* Izaguirre & Beyhaut (1997: 134), *R. franciscana*, *R. lewisii*, and *R. mineira*. Also, the species *R. hagenbeckii* Harms (1903: 29) was synonymized to *R. balansae*, and one taxon, *R. diversifolia* var. *prostrata* Burkart (1967: 628), was elevated to specific rank with a new name, *R. bicentrica* Turner (2012: 22).

Grear (1978) recorded the species *R. precatória* Candolle (1825: 385) and *R. quercetorum* Standley (1937: 555) in South America based on single records from Colombia for both species. We were unable to confirm the identities of these two specimens from analysis of digital images. Considering that no other South American material of either species was located, *R. precatória* and *R. quercetorum* are not treated in this work. However, we note that there is substantial confusion surrounding the taxonomy of the Neotropical species with bicolored seeds, including these two species.

Ecology and economic importance:—Many species of *Rhynchosia*, as well as *Eriosema* (Candolle 1825: 388) Desvaux (1826: 421), possess specialized root systems that confer resiliency against cutting and burning (Gear 1978; Cândido et al. 2019). These genera and other members of subtribe Cajaninae have characteristic secretory structures throughout the plant body, such as bulbous-based trichomes and vesicular glands (Vargas et al. 2018). Histochemical and ultrastructure analysis shows that the exudates of these structures act in defense against herbivory, and may also lessen damage by ultraviolet radiation (Vargas et al. 2019).

Some species of *Rhynchosia* have attractive seeds. Regarding these South American species, the seeds are bicolored, red and black (yellow-orange and black in one species), with areas of coloration almost equal or the red just only around the hilum. These hard and brightly-colored seeds, that in coloration resemble fleshy fruits, but that do not offer food rewards to mutualistic frugivores, are called mimetic seeds (Peres & Van Roosmalen 1996; Pizo et al. 2020).

A study that evaluates the temporal pattern of seed rain of the mimetic seeds of *R. melanocarpa* in an area of disturbed Cerrado vegetation in Rio Claro, São Paulo, Brazil, was performed by Pizo et al. (2020). This study revealed that dispersal of such seeds benefits from the temporal heterogeneity found in Cerrado environments, where the availability of fleshy fruits drastically varies with time. The fruits of *R. melanocarpa* dehisce and the seeds become available early in the Cerrado fruiting season to profit from the less discriminating eating habits of birds coming out of the dry season, as well as the influx of migratory bird species that are presumably naive with respect to the recognition of mimetic seeds.

Species of *Rhynchosia* may be linked to increased virility, as in the case of *R. pyramidalis* (Lamarck 1786: 296) Urban (1918: 318), popularly known as "Pega Palo" (Gear 1978). Some species of the genus, such as *R. phaseoloides*, also have narcotic properties and had their seeds used as hallucinogens by ancient Mexican peoples. These seeds have given positive to alkaloid tests, but the toxic principles have still not been characterized (Schultes 1976). Species of *Rhynchosia* can also be used as food sources for both humans and cattle, and the showy seeds of some species are used in handicrafts (Gear 1978; Jaca 2017). The ornamental potential of species with showy flowers, fruits and foliage deserves greater attention.

Identification Key to South American *Rhynchosia*

1. Leaves unifoliolate ... 23. *R. platyphylla*
 - Leaves trifoliolate ... 2
2. Inflorescence equals or exceeds the length of the subtending leaf ... 3
 - Inflorescence is shorter than the length of the subtending leaf ... 21
3. Surface of leaflets bullate; inflorescence corymbiform ... 7. *R. corylifolia*
 - Surface of leaflets not bullate; inflorescence racemose or paniculate ... 4
4. Plant covered with cinereous indument; leaves sessile to subsessile ... 14. *R. leucophylla*
 - Plant covered with white or yellow indument; leaves petiolate ... 5
5. Calyx with at least one lobe equaling or exceeding the length of the corolla (sometimes slightly shorter within the same specimen in *R. lateritia*) ... 6
 - All calyx lobes not exceeding the length of the corolla (sometimes slightly longer within the same specimen in *R. burkartii*) ... 11
6. Leaflets narrowly lanceolate to linear ... 16. *R. lineata*
 - Leaflets narrowly elliptical to elliptical, oblong, ovate, deltoid to rhombic, obovate or rounded ... 7
7. Inflorescence less than twice the length of the subtending leaf ... 2. *R. balansae*
 - Inflorescence often more than twice the length of the subtending leaf ... 8
8. Only the ventral lobe of the calyx exceeding the length of the corolla ... 26. *R. schomburgkii*
 - All calyx lobes equaling or exceeding the length of the corolla ... 9
9. Stems prostrate ... 13. *R. lateritia*
 - Stems twining ... 10
10. Stipules 3 – 10 mm long; leaflets pubescent or tomentose ... 24. *R. reticulata*
 - Stipules 1 – 2.5 mm long; leaflets puberulous to pilose ... 5. *R. calycosa*
11. Fruit slightly to strongly constricted between seeds; seeds bicolored ... 12
 - Fruit without constrictions between seeds; seeds unicolored ... 15
12. Fruit reddish-brown to black, glabrescent ... 13
 - Fruit greenish or greenish to brownish, pilose or pilose to pubescent ... 14
13. Vesicular glands on the abaxial leaflet surface only; stipels present; pedicel 2–4 mm long ... 18. *R. melanocarpa*
 - Vesicular glands on both leaflet surfaces; stipels absent; pedicel 1–2 mm long ... 10. *R. erythrinoides*
14. Fruits slightly constricted between seeds; seeds bicolored, yellow to orange and black ... 15. *R. lewisii*

- Fruits strongly constricted between seeds; bicolored black and red seeds ... 22. *R. phaseoloides*
- 15. Flowers 35 – 39 mm long ... 11. *R. franciscana*
- Flowers up to 18 mm long ... 16
- 16. Vesicular glands present on both leaflet surfaces ... 17
- Vesicular glands present only on the abaxial leaflet surface ... 19
- 17. Fruit falcate ... 20. *R. minima*
- Fruit elliptic, oblong, or ovate in outline ... 18
- 18. Fruit covered by pubescent to hirsute hairs and bulbous-based trichomes ... 12. *R. hauthalii*
- Fruit covered by pilose hairs, bulbous-based trichomes absent ... 3. *R. burkartii*
- 19. Fruits narrowly obovate, lacking bulbous-based trichomes ... 25. *R. rojasii*
- Fruits oblong to slightly obovate, densely covered with bulbous-based trichomes... 20
- 20. Vesicular glands on the abaxial leaflet surface brown to black; flowers 5–8 mm long ... 9. *R. edulis*
- Vesicular glands on the abaxial leaflet surface yellow; flowers 9–13 mm long ... 17. *R. mantaroensis*
- 21. Inflorescence racemose ... 22
- Inflorescence corymbiform or fasciculate ... 23
- 22. Fruit reddish-brown to black, with constrictions between seeds ... 21. *R. naineckensis*
- Fruit greenish to brownish, without constrictions between seeds ... 4. *R. caaguazuensis*
- 23. Inflorescence fasciculate ... 24
- Inflorescence corymbiform ... 25
- 24. Leaflets 0.9–2.3 cm long; fruit falcate ... 27. *R. senna*
- Leaflets 0.5–5.2 cm long; fruit oblong, obovate, or elliptic in outline ... 8. *R. diversifolia*
- 25. Plant covered by hirsute hairs; calyx lobes elliptic or narrowly ovate ... 6. *R. claussenii*
- Plant covered by pilose to pubescent hairs; calyx lobes linear or lanceolate ... 26
- 26. Stems prostrate; stipules ovate, 5–10 mm long ... 19. *R. mineira*
- Stems erect; stipules lanceolate to triangular, 2–5 mm long ... 1. *R. arenicola*

1. *Rhynchosia arenicola* Hassl., Bull. Herb. Boissier, sér. 2 7: 167. 1907. Type:— PARAGUAY, Department Caaguazú, Yhu, October 1905 (fl.), *Hassler 9565* (Lectotype [designated by Grear 1978]): G [not seen]; isoelectotypes: BM 000538505 [digital image!], K 00048404 [digital image!], NY 00026940 [!], P 00708585 [digital image!]). Iconography: *Rodriguésia* 70: 5. 2019.

Rhynchosia arenicola var. *major* Hassl., Bull. Herb. Boissier, sér. 2 7: 167. 1907. Type: Paraguay, Department Caaguazú, Yhu, *Hassler 9564* (Holotype: G [not seen]).

Fig. 3 A–C

Subshrub erect to prostrate, stems branched, glabrescent to pilose, indument white to light yellow, with non-glandular, yellow vesicular glands, and bulbous-based trichomes. *Stipules* 2–5 × 0.5–1.5 mm, free, persistent, lanceolate to triangular, externally pubescent with yellow vesicular glands and bulbous-based trichomes. *Leaves* trifoliolate, petiole 1.5–3.1 cm long; leaf rachis 0.4–1 cm long; stipels absent; leaflets 1.1–3.6 × 1.1–2.3 cm, narrowly elliptical to elliptical, lanceolate, rounded, or ovate, surface not bullate, retuse, obtuse, or rounded at apex, obtuse or rounded at base, entire-margined, pilose, with yellow vesicular glands on both surfaces. *Inflorescences* axillary, corymbiform to crowded racemose, 1.2–2 cm long, bearing 4–10 flowers, not exceeding the length of the subtending leaf, bracts deciduous; pedicel 1–2 mm long. *Flowers* 7–11 mm long excluding the pedicel; calyx 7.5–12 mm long, pilose to pubescent with yellow vesicular glands and bulbous-based trichomes, lobes linear to lanceolate, all of them equaling or exceeding the corolla in length; *standard petal* 6–9 × 3–4 mm, obovate, rounded at apex, glabrous, lacking vesicular glands and bulbous-based trichomes, claw 1–2 mm long, auricle ca. 0.5 mm long; wing petals 6–8.5 × 1–1.5 mm, oblong, claw 1.5–2 mm long, auricle ca. 0.5 mm long; keel petals 6.2–9 × 2–2.5 mm, falcate, claw 2–2.5 mm long; stamens 6.7–9 mm long; ovary 2–4 mm long, pilose, with yellow vesicular glands. *Fruits* 1.3–1.6 × 0.5–0.6 cm, brownish, without constrictions between the seeds, oblong to elliptical in outline, pilose with sparsely yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 3–3.8 × 2.5–3.2 mm, orbicular, unicolored, brown.

Nomenclatural and taxonomic notes:—*Rhynchosia arenicola* was described in 1907 by Hassler. In the protologue the author cited the gathering *Hassler 9565* but did not specify a particular specimen as type. There are at least five duplicates of the gathering deposited in different herbaria. Grear's (1978) citation of the specimen at G as the holotype constitutes an inadvertent lectotypification (see Turland et al. 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

Rhynchosia arenicola var. *major* was based on a Hassler collection gathered from the same locality and on the same date as the type of the typical variety (*Hassler 9564*). According to the protologue, they are differentiated by the size of the leaflets, which are a little larger in *R. arenicola* var. *major*, and by the length of the inflorescences, which are a bit more elongate in *R. arenicola* var. *major*. Grear (1978) found that no consistent distinctions between the varieties when more material was studied. We were unable to study the lectotype of the typical variety housed in G, the curator having informed to us that some material of the genus was sent on loan and not returned.

Rhynchosia arenicola is characterized by the calyx lobes exceeding the corolla in length (Fig. 3A) and prostrate stems (Fig. 3B). It is similar to *Rhynchosia mineira* due to its corymbiform inflorescence not exceeding the length of the subtending leaf (Fig. 3C) and well-developed calyx lobes. However, *R. arenicola* presents the stipules 2–5 mm long, lanceolate to triangular (vs. stipules 5–10 mm long, ovate in *R. mineira*) and glabrescent to pilose stems (vs. densely pubescent in *R. mineira*).

Reproductive phenology:—Flowering in February, March, October and November; fruiting in February, March, August and November.

Distribution and habitat:—This species is distributed in Brazil, Argentina and Paraguay (Fig. 4). It occurs in rocky fields, “campos limpos” (open grassland), recently burned field, open areas, and roadsides.

Conservation status:—Least Concern (LC). *Rhynchosia arenicola* has an EOO of 352,739 km² (GeoCAT, accessed in May 2022). There are many records of *R. arenicola* from Brazil and Argentina, and the species was recently collected in Botucatu, São Paulo, Brazil (*L. M. P. A. Bezerra et al. 140*, BOTU).

Specimens Examined:—**ARGENTINA.** Corrientes: Concepción, 6 km E de Santa Rosa, estancia Millán, 27 March 1975 (fl./fr.), *M. M. Arbo et al. 846* (MBM). Mburucuyá, Parque Nacional Mburucuyá, Potrero Maizal, 17 October 2006 (fl.), *M. M. Arbo et al. 9263* (ICN). Misiones: Candelaria, Santa Ana, 10 November 1945 (fl./fr.), *Montes 1469* (NY); San Ignacio, November 1896 (fl.), *N. Alboff s.n.* (NY); *ibid.*, alrededores de la casa de Horacio Quiroga, 5 November 1993 (fl.), *A. Krapovickas & C. L. Cristóbal 44603* (NY); *ibid.*, Teyú Cuaré, camino al paraje Payal, 20 February 1996 (fl.), *O. Morrone et al. 1047* (NY); *ibid.* 23 November 1995 (fl./fr.), *E. R. Guaglianone et al. 3037* (NY). **BRAZIL.** Minas Gerais: s.loc., November 1833 (fl./fr.), *Riedel 1571* (US). Paraná: Jaguariaiva, Joaquim Murtinho, 09 October 1958 (fl.), *G. Hatschbach 5094* (MBM); Rio Samambaia, 13 November 1974 (fl./fr.), *G. Hatschbach 35460* (MBM); Palmeira, Rio do Salto, 10 November 1951 (fl./fr.), *G. Hatschbach 2577* (MBM);

Ponta Grossa, Parque Estadual de Vila Velha, 19 March 2012 (fl.), *J. M. Silva et al.* 8285 (MBM). São Paulo: Botucatu, a margem da rodovia João Melão, que liga São Manuel a Avaré, no km 296, 22°54' lat. S., 48°44'19" long W., 20 November 1986 (fl./fr.), *L. R. Hernandez et al.* 1712 (UEC/SP); *ibid.*, Borda do horto florestal de Botucatu, 06 August 2020 (fr.), *T. C. Monteiro, I. C. Castro & A. P. Fortuna-Perez* 286 (BOTU); *ibid.*, 06 February 2020 (fr.), *T. C. Monteiro* 466 (BOTU); *ibid.*, 23 June 2021 (fr.), *L. M. P. A. Bezerra et al.* 140 (BOTU); s.loc., 06 October 1986 (fl.), *L. R. Hernades Bicudo et al.* 1552 (BOTU). **PARAGUAY.** Dep. Itapúa, “ruderalis circa Ecclesiam antiquam Trinidad”, 15 November 1978 (fl.), *Bernardi* 18662 (NY).

2. *Rhynchosia balansae* Micheli, Mém. Soc. Phys. Genève 28(7): 31. 1883. *Dolicholus balansae* (Micheli) Kuntze, Revis. Gen. Pl. 3(3): 60. 1898. *Rhynchosia reticulata* fo. *balansae* (Micheli) Hassl., Repert. Spec. Nov. Regni Veg. 16: 230. 1919. Type:—PARAGUAY, “Assomption, in collibus incultis”, February 1874 (fl./fr.), *B. Balansa* 1513 (Lectotype [designated by Grear 1978]: G 00400128 [digital image!]; isolectotypes: F 935567 [digital image!], K 000502955[!], LE 00002542 [digital image!], P 00708587[!], S R-9721 [digital image!]). Iconography: *Rodriguésia* 70: 5. 2019.

Rhynchosia pallida Micheli, Mém. Soc. Phys. Genève 28(7): 32. 1883. *Rhynchosia schomburgkii* fo. *pallida* (Micheli) Hassl., Repert. Spec. Nov. Regni Veg. 16: 230. 1919. Type: PARAGUAY, “Cerro-Peron prope Paraguari in pratis”, January 1876 (fr.), *B. Balansa* 1511 (Lectotype [first-step designated by Grear 1978; second-step designated here]: P 00709013 [digital image!]; isolectotypes: K 000502963 [digital image!], P 00709012 [digital image!]).
syn. nov.

Rhynchosia hagenbeckii Harms, Bot. Jahrb. Syst. 33, beibl. 72: 29. 1903. Type: ARGENTINA, Gran Chaco, *Hagenbeck s.n.* (Holotype: B [not seen]; isotype: F 0059816F [fragment; [digital image!]]).

Rhynchosia hassleriana Chodat, Bull. Herb. Boissier, sér. 2. 4(9): 904. 1904. Type: PARAGUAY, “in campo pr. flumen Jejuí guazu, s.d. (fl.) *E. Hassler* 5692 (Lectotype [designated by Grear 1978]: G 00400134 [digital image!]; isolectotypes: F 1563549 [digital image!], GH 00063821 [digital image!], K 000502956 [digital image!], MPU 022975 [digital image!], NY 00026945[!], P 00708604 [digital image!], UC 934983 [digital image!]; paratypes: *E. Hassler* 3566, BM 000538521 [digital image!], G 00400132 [digital image!], G 00400133 [digital image!], G 00400135 [digital image!], G 00400160 [digital image!], K 000502957 [digital image!], P 02748446 [digital image!], MPU 022976 [digital image!], NY 00026944[!] P 02748447 [digital image!], S-R-9725 [digital image!]).

Rhynchosia pallida var. *boliviana* Grear, Mem. New York Bot. Gard. 31(1): 145–147.1978. Type: BOLIVIA, “Chiquitos”, s.d. (fl./fr.), A. D. d’Orbigny 832 (Holotype: P 00709011 [digital image!]; isotypes: BAB [fragment] 00000491 [digital image!], G 00370857 [digital image!]). **syn. nov.**

Rhynchosia balansae var. *psilantha* Fortunato, Parodiana 2: 56–57, f. 4. 1983. Type: ARGENTINA, Corrientes, Dep. Concepción, 28 km SE de Concepción Ea. El Tránsito, May 1976 (fl.), A. Schinini et al. 13037 (Holotype: CTES 0000671 [digital image!]; isotype: SI 002510 [digital image!]). **syn. nov.**

Fig. 3 D–E

Subshrub erect to prostrate, stems simple to few-branched, pubescent, indument light yellow to yellow, with non-glandular trichomes and yellow vesicular glands, but lacking bulbous-based trichomes. *Stipules* 2.3–5 × 1–2.1 mm, free, deciduous to late-deciduous, ovate or lanceolate to triangular, externally pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 1.2–3.4 cm long; leaf rachis 0.5–1.5 cm long; stipels late-deciduous; *leaflets* 2.5–8.5 × 0.9–3.2 cm, narrowly elliptical to elliptical or oblong, surface not bullate, cuneate to rounded at apex, truncate, subcordate or rounded at base, entire-margined, pubescent to tomentose, with yellow vesicular glands on both surfaces. *Inflorescences* axillary, racemose, 4.5–12 cm long, many-flowered, equaling or exceeding the length of the subtending leaf, bracts deciduous; pedicel 0.5–1 mm long. *Flowers* 5.5–9 mm long excluding the pedicel; *calyx* 4–8.5 mm long, pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, all of them equaling or exceeding the corolla in length; *standard petal* 4.5–6.7 × 3–4 mm, elliptical or oblong, rounded at apex, pilose, with yellow vesicular glands but lacking bulbous-based trichomes, claw 0.5–1 mm long, auricle 0.3–0.5 mm long; *wing petals* 4.5–6.2 × 1–1.3 mm, oblong, claw 1–1.5 mm long, auricle ca. 0.5 mm long; *keel petals* 4.5–6.3 × 1.3–2 mm, falcate, claw 1–1.5 mm long; *stamens* 3.7–6 mm long; *ovary* 1.5–3 mm long, hairy, with yellow vesicular glands. *Fruits* 1–1.5 × 0.5–0.6 cm, green to brown, without constrictions between the seeds, ovate, oblong, or elliptical in outline, pubescent to tomentose, with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 3–4 × 2.5–3.8 mm, suborbicular, unicolored, brown to black.

Nomenclatural and taxonomic notes:—In the protologue of *Rhynchosia balansae* the author cited the gatherings *Balansa 1513* and *1844* from “Assomption, in collibus incultis”, but did not specify a particular specimen as type. When cited the gathering *Balansae 1513* at G as the holotype, Grear (1978) unintentionally lectotypified it (see Turland et al. 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

The same happens with *R. hassleriana*. In the protologue Chodat (1904) cited the gatherings *Hassler 5692* and *3566* but did not specify a particular specimen as type. Grear (1978) unintentionally lectotypified the gathering *Hassler 5692* at G when called it as the holotype (see Turland et al. 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

Fortunato (1983) designated a new variety for this species, named *R. balansae* var. *psilantha*. According to the protologue, this taxon is characterized by the stems prostrate (vs. stems erect to prostrate in *R. balansae* var. *balansae*), standard glandular, glabrous or rarely pubescent at the apex (vs. standard glandulous-pubescent in *R. balansae* var. *balansae*), apex emarginate (vs. apex apiculate to rounded in *R. balansae* var. *balansae*), wings glabrous (vs. glandulous-pubescent wings in *R. balansae* var. *balansae*) and calyx with long and short trichomes (vs. calyx puberulous or with long and short trichomes in *R. balansae* var. *balansae*). After a careful comparison of the characteristics present in the protologue as well as the photos of the type collection we concluded that the characters pointed out by the author are variable in both taxa and often overlap. Therefore, we propose here the synonymization of *R. balansae* var. *psilantha*.

Rhynchosia pallida and *R. balansae* were described by Micheli (1883) based on the *Balansa* gatherings from the same expedition in Paraguay: *Balansa 1511* and *1513*, respectively. According to the protologue, Grear (1978) and Fortunato (1983), *R. balansae* differs from *R. pallida* by the prostrate stems (vs. erect in *R. pallida*), by the calyx lobes, which are slightly longer in *R. pallida*, by the racemes, which are crowded in *R. balansae*, and by the arrangement of the vesicular glands on the leaflets (present on both surfaces in *R. pallida* vs. just in abaxial surface in *R. balansae*). When analyzing many specimens and digital images of *R. balansae* and *R. pallida*, as well as the type collections, we noticed that many characteristics listed to differentiate them often overlap, not justifying the two assigned names. In this way, *R. pallida* is proposed here as a synonym of *R. balansae*.

Micheli (1883) described *R. pallida* based on the gathering *Balansa 1511* but he did not specify a particular specimen as type. Grear (1978) cited a specimen at P as the holotype, but there are two duplicates of this gathering deposited there and he did not specify which of them is the type. The type designation of Grear (1978) should be treated as the first-step lectotypification and we designate here the P specimen with barcode number 00709013 as the second-step lectotype of *R. pallida* (see Turland et al. 2018, Art. 9.17).

Rhynchosia balansae is characterized by narrowly elliptical to elliptical or oblong leaflets (Fig. 3 D–E) with vesicular glands on both surfaces and by the racemose inflorescences equaling or exceeding the length of the subtending leaf. Is it morphologically similar to *R.*

burkartii mainly in fruits characteristics. However, it differs from *R. burkartii* by the shape of the leaflets, which is narrowly elliptical to elliptical or oblong in *R. balansae* (vs. rounded, ovate, rhombic or obovate in *R. burkartii* (Fig. 5A); by the calyx lobes equaling or exceeding the corolla in length in *R. balansae* (vs. calyx lobes not exceeding the corolla in length or sometimes are slightly longer within the same specimen in *R. burkartii*), and by the racemose inflorescence in *R. balansae* (vs. racemose or paniculate).

Reproductive phenology:—Flowering from January to March, August, and October to December; fruiting from January to March and October to December.

Distribution and habitat:—*Rhynchosia balansae* occurs in Argentina, Bolivia, Brazil, Paraguay and Uruguay (Fig. 4). This species can be found in secondary vegetations, cerrado fields, seasonal deciduous forest in transition to cerrado, roadsides and pastures.

Paratype:—PARAGUAY. “Assomption, in collibus incultis”, October 1875 (fl./fr.), *B. Balansa 1844* (P 02749401 [digital image!]).

Conservation status:—Least Concern (LC). According to the value of EOO (571,848 km²), *R. balansae* is classified as LC based on the terms of IUCN Red List (IUCN 2022). Also, this species is commonly collected in Mato Grosso do Sul state, Brazil.

Specimens Examined:—**ARGENTINA.** Corrientes: Capital, 15 February 1996 (fl.), *A. Schinini 30430* (UEC); Dep. Concepción, Estancia Tranquera de Hierro, 66 km al NE de Chavarria, camino a Concepción; Cerro Puitá, 14 km al E de la ruta, aprox 28 35'S 58 04 W, 3 December 1996 (fl./fr.), *M. M. Arbo, S. A. Cáceres & V. Maruñak 6933* (NY); Dep. Empedrado, Arroyo Gonzalez y Ruta 12, 27 February 1974 (fl./fr.), *C. Quartín et al. 2273* (MBM); Dep. General Paz, Los Cubanos, 7 December 1944 (fl./fr.), *G. J. Schuvarz 300* (NY). Dep. San Miguel, 12 km NE de San Miguel, 1 March 1990 (fl.), *R. Vanni et al. 1552* (NY); Dep. San Roque, Chavarria – cercanías, 2 April 1945 (fr.), *F. Ibarrola 2831* (NY). **BOLIVIA.** Dep. Santa Cruz: Chiquitos, camión Roboré- San José, 7 km NW de Roboré, camión de la serranía, s.d. (fl.), *B. Mostacedo & R. Abbou 2851* (NY). **BRAZIL.** Mato Grosso do Sul: Aquidauana, 19 February 1970 (fr.), *G. Hatschbach 23814* (MBM); *ibid.*, 30 July 2013 (fl.), *A.L.B. Sartori et al. 709* (BOTU); Bela Vista, Córrego Capei, 17 March 1985 (fl./fr.), *G. Hatschbach & J. M. Silva 49188* (MBM, NY); *ibid.*, Rodovia Bela Vista – Caracol, km 117, 06 September 2016 (fl.), *P. H. A. Melo & G. M. Marcusso 5705* (HUEFS); Bonito, MS - 382, 6,5 km E de Bonito, 21°05'15"S 56°35'35.6" W, alt. 423, 09 November 2002 (fl./fr.), *A. Pott et al. 10529* (RB); *ibid.*, Rodovia Bonito ao trevo com a Rod. BR-267, próximo do km 31, 13 November 2002 (fl.), *G. Hatschbach et al. 74176* (MBM); *ibid.*, 11 March 2003 (fl.), *G. Hatschbach et al. 74524* (MBM); *ibid.*, Rodovia Guia Lopes da Launa a Bonito, Rio Miranda, 09 March 2003 (fl./fr.),

G. Hatschbach et al. 74404 (MBM); Caracol, 10–20 km 0, 24 October 1987 (fl.), *G. Hatschbach et al. 51638* (MBM); 15 km L na rod. para Bela Vista, 10 February 1993 (fl.), *G. Hatschbach et al. 58871* (MBM); Corumbá, Fazenda Leque, 01 October 1976 (fl./fr.), *A. Allen 16* (RB); *ibid.*, Fazenda Santa Cruz, 20 November 2002 (fl./fr.), *G. Hatschbach et al. 73925* (MBM); Maracaju, Rod. BR-163, descida para a Serra de Maracaju, 08 October 2003 (fl./fr.), *G. Hatschbach et al. 76027* (MBM/RB). **PARAGUAY.** Acahay, 27 January 1992 (fl./fr.), *E. Zardini & P. Aquino 29981* (NY). Concepción: 3,2 km NW de Loreto, camino a Valle-Mi, 03 March 2009 (fl./fr.), *M. Dematteis et al. 3129* (UEC); In regione collium, Cordillera de Villa-Rica, 1905 (fl./fr.), *M. Hassler 8727* (P); Ybycui, 12 March 1992 (fr.), *E. Zardini & L. Guerrero 30996* (NY). **URUGUAY.** Montevideo, January 1873 (fl.), *Fruchard 1022* (P).

3. *Rhynchosia burkartii* Fortunato, *Parodiana* 2: 49–52. 1983. Type:—ARGENTINA, Formosa, Dep. Matacos, pastizal entre la Florencia e Ing. G. N. Juarez, September 1980 (fl.), *M. N. Correa et al. 7662* (Holotype: BAB 00000480 [digital image!]; isotypes: CTES 0000680 [digital image!], SI 002511 [digital image!]).

Fig. 5 A–B

Subshrub prostrate, stems branched, pubescent, indument light yellow, with non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 2–4.52 × 1–1.5 mm, free, persistent to late-deciduous, triangular to ovate, externally pubescent with yellow vesicular glands, but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 1.4–3.6 cm long; leaf rachis 0.5–1.7 cm long; stipels persistent to late-deciduous; *leaflets* 1.6–3.3 × 1.1–3.6 cm, rounded, ovate, rhombic or obovate, surface not bullate, emarginate to rounded at apex, obtuse to rounded at base, entire-margined, pilose to pubescent, with yellow vesicular glands on both surfaces. *Inflorescences* axillary to terminal, racemose or paniculate, 2.2–8 cm long, many-flowered, equaling or exceeding the length of the subtending leaf, bracts deciduous; pedicel 0.5–1 mm long. *Flowers* 4–7 mm long excluding the pedicel; *calyx* 4–6 mm long, pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, generally not exceeding the corolla in length (but sometimes slightly longer within the same specimen); *standard petal* 5–7 × 4–6 mm, obovate, rounded at apex, puberulous, pilose, or densely pilose, with vesicular glands but lacking bulbous-based trichomes, claw 1–1.5 mm long, auricle ca. 0.5 mm long; *wing petals* 6–6.5 × 1–1.5 mm, oblong, claw 1–1.5 mm long,

auricle 0.5–1 mm long; *keel petals* 6–7 × 1.5–2 mm, falcate, claw 1–1.5 mm long; *stamens* 5–7 mm long; *ovary* 2–3 mm long, pubescent, with light yellow vesicular glands. *Fruits* 1.1–1.9 × 0.4–0.6 cm, brown, without constrictions between the seeds, elliptical, ovate, or oblong in outline, pilose, with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 2.5–2.7 × 2.3–2.5 mm, suborbicular, unicolored, brown to reddish brown.

Nomenclatural and taxonomic notes:—*Rhynchosia burkartii* was described by Fortunato (1983). The type material comes from the province of Formosa, Matacos, Argentina. The epithet honors Dr. Burkart for his dedicated studies on Leguminosae. It is similar to *R. balansae*, the morphological characters that differentiate them are cited on taxonomic notes of this species.

Reproductive phenology:—Flowering in February, March, May, June and October to December; fruiting in February, March, May, June and October to December.

Distribution and habitat:—*Rhynchosia burkartii* occurs in Argentina, Bolivia, and Paraguay (Fig. 4). We examined one sheet of this species determined by Dr. Fortunato from Brazil (MBM 260284). However, this collection was damaged and without reproductive parts. In this way, we will not confirm its occurrence in Brazil. It can be found in disturbed and recently burned areas, sandy soil fields, semideciduous forests and floodable fields.

Paratypes:—ARGENTINA, Chaco: Dpto. Almirante Brown, December 1978, *SPF 4454* (SI [not seen]); Dep. Capital Arroyo Riachuelo, January 1959, *W. Gregory et al. 9535* (SI [not seen]). Formosa: Dep. Patiño, por Ruta 32, rumbo a Las Lomitas. Fn. Soledad, a 35 km hacia el N, June 1982 (fr.), *A. M. Molina et al. 440* (BAB 00000484, 00000485 [digital image!]); Dep. Matacos, Ing. Juárez, October 1981 (fl.), *A. Cabral et al. 1025* (BAB 00000482 [digital image!]). Salta: Dep. Orán, Abra Grande, November 1927 (fr.), *S. Venturi 7612* (US 02346644 [digital image!]); Orán a Saucelito, February 1906 (fl./fr.), *C. Spegazzini s.n.* (BAB 00000483 [digital image!]); Santa Maria, a 3km de Orán, October 1971, *M. Vallejos 12* (LIL [not seen]); Dep. Rivadavia, a 64 km de Gral. Mosconi, June 1982 (fl.), *A. M. Molina et al. 376* (BAB 00000486 [digital image!]). BOLIVIA, Santa Cruz: Chiquitos, 2km E de Roboré cerca del río Urusibique, s.d., *A. Krapovickas & A. Schinini 36365* (CTES [not seen]); Cordillera, 6 Km S de Lagunillas, 19°45' S 63°40' W, April 1977 (fl./fr.), *A. Krapovickas & A. Schinini 31421* (CTES 0000681 [digital image!]); El Hurón, January 1947, *J. Peredo s.n.* (LIL [not seen]). PARAGUAY, Chaco: Mayor Pedro Lagerenza, 20° S 60°45' W, April 1978 (fl./fr) *A. Schinini & E. Bordas 14888* (CTES 0000682 [digital image!]); *A. Schinini & E. Bordas 15106* (BAB

00000481 [digital image!], SI [not seen]); Etre Gral. Garay y Asunción, Ruta Trans Chaco, October 1975 (fl./fr.), *Adamoli et al.* 30 (BAA 00004333 [digital image!]); Isla Poé, s.d., *T. Rojas* 7107 (SI [not seen]).

Conservation status:—Least Concern (LC). According to the value of EOO (433,257; GeoCAT, accessed in May 2022), *R. burkartii* is classified as LC following the IUCN Red List (IUCN 2022). There are many records of this species from Argentina, Bolivia and Paraguay.

Specimens Examined:—**ARGENTINA.** Formosa: Dep. Matacos, ruta 39, 23 km S de Ing. G. M. Juarez, 07 November 1983 (fl./fr.), *R. Fortunato et al.* 283 (MBM); Dep. Patiño, 8km al N de las Lomitas, 10 November 1994 (fl./fr.), *R. H. Fortunato et al.* 4392 (MBM). Salta: Dep. Orán, Ruta 50, 2km W de San Ramón de la Nueva Orán, 04 December 2005 (fr.), *M. M. Arbo et al.* 8974 (MBM). **BOLIVIA.** Chuquisaca: Luis Calvo, El Salvador, Laguna Seca, 08 December 1992 (fl.), *J. Pensiero & G. Marino* 4387 (NY); Santa Cruz: Chiquitos, 26 km N de San José yendo a Taperas, 11 November 1996 (fr.), *A. Jardim, J. Haffman & F. Mamani* 3575 (NY); Cordillera, around highway and railroad bridges over Rio Seco on N side of settlement of Rio Seco, along new highway from Santa Cruz to Abapó, 24 May 1998 (fl./fr.), *M. Nee & L. Bohs* 49457 (NY); *ibid.*, camión hacia Boyuibe, entrando a mano derecha hacia palmarito, 10 June 2006 (fl./fr.), *L. Arroyo et al.* 3232 (NY); *ibid.*, Estancia Rancho Chico (puesto nuevo) y alrededores, 22 May 1998 (fl./fr.), *A. Fuentes et al.* 2349 (NY); Velasco, aprox.. 400 m, San Ignacio 14 km hacia SE, al lado del camino, suelo arenoso, 18 February 1988 (fl.), *B. Bruderreck* 249 (NY); Warnes, near future “Urbanización Bélgica Chica”, 11 km by dirt road E of main Highway from Santa Cruz to Warnes, 10 km (by air) SE of Warnes, 31 October 2000 (fl./fr.), *M. Nee* 51090 (NY); *ibid.*, pampa de Viru-viru a 17 km al N de ciudad de Santa Cruz, 13 February 1994 (fl./fr.), *M. Menacho & E. Gutierrez* 459 (NY). **PARAGUAY.** Boqueron: 9 km S de Loma Plata, propiedad de Ebenfeld, 25 November 1991 (fl./fr.), *R. Vanni, A. Radovancich & A. Schinini* 2174 (NY); Cruce de los Pineros, 7 km NE of the Trans Chaco Highway on the road to Buenavista, 17 February 2002 (fl./fr.), *M. Luckow* 4487 (NY); Filadelfia, 4 March 1984 (fl./fr.), *W. Hahn* 2140 (MBM); *ibid.*, dry thorn forest, 4 March 1984 (fl./fr.), *W. Hahn* 2140 (NY); Nueva Asunción, between Parque Nacional Teniente Agripino Enciso and Nueva Asunción, 27 January 1995 (fl./fr.), *E. M. Zardini & A. Acosta* 42382 (NY).

4. *Rhynchosia caaguazuensis* Hassl., Bull. Herb. Boissier 7: 168. 1907. Type:—PARAGUAY, “in campis pr. Caaguazú”, February 1905 (fl.), *E. Hassler 9013* (Lectotype [first-step designated by Grear 1978; second-step designated here]: G 00400136 [digital image!]; isoelectotypes: BM 000538508 [digital image!], F 0059811 [digital image!], G 00400137 [digital image!], GH 00063819 [digital image!], K 000484041 [digital image!], MPU 022980 [digital image!], NY 00026941[!], P 00708589 [digital image!], S S-R-9722 [digital image!], UC 929041 [digital image!]).

Fig. 5 C

Subshrub erect, stems branched, sericeous, indument white, with non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 0.5–1 × 0.5 mm, free, deciduous, triangular, externally villous with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 0.3–0.7 cm long; leaf rachis 0.2–0.4 cm long; stipels absent; *leaflets* 1.3–4.3 × 0.4–1.2 cm, linear, narrowly elliptical, or oblong, surface not bullate, obtuse to rounded at apex, cuneate to obtuse at base, revolute-margined, sericeous to tomentose, with yellow vesicular glands on both surfaces. *Inflorescences* axillary or terminal, racemose, 1.2–4.2 cm long, bearing 3–12 flowers, not exceeding the length of the subtending leaf, bracts deciduous; pedicel 2–3 mm long. *Flowers* 7–12 mm long excluding the pedicel; *calyx* 5.5–9 mm long, pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, not exceeding the corolla in length; *standard petal* 7.5–9 × 4–5 mm, oblong to elliptical or emarginate at apex, densely pilose, with vesicular glands but lacking bulbous-based trichomes, claw 2–2.5 mm long, auricle ca. 0.5 mm long; *wing petals* 7–8 × 1–1.5 mm, oblong, claw 1.5–2 mm long, auricle ca. 0.5 mm long; *keel petals* 8–9 × 2–2.5 mm, falcate, claw 2–2.5 mm long; *stamens* 7.5–8.5 mm long; *ovary* 2–2.5 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.4–2.2 × 0.5–0.7 cm, greenish to brownish, without constrictions between the seeds, elliptical to ovate-elliptical in outline, pilose to pubescent, with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 3.5–4 × 3–4 cm, reniform to suborbicular, unicolored, reddish-brow to brow.

Nomenclatural and taxonomic notes:—Hassler (1907) described *R. caaguazuensis* based on the gathering *Hassler 9013* but he did not specify a particular specimen as type, since there are several duplicates of this gathering deposited in different herbaria. Grear (1978) cited a specimen at G as the holotype, but this citation constitutes an inadvertent lectotypification (see

Turland et al. 2018, Art. 9.10, Ex. 11; Prado et al. 2020). As there are three duplicates of this gathering housed in G (G 00379289, G 00400136 and G 00400137) and Grear (1978) did not specify which of them is the type, his type designation should be treated as the first-step lectotypification (see Turland et al. 2018, Art. 9.17). We selected here the specimen with barcode number G 00400136 as the second-step lectotype of *R. caaguazuensis*.

Rhynchosia caaguazuensis is an easily recognizable species in South America. It is characterized by its erect subshrub habit, leaves short-petiolate (0.3–0.7 cm long) and by the leaflets linear, narrowly elliptical, or oblong up to 1.2 cm wide with revolute margins (Fig. 5 C).

Reproductive phenology:—Flowering and fruiting in February and November.

Distribution and habitat:—*Rhynchosia caaguazuensis* is an endemic species from Paraguay (Fig. 4). It can be found in areas of Cerrado domain, such as and rocky fields. This species is very rare with just few samples in herbaria.

Conservation status:—Critically Endangered (CR). *Rhynchosia caaguazuensis* was described in 1907 and only 3 records were found for this species since then. Therefore, it is classified as CR, following the criterion D of the IUCN red list (IUCN 2022).

Specimens Examined:—**PARAGUAY.** Caaguazú: “Dans les campos”, 16 November 1874 (fl./fr.), *B. Balansa 1499* (P 02749393). Canendiyú, Mbaracayú Natural Reserve, 14 January 1998 (fl.), *E. M. Zardini & M. Vera 47878* (MEXU 1161266); “In regione calcarea cursus superioris fluminis Apa”, s.d. (fl./fr.), *E. Hassler 11067* (NY, P 2749397).

5. *Rhynchosia calycosa* Hemsl., Diagn. Pl. Nov. Mexic. 3: 48. 1880. *Dolicholus calycosus* (Hemsl.) Standl., Contr. U.S. Natl. Herb. 18(3): 108. 1916. Type:—PANAMA, Chagres, January 1850 (fl./fr.), *A. Fendler 72* (Lectotype [first-step designated by Grear 1978; second-step designated here]: K 000502948 [digital image!]; isolectotypes: GH 00063804 [digital image!], K 000502949 [digital image!], MO 125145 [digital image!], US 00004672 [digital image!]).

Vine suffrutescens, twining, stems branched, puberulous, indument light yellow, with non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 1–2.5 × 1–1.5 mm, free, deciduous, lanceolate. *Leaves* trifoliolate, petiole 1.1–6.8 cm long; leaf

rachis 1.1–2 cm long; stipels persistent to late-deciduous; *leaflets* 1.6–7.2 × 1.4–6.7 cm, ovate or deltoid to rhomboid, surface not bullate, acute to acuminate at apex, obtuse to rounded at base, entire-margined, puberulous to pilose, with yellow vesicular glands on the abaxial surface. *Inflorescences* axillary or terminal, racemose or paniculate, 8–27 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 1–2 mm long. *Flowers* 8–10 mm long excluding the pedicel; *calyx* 9–11 mm long, pubescent to hirsute with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, all of them equaling or exceeding the corolla in length; *standard petal* 7–10 × 4–5 mm, orbicular, rounded at apex, glabrous, lacking vesicular glands and bulbous-based trichomes, claw 1.5–2 mm long, auricle ca. 0.5 mm long; *wing petals* 7–8 × 1.5–2 mm, oblong, claw 1.5–2 mm long, auricle ca. 0.5 mm long; *keel petals* 8–9 × 2.5–3 mm, falcate, claw 2–2.5 mm long; *stamens* 8–8.5 mm long; *ovary* 2–2.5 mm long, pilose, with yellow vesicular glands. *Fruits* 1.6–2.6 × 0.6–0.8 cm, brown, without constrictions between the seeds, oblong to obovate in outline, glabrescent to puberulous, with sparsely yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 3–4 × 3–3.5 mm, reniform, unicolored, dark brown to black.

Nomenclatural and taxonomic notes:—*Rhynchosia calycosa* was described by Hemsley (1880) based on a Flender collection from “Panama: Chagres”, deposited in K. Grear (1978) cited the gathering Flender 72, which has the information that matches that of the protologue, as the holotype. Nevertheless, there are at two duplicates of this gathering at K (K 000502948 and K 000502949), and Grear (1978) did not specify a particular specimen as type. Thus, Grear’s (1978) citation of the specimen at K as the holotype should be treated as the first-step lectotypification (see Turland et al. 2018, Art. 9.17). Therefore, we designate here the specimen with barcode number K 000502948 as the second-step lectotype of *R. calycosa*.

Rhynchosia calycosa resembles *R. reticulata* mainly by the calyx lobes equaling or exceeding the corolla in length and by the shape of the leaflets and fruits. However, *R. calycosa* differs from *R. reticulata* by the stipules 1–2.5 × 1–1.5 mm, deciduous (vs. 3–10 × 1–6 mm, persistent to late-deciduous) and by the leaflets puberulous to pilose (vs. pubescent to tomentose).

Reproductive phenology:—Flowering in January, February, April, June and July and fruiting from January to April, June and July.

Distribution and habitat:—*Rhynchosia calycosa* occurs in Nicaragua to Panama in Central America and in Bolivia, Colombia and Ecuador in South America (Fig. 6). It can be found in roadsides, secondary vegetations and tropical forests.

Conservation status:—Least Concern (LC). According to the value of EOO (2,836,586 km²; GeoCAT, accessed in May 2022), *R. calycosa* is classified as LC based on the terms of IUCN Red List (IUCN 2022). There are few records of this species for South America. For that reason, we believe that efforts to collect and conserve this species are needed, even though it was accessed as LC.

Specimens Examined:—**BOLIVIA.** Santa Cruz: Velasco, Campamento El Refugio a 7 km al E de la casa, yendo hacia la serranía Caparuch, 9 July 1994 (fr.), *R. Guillén & S. Coria 2144* (NY). **COLOMBIA.** Bolívar: Morales, On Rio Sinu, 05 February 1918 (fl.), *F. W. Pennell 4161* (NY). Magdalena: Sevilla, Carretera Santa María – Fundación, en la orilla del río, 30 April 1981 (fl./fr.), *R. Barneby 82* (NY). **ECUADOR.** Cachaqui, 23 June 1926 (fl./fr.), *H. E. Anthony & G. H. F. Tate 92* (US digital image); Guarumo, December 1875 (fl.), *André 500* (NY); Guayas, Guayaquil, 18 June 1923 (fl./fr.), *A. S. Hitchcock 20146* (NY). Manabí: Roadside at Naranja, north of Paján, 17 July 1942 (fl./fr.), *O. L. Haught 3407* (NY).

Additional specimens examined:—**COSTA RICA.** Puntarenas: Tropical rain forest and moist secondary forest on El General Valley, vicinity of San Isidoro El General, 11 March 1966 (fr.), *R. A. Molina 18185* (US digital image). **NICARAGUA.** Chontales: Acoyapa, 2 km south of Acoyapa, 04 January 1969 (fl.), *C. E. Nichols 1735* (MEXU 1188769). **PANAMA.** Agricultural Experiment Station at Matías Hernández, January 1915 (fl./fr.), *H. F. Pittier 6911* (US digital image); Ancon, Canal Zone, 24 December 1912 (fl.), *B. Celestine 69* (US digital image); Colón, Vicinity of Gatuncillo, Canal Zone, 26 February 1923 (fr.), *C. V. Piper 5619* (US digital image); Darien, 13 February 1967 (fr.), *J. A. Duke 10105* (US digital image); Río Tocumen, 03 January 1924 (fl./fr.), *P. C. Standley 29449* (US digital image).

6. *Rhynchosia clausenii* Benth., Fl. Bras. 15(1B): 201. 1862. *Arcyphyllum capitatum* Benth. Linnaea 22: 525. 1849. Type:—BRAZIL, Minas Gerais, “Caxoeiras do Campo” s.d. (fl./fr.), *P. Clausen 172* (Lectotype [designated by Grear 1978]: K 000502965 [digital image!]; isolectotypes: F 1539658 [digital image!], G 00367747 [digital image!], K 000502966, 000502967 [digital image!]). Iconography: Rodriguésia 70: 5. 2019.

Fig. 3 F

Subshrub erect, stems simple to few-branched, indument hirsute, yellow, with non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 4–12 × 1.5–4 mm, free, persistent, ovate, lanceolate or elliptical, externally hirsute with yellow to light brown vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 3.1–6.2 cm long; leaf rachis 0.9–1.5 cm long; stipels late-deciduous; *leaflets* 2.1–5.8 × 1.2–4.7 cm, ovate, elliptical, oblong or rounded, surface not bullate, mucronate, retuse or cuneate to rounded at apex, rounded at base, entire-margined, pilose to hirsute, with yellow to light brown vesicular glands on both surfaces. *Inflorescences* axillary or terminal, corymbiform, 2.1–7.4 cm long, many-flowered, not exceeding the length of the subtending leaf, bracts deciduous; pedicel 2–5.5 mm long. *Flowers* 9–17 mm long excluding the pedicel; *calyx* 8–16 mm long, hirsute, with yellow vesicular glands but lacking bulbous-based trichomes, lobes elliptical or narrowly ovate, all of them equaling or exceeding the corolla in length; *standard petal* 7–10 × 4–6 mm, obovate, rounded at apex, glabrous, with yellow vesicular glands, 1.5–2 mm long, auricle 0.4–0.5 mm long; *wing petals* 7–10 × 1–2 mm, oblong, claw 1.8–2 mm long, auricle 0.6–1 mm long; *keel petals* 8–11 × 2–4 mm, falcate, claw 2–2.3 mm long; *stamens* 8–11 mm long; *ovary* 2–3 mm long, hairy, with yellow vesicular glands. *Fruits* 1.1–2 × 0.5–0.6 cm, brownish, without constrictions between the seeds, ovate or oblong in outline, pilose to hirsute, with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 2–3 × 2–2.5 mm, suborbicular, unicolored, brown to black.

Nomenclatural and taxonomic notes:—This species was described by Bentham (1849) as *Arcyphyllum capitatum*. The binomial *Rhynchosia capitata* had already been assigned to a different species, so Bentham (1862) established the name *Rhynchosia clausenii* in honor of Claussen, who gathered the type specimen.

In the protologue of *R. clausenii* two collections were mentioned: “Habitat in prov. Minarum, ad Caxoeira do Campo: Claussen” and “in campis siccis inter Goyaz et Cuiaba: Weddell”. According to Grear (1978) the type specimen at K consists in two different gatherings of *R. clausenii*. One of them was gathered by Claussen, which was selected as lectotype by Grear (1978) because it is specifically cited in the protologue, and the other is a paratype gathered by Weddell.

Rhynchosia clausenii can be easily recognized by the erect shrubby habit (Fig. 3 F); hirsute indumentum throughout the plant’s body; corymbiform inflorescence not exceeding the

length of the subtending leaf; well-developed calyx lobes, elliptical or narrowly ovate; and by the glabrous corolla (Bezerra et al. 2019a).

Reproductive phenology:—Flowering from February to March and from October to December; fruiting in February to March, August, and October to December.

Distribution and habitat:—*R. clausenii* occurs in Cerrado areas, rockyfields and sandy soil areas of the midwest, northeast and southeast regions of Brazil and northeastern region of Paraguay (Fig. 6).

Paratype:—BRAZIL. “in campis siccis inter Goyaz et Cuiaba”, October 1844 (fl.) *Weddell* 2962 (K 000502964 [digital image!]).

Conservation status:—Least Concern (LC). According to the value of EOO (1,961,736 km²; GeoCAT, accessed in May 2022), *R. clausenii* is classified as LC following the terms of IUCN red list (IUCN 2022). Also, it was recently collected in Parque Nacional de Brasília, DF, Brazil (*C. R. Martins* 2431).

Specimens Examined:—BRAZIL. Ceará: Guaraciaba do Norte, Chapada da Ibiapaba, 10 April 1992 (fl.), *A. Fernandes et al. s.n.* (EAC). Distrito Federal: Brasília, Parque Nacional de Brasília, 21 February 2004 (fl./fr.), *C. R. Martins* 252 (UEC); *ibid.*, 18 December 2016 (fr.), *C. R. Martins* 2431 (CEN). Goiás: Anápolis, margem da Rodovia Brasília-Anápolis, 16 December 1965 (fl./fr.), *R. P. Belém* 2025 (IPA); Aparecida de Goiânia, Chácara Jatobá, 26 December 2002 (fr.), *J. F. B. Pastore* 198 (CEN); Corumbá de Goiás, 15 km. S of Corumbá de Goiás, elevation 1000m, 30 November 1965 (fl.), *H. S. Irwin et al. s/n* (UB); Estrada Brasília/Belo Horizonte, km 5, 29 November 1976 (fr.), *G. Shepherd et al.* 3799 (UEC); Luziânia, BR-30, a 5 km divisa Cristalina - GO, 20 November 1976 (fl.), *A. Allem* 462 (RB, CEN). Maranhão: Balsas, Morro Larerita, 23 March 1997 (fl./fr.), *R. C. Oliveira et al.* 717 (UEC). Mato Grosso: Cuiabá, 8 km SE Cuiabá, caminho para Faz. Roselândia, 30 September 1986 (fl.), *A.M. de Carvalho* 2155 (CEPEC). Mato Grosso do Sul: Camapuã, 08 February 1974 (fr.), *G. Hatschbach* 33932 (MBM); Campo Grande, BR-163, próximo a Água Ruim, 14 July 1970 (fr.), *G. Hatschbach & O. Guimarães* 24636 (MBM). Minas Gerais: Morrinhos, 24 November 1975 (fl.), *G. Hatschbach* 37824 (MBM); Paraopeba, Horto Florestal, 20 October 1954 (fl./fr.), *E. P. Heringer* 3596 (UB). São Paulo: Mogi Guaçu, Reserva Florestal, Fazenda Campininha, 30 October 1957 (fl.), *M. Kuhlmann* 4260 (SP). PARAGUAY. Caaguazú, Sierra de Maracayú “in altoplanitie et decliviis”, s.d. (fl./fr.), *E. Hassler* 5315 (P).

7. *Rhynchosia corylifolia* Mart. ex Benth., Fl. Bras. 15(1B): 202. 1862. Type:—BRAZIL, s. loc. (fl.), *Sellow 760* (Lectotype [designated by Grear 1978]: K 000502974 [digital image!]). Iconography: *Rodriguésia* 70: 5. 2019.

Rhynchosia corylifolia var. *erecta* Micheli. Mem. Soc. Phys. Hist. Nat. Geneve. 28: 31. 1883. Type: PARAGUAY, “in sylva Mbatobi prope Paraguari”, *B. Balansa 1509* (Lectotype [designated by Grear 1978]): G [not seen]; isolectotypes: P 00708595 [digital image!], P 00708596 [digital image!], P 00708597 [digital image!]).

Rhynchosia corylifolia var. *orbiculata* Chodat & Hassl. Bull. Herb. Boissier, sér. 2. 4(9): 902. 1904. Type: PARAGUAY, “ad marginem silvae pr. Caragatay”, X.1900 (fl.) *E. Hassler 3328* (Lectotype [first-step designated by Grear 1978; second-step designated here]: G 00400128 [digital image!]; isolectotypes: F 1539554 [digital image!], G 00400129 [digital image!], GH 00063820 [digital image!], K 000502972 [digital image!], NY 00026943[!], P 00708583 [digital image!]).

Rhynchosia corylifolia fo. *glabrior* Chodat & Hassl. Bull. Herb. Boissier, sér. 2. 4(9): 902. 1904. Type: PARAGUAY, “inter gramine in campo pr. Valenzuela”, *E. Hassler 7141* (Holotype: G [not seen]).

Rhynchosia corylifolia var. *discolor* Chodat & Hassl. Bull. Herb. Boissier, sér. 2. 4(9): 903. 1904. Type: PARAGUAY, “in arenosis pr. Choló”, *E. Hassler 6801* (Lectotype [designated by Grear 1978]): G [not seen]; isolectotype: BM 000538503 [digital image!])

Rhynchosia reticulata fo. *subumbellata* Chodat & Hassl. Bull. Herb. Boissier, sér. 2. 4(9): 903. 1904. Type: PARAGUAY, “in campo pr. Valenzuela”, *E. Hassler 7097* (Lectotype [designated by Grear 1978]): G [not seen]; isolectotype: NY 00026953[!])

Rhynchosia reticulata var. *brevipetiolata* fo. *ovalifolia* Chodat & Hassl. Bull. Herb. Boissier, sér. 2. 4(9): 903. 1904. Type: PARAGUAY, “in regione cursus superioris fluminis Jeju Guazú”, s.d. (fl.) *E. Hassler 4655* (Lectotype [first-step designated by Grear 1978; second-step designated here]: G 00379286 [digital image!]; isolectotypes: BM 000793101 [digital image!], G 00379287 [digital image!], K 000502971 [digital image!], NY 00026952[!], P 00708594 [digital image!])

Rhynchosia reticulata var. *brevipetiolata* fo. *oblongifolia* Chodat & Hassl. Bull. Herb. Boissier, sér. 2. 4(9): 903. 1904. Type: PARAGUAY, “in campis pr. San Estanislao”, *E. Hassler 4176* (Lectotype [designated by Grear 1978]): G [not seen]; isolectotypes: BM 000538502 [digital image!]; NY 00026951[!])

Fig. 3 G–J

Subshrub prostrate, stems simple to branched, pubescent, indument white to light yellow, with non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 3–12 × 2–9 mm, free, persistent, lanceolate or ovate, externally pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 0.4–6 cm long; leaf rachis 0.4–1 cm long; stipels absent; *leaflets* 1.3–9.2 × 1.1–7 cm, ovate, elliptical, obovate, oblong or rounded, surface bullate, obtuse, retuse or rounded at apex, cuneate to

rounded at base, entire-margined, pilose to pubescent, with yellow vesicular glands just on the abaxial surface. *Inflorescences* axillary, corymbiform, 5.5–16.5 cm long, many-flowered, equaling or exceeding the length of the subtending leaf, bracts deciduous; pedicel 1–8 mm long. *Flowers* 6–9 mm long excluding the pedicel; *calyx* 5.5–12 mm long, pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes narrowly elliptical to lanceolate, all of them equaling or exceeding the corolla in length; *standard petal* 4.5–10.3 × 3–7 mm, oblong to obovate, rounded at apex, glabrous, lacking vesicular glands and bulbous-based trichomes, claw 1–1.5 mm long, auricle ca. 0.5 mm long; *wing petals* 6.0–11 × 1–1.5 mm, oblong, claw 1.5–2 mm long, auricle 0.5–1 mm long; *keel petals* 6–10 × 1.5–2.5 mm, falcate, claw 1.5–2.5 mm long; *stamens* 6–10 mm long; *ovary* 3.3–3.7 mm long, densely pubescent, with few light yellow vesicular glands. *Fruits* 1.1–2.3 × 0.5–0.6 cm, brown, without constrictions between the seeds, oblong or elliptical, pilose to pubescent, with few yellow vesicular glands and bulbous-based trichomes. *Seeds* 2–3 × 2–3 mm, suborbicular, unicolored, brown to black.

Nomenclatural and taxonomic notes:—In the protologue of *R. corylifolia*, Bentham (1862) cited four collections: “*Habitat in arenosis ad. Itapemerein: M*”; “*in prov. Rio Grande do Sul: Tweedie*”; “*Hb. Imp. Br. n 1508*”; and “*et verisimiliter ibidem legit Sellow*”. Gear (1978) cited the gathering *Sellow 760* as holotype, but it actually constitutes an inadvertent lectotypification (see Turland et al. 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

The authors of *R. corylifolia* var. *erecta*, *R. corylifolia* var. *orbiculata*, *R. corylifolia* var. *discolor*, *R. reticulata* fo. *subumbellata*, *R. reticulata* var. *brevipetiolata* fo. *ovalifolia* and *R. reticulata* var. *brevipetiolata* fo. *oblongifolia* did not specify a particular specimen as type in the protologue, although there are duplicates deposited in other herbaria. Gear (1978) inadvertently lectotypified them when cited one specimen of their type collection as the holotype (see Turland et al. 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

Gear (1978) cited the gathering *Hassler 3328* at G as the type of *Rhynchosia corylifolia* var. *orbiculata*. There are two duplicates of this gathering deposited there (G 00400128 and G 00400129) and he did not specify a particular specimen as type. This was also observed in *Rhynchosia reticulata* var. *brevipetiolata* fo. *ovalifolia*. There are two duplicates of the type collection (*Hassler 4655*) at G: G 00379286 and G 00379287 and Gear (1978) did not designate which specimen is the type. The type designation of Gear (1978) should be treated as the first-step lectotypification and we designate here the specimens with barcode number G

00400128 and G 00379286 as the second-step lectotypes of *Rhynchosia corylifolia* var. *orbiculata* and *R. reticulata* var. *brevipetiolata*, respectively (see Turland et al. 2018, Art. 9.17).

We were unable to study the holotype of *Rhynchosia corylifolia* fo. *glabrior* in G. We have been informed by the curator that some materials of the genus were sent on loan and did not return. We decided to keep this taxon as a synonym of *R. corylifolia* based on the characteristics provided in the protologue.

Rhynchosia corylifolia is an easily recognizable species of the genus by having leaflets with a bullate surface (Fig. 3 G–H). Also, this is the only South America species which has a corymbiform inflorescence (Fig. 3 G, I–J) equaling or exceeding the length of the subtending leaf.

Reproductive phenology:—Flowering from January to March, May, and September to December; fruiting from January to March, May, June and October to December.

Distribution and habitat:—*Rhynchosia corylifolia* occurs in Argentina, Bolivia, Brazil, Paraguay and Uruguay (Fig. 6). This species can be found mainly in cerrado areas, rocky fields, forest edges, disturbed areas and roadsides.

Paratypes:—BRAZIL, Itapemirim, s.d., *Martius s.n.* (BR 5850969 [digital image!]); “Province de Rio Grande”, 1833 (fl.), *C. Gaudichaud 1508* (P 00708592 [digital image!]).

Conservation status:—Least Concern (LC). *Rhynchosia corylifolia* is classified as LC following the IUCN red list (IUCN 2022) due to its values of EOO (2,067,521 km²). This species is widespread in central South America being frequently observed in ruderal areas such as roadsides and villages.

Specimens Examined:—ARGENTINA. Chaco: Resistencia, 28 September 1944 (fl.), *T. Rojas 12365* (NY). Corrientes: Bella Vista, 9.2 km al S de Bella Vista sobre ruta 27, 27 December 1983 (fr.), *C. P. Cowan et al. 4186* (NY); San Miguel, Ea. San Juan Porajhu, ruta 17, 18 km ruta 12, Potrero Três Marias, 6 December 1992 (fl./fr.), *S. G. Tressens, M. Beccaceci, & R. Vanni 4254* (NY); Santo Tomé: Timbó, Ayo, s.d. (fl.), *A. Schinini et al. 23456* (IPA). Jujuy: Capital, Zapla, 9 November 1974 (fl.), *A. Burkart et al. 30470* (NY). Misiones: Cainguas, Puerto Rico, 9 February 1955 (fl./fr.), *J. E. Montes 14771* (NY); Candelaria, Bompland, 17 February 1975 (fr.), *J. F. Chuvarez 684* (NY); ibid. Loreto, 12 December 1944 (fl.), *E. Montes 275* (NY); Corpus, 18 September 1945 (fl.), *Bertoni 1913* (NY). Salta: La Caldera, Alto la Sierra, cabecera del A. la Sierra, 5 November 1987 (fl.), *V. Nunez & L. A. Marmol 325* (NY). Santa Fé: Camiño de Reconquista a Dr Barros Pazos, 1 February 1936 (fl./fr.), *M. M. Job 774* (NY). BOLIVIA. Santa Cruz: El Fuerte, Samaipota, November 1954

(fl.), *Cardenas 5194* (US); Florida, Bella Vista, Sendero al Cañadón, bosque com vegetación del Cerrado, 11 December 2007 (fl.), *D. Villarreal et al. 1527* (NY); *ibid.*, 10 November 2005 (fl.), *L. Arroyo et al. 3071* (NY); Vallegrande, Comunalidad de Chapas, 2-3 km S de El Palmar, 26 December 1993 (fl./fr.), *I. G. Vargas 3065* (NY). **BRAZIL.** Mato Grosso: Rio Brillhante, Aroeira, October 1970 (fl.), *G. Hatschbach 25255* (MBM). Mato Grosso Do Sul: Dourados, Rio Dourados, 16 May 1976 (fl.), *G. Hatschbach 38690* (MBM). Paraná: Balsa Nova, Serra de São Luiz, 12 December 1965 (fl.), *Reitz & Klein 17447* (FLOR); Coronel Domingos Soares, interior do município, 13 March 2013 (fr.), *Campestrini et al. 520* (FLOR); Lapa, via Lapa-União da Vitória, 5 November 1964 (fl.), *J. Mattos 11917* (SP); Palmas, Refúgio de Vida Silvestre (REVIS) dos Campos de Palmas, 19 June 2013 (fr.), *Campestrini et al. 245* (FLOR); Ponta Grossa, 01 November 1928 (fl.), *F. C. Hoehne s.n.* (SP); Ponta Porã, 35 km L, 15 May 1976 (fl./fr.), *G. Hatschbach 38668* (NY); Porto Amazonas, campo seco, 16 December 1929 (fl.), *Gurgel s/nº* (RB). Rio Grande Do Sul: Alegrete, junto ao cerro do Tigre, em afloramento rochoso em frente a ele, do outro lado da estrada (lado direito de quem vem de Alegrete), 11 February 1990 (fl./fr.), *D. B. Falkenberg & M. E. G. Sobral 5197* (FLOR); Caçapava do Sul, 13 December 1982 (fr.), *D. B. Falkenberg 20* (FLOR); beira estrada Caçapava - Pedra do Segredo, à esquerda, na base do maior morro, 21 January 1994 (fl./fr.), *D. B. Falkenberg et al. 6472* (FLOR); Caxias do sul - Distrito de Criuva - São Luiz Dalagno, 5 January 2013 (fl.), *J. Gaio et al. 301* (FLOR); Morro Redondo - Santo Amor, 3 December 1989 (fl.), *J. A. Jarenkow 1486* (FLOR); Pelotas - entre Colônia São José e Sta. Silvana, 30 October 1988 (fl.), *J. A. Jarenkow 1017* (FLOR); Porto Alegre, Morro da Glória, 13 October 1932 (fl./fr.), *B. Rambo 379* (SP); Santiago, BR 453, KM 166, após porteira, 24 April 1979 (fl.), *J. Valls et al. 4623* (CEN); Tapes, ca. 10 km depois do trevo, em direção a Camaquã, 16 December 1996 (fl./fr.), *J. A. Jarenkow 3325* (FLOR); Torres, próximo ao trevo BR 101, 26 October 1985 (fl./fr.), *D. B. Falkeberg 2952* (FLOR); Tupanciretã, December 1986 (fr.), *M. Sobral 5311* (FLOR, NY). Santa Catarina: Agua Doce, Campos de Palmas, 4 December 1964 (fl.), *L. B. Smith & M. Klein 13548* (NY); Lages UAP16/UAL1, 30 March 2013 (fl.), *E. D. Santos et al. 72* (FLOR). São Paulo: Itapetininga, km 180., Rod. Raposo Tavares, 3 December 1974 (fl./fr.), *L. d'A. F. Carvalho 140* (RB); São José dos Campos, 400-800 m ao oeste da estrada para Paraibuna, cabeceira de um vale pequeno, 14 November 1961 (fl.), *I. Minuma 94* (NY, UB); São Paulo, Avenida Paulista, October 1913 (fl./fr.), *A. C. Brade 7291* (SP); Villa Mariana, 24 November 1905 (fl./fr.), *A. Usteri s/nº* (SP); Tatuí, 18 October 1957 (fl.), *O. Handro 708* (SP). **PARAGUAY.** Caaguazú, east of Caaguazú, 28 December 1994 (fl.), *L. Guerrero 42082* (NY);

San Pedro, Alto Paraguay: Primavera, 14 October 1955 (fl.), *A. L. Woolston 598* (NY).
URUGUAY. Montevideo: Montevideo, s.d. (fl.), *Sellow D652* (P).

8. *Rhynchosia diversifolia* Micheli, Mém. Soc. Phys. Genève 28(7): 33. 1883. *Rhynchosia senna* var. *diversifolia* (Micheli) Hassl. 16: 230. 1919. Type:—PARAGUAY, “Cerro Peron, près de Paraguari, dans les lieux herbeux”, January 1877 (fl./fr.), *B. Balansa 1508* (Lectotype [designated by Grear 1978]): G 00400127 [digital image!]; isolectotypes: P 00708500 [digital image!]; P 02748443 [digital image!]; K 000502981 [digital image!]). Iconography: *Rodriguésia* 70: 5. 2019.

Rhynchosia senna Gillies ex Hook. emend. Griseb. Abh. Böhm. Ges. Wiss. 19: 122. 1874.

Rhynchosia senna var. *genuina* (Griseb.) Hassl. Repert. Spec. Nov. Regni Veg. 16: 230. 1919. Type: ARGENTINA, Misiones “in campis pr. San Ignacio”, s.d. (fl./fr.) *Hassler 459* (Holotype: G [not seen]).

Rhynchosia senna var. *diversifolia* fo. *genuina* (Micheli) Hassl. Repert. Spec. Nov. Regni Veg. 16: 230. 1919. Type: PARAGUAY, “in pratis apricis collis Cerro-Hu”, s.d. (fl./fr.) *Hassler 1223* (Lectotype [designated here]: G 00379284 [digital image!]; isolectotypes: BM 000538497 [digital image!], K 000502980 [digital image!], P 00708601 [digital image!], P 02748423 [digital image!]; paratype: *Hassler 2265*, [not seen]).

Rhynchosia senna fo. *glabrata* (Micheli) Hassl. Spec. Nov. Regni Veg. 16: 230. 1919. Type: PARAGUAY, Santo Tomás, December 1900. *E. Hassler 6492* (Holotype: G [not seen]).

Rhynchosia diversifolia var. *prostrata* Burkart Fl. Prov. Buenos Aires 4(3): 628. 1967. **syn. nov.** *Rhynchosia bicentrica* B.L. Turner, *Lundellia* 15: 22. 2012. **syn. nov.** Type: ARGENTINA, Buenos Aires, “al leste de Olavarría, Sierra Barja”, December 1913 (fl./fr.), *J. Najera 29* (Holotype: SI 002512 [digital image!]; paratypes: *R. Hicken 7442*, SI 002514 [digital image!]; *R. M. Crovetto 2386*, BAB 00000488 [digital image!], SI 002513 [digital image!]).

Rhynchosia edensis Izag. & Beyhaut, *Leguminosae Uruguay Reg. Vecin.* 1: 134–136. 1997. Type: URUGUAY, Tacuarembó, Valle Edén, November 1990 (fl./fr.), *Izaguirre et al. s.n.* (Holotype: MVFA 0000185 [digital image!]). **syn. nov.**

Fig. 7 A–C

Subshrub prostrate to erect, stems simple to branched, pilose to pubescent, indument white to light yellow, with non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 2–5 × 0.5–2.1 mm, free, persistent, lanceolate to triangular, externally pilose to pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 0.3–2.1 cm long; leaf rachis 0.4–1.3 cm long; stipels deciduous; *leaflets* 0.5–5.2 × 0.6–2.8 cm, ovate, lanceolate, elliptical, obovate, oblong, or rounded, surface not bullate,

acuminate or cuneate to rounded at apex, truncate, cuneate, subcordate, or rounded at base, repand to entire-margined, pilose, with yellow vesicular glands just on the abaxial or both surfaces. *Inflorescences* axillary, fasciculate, 1.2–2 cm long, bearing 1–7 flowers, not exceeding the length of the subtending leaf, bracts deciduous; pedicel 0.3–1.2 mm long. *Flowers* 6–10 mm long excluding the pedicel; *calyx* 4–6.5 mm long, pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, not exceeding the corolla in length; *standard petal* 6–10 × 4–6 mm, obovate or retuse to rounded at apex, glabrous to pilose, with vesicular glands, claw 1–2 mm long, auricle ca. 0.3 mm long; *wing petals* 6–9 × 1–2 mm, oblong, claw 1–2.6 mm long, auricle 0.3–0.5 mm long; *keel petals* 6–9 × 2–3 mm, falcate, claw 2–3 mm long; *stamens* 6–10 mm long; *ovary* 2.7–3.8 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.5–2 × 0.5–0.7 cm, brown, without constrictions between the seeds, oblong, obovate, or elliptical in outline, pilose, with few yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 1.8–3.2 × 2–3 mm, suborbicular, unicolored, brown to black.

Nomenclatural and taxonomic notes:—*Rhynchosia diversifolia* was described by Micheli (1883). In the protologue the author cited the gathering *Balansa 1508* but did specify a particular specimen as type. Since there are four duplicates of this collection in different herbaria, Grear (1978) inadvertently lectotypified the collection at G when cited it as holotype (Turland et al. 2018, Art. 9.10 [Ex. 11]); Prado et al. 2020).

Hassler (1919) described the taxon *R. senna* var. *diversifolia* fo. *genuina* based on the gatherings *Hassler 1223* and *2265*. As the author did not designate a holotype, we choose here the *Hassler* gathering *1223* deposited in G (barcode number 00379284) as the lectotype of *R. senna* var. *diversifolia* fo. *genuina*.

Rhynchosia diversifolia var. *prostrata* was described by Burkart (1967). According to him, this variety is characterized by presenting prostrate stems, smaller leaves than the typical variety and leaflets that are often orbicular and obtuse. Grear (1978) and Fortunato (1983) mentioned that this taxon is also differentiated by the arrangement of the glands on the leaflets. Turner (2012) raised *R. diversifolia* var. *prostrata* at the species level, naming it *R. bicentrica*, due to its disjunct distribution. However, we do not think that the assignment of a new name to this taxon is necessary, considering that some characters are variable and many times overlaps with the typical variety. In 1997 Izaguirre & Beyhaut described *R. edensis*, based on the *Izaguirre* gathering from Uruguay. The authors mentioned that this species resembles *R. diversifolia* var. *prostrata*, but they are distinguished by characteristics related to leaf size and

glandular arrangement. For these reasons, we propose here the synonymization of *R. diversifolia* var. *prostrata*, *R. bicentrica* and *R. edensis*.

Since we couldn't check the type materials of *R. senna* var. *genuina* and *R. senna* fo. *glabrata*, we chose to keep these taxa as a synonym of *R. diversifolia* according to the characters described in the protologue.

Rhynchosia diversifolia can be recognized for its fasciculate axillary inflorescence (Fig. 7 A–B) bearing 1–7 flowers, not exceeding the length of the subtending leaf (Fig. 7 A–C; Bezerra et al. 2019a). It is variable in characteristics related to the habit, shape and leaflets size, and the arrangement of vesicular glands, which explains a misunderstanding about its circumscription and the assignment of different names. This species is closely related to *R. senna*, a species commonly sympatric and with the same pattern of geographic distribution (including the same kind of disjunct distribution). The difference between them can be observed mainly by the leaflets, which are bigger in *R. diversifolia* (Fig. 7 A–C), and by the fruits, which are oblong, obovate, or elliptical in outline in *R. diversifolia* (Fig. 7 A) and falcate in *R. senna* (Fig. 15 K).

Reproductive phenology:—Flowering from January to March and October to December; fruiting from January to April, July and October to December.

Distribution and habitat:—*Rhynchosia diversifolia* occurs in Argentina, Bolivia, Brazil, Paraguay, Uruguay (Fig. 8), northeastern Mexico and United States. It occurs mainly areas of Cerrado domain, sandy and rocky fields, pastures and roadsides.

Conservation status:—*Rhynchosia diversifolia* is assessed as Least Concern (LC) in IUCN's Red List (Groom 2012; IUCN 2022), mainly by its widespread distribution in central South America and Mexico.

Specimens Examined:—**ARGENTINA.** Buenos Aires: Arroyo e serranias de Bavard, caminho a Pigüé, 15 November 1928 (fl.), A. C. Scala s.n. (NY); Lincoln, 21 December 1944 (fl./fr.), O. G. Schulz 5698 (NY); Part. Cnel. Suárez, Villa Arcadia, em cerros próximos al arroyo Sauce Corto, Balneario Los Angelitos, 13 January 1999 (fr.), G. Seijo 1395 (MBM). Córdoba: Dep. Colón, camino a Humaitá, via ferrea, 18 November 1976 (fl./fr.), N. Troncoso et al. 1084 (SP); Dep. Punilla, 10km antes del desvío a Copina, por ruta Nac. 20, camino a altas cumbres, 31°31'S 64°37'W, 14 March 1996 (fr.), R. H. Fortunato 5330 (MBM); Dep. Tercero Arriba, Tancacha, caminho de Tancacha a Rio 3°, December 1924 (fl./fr.), A. Scala s.n. (SP). Corrientes: Dep. Monte Caseros, Juan Peyol, 10 February 1945 (fr.), F. Ibarrola 2367 (NY); Dep. Santo Tomé, Estancia Garruchos, casco, 10 February 1972 (fr.), A. Krapovickas et al.

21474 (MBM). San Luis: Rio de las Barranquitas, January 1934 (fl./fr.), *M. A. Vignati* 201 (NY); Tucumán: Burreyacú, El Puestilo, 9 October 1928 (fl./fr.), *S. Venturi* 7357 (NY); Estación Oraoz (FECA), 21 November 1925 (fl.), *Lehreiter* 3971 (NY). Misiones: Dep. Apóstoles, Arroyo Cuñá Maná, 6 November 1944 (fl./fr.), *F. Ibarrola* 1036 (NY); Dep. San Ignacio, 19 December 1944 (fl.), *J. E. Montes* 492 (NY). **BOLIVIA**. Chuquisaca: Rosal, 3 October 1949 (fl.), *Brooke* 5752 (BM); Vallegrande, 5.5 km S of Vallegrande, vic. Santa Rosita, Quebrada Huasa Canada, 24 December 1989 (fl./fr.), *M. Nee* 38346 (NY). **BRAZIL**. Paraná: Guarapuava, Faz. Campo Real, 17 November 1963 (fl.), *E. Pereira & G. Hatschbach* 7995 (MBM, NY). Rio Grande do Sul: Alegrete, Lageadinho cerca de 16 km após Alegrete em direção a Rosário, 12 February 1990 (fl./fr.), *D. B. Falkenberg* 5273 (FLOR); *ibid.*, parada de trem Perau, 29 October 1989 (fl./fr.), *L. A. Z. Machado* 264 (SMDB); *ibid.*, Arroio dos Ratos, BR 290 km 159, 7 November 1988 (fl./fr.), *M. L. Abruzzi* 1554 (HAS); Bagé, 1 December 1992 (fr.), *N. R. Bastos s.n.* (PACA); BR 153m km 135, ponte sobre o Arroio Quebradinho, 2 November 1981 (fl.), *O. Bueno* 3306 (HAS); *ibid.*, ca. 20 km da cidade, 11 November 1995 (fl.), *R. Záchia* 1977 (FLOR); *ibid.*, em frente a Fazenda Santa Genoveva na estrada de Bagé para Serrilhada, 6 December 1982 (fr.), *J. F. M. Valls et al.* 6980 (CEN); Balneario Guaruja p. Porto Alegre, 23 November 1947 (fr.), *B. Rambo s.n.* (PACA); Butiá, 17 January 1989 (fl.), *P. Brack & P. L. Oliveria* 143 (HAS); Caçapava do Sul, 13 December 1982 (fl./fr.), *D. B. Falkenberg* 21 (FLOR, MBM); *ibid.*, BR 153 entre km 488 e 489, 21 January 1994 (fl./fr.), *D. B. Falkenberg et al.* 6437 (BHCB, FLOR); *ibid.*, Irapuá, Guarda Velha, January 1988 (fl./fr.), *L. A. Z. Machado* 30 (SMDB); *ibid.*, na rodovia para Bagé, 11 March 1982 (fl.), *G. Mattos & N. Mattos* 26224 (HAS); *ibid.*, Rincão de Lurdes, 4 November 1989 (fl./fr.), *L. A. Z. Machado* 354 (SMDB); *ibid.*, Vila Progresso, BR 290, 4 November 1989 (fr.), *L. A. Z. Machado* 360 (SMDB); Cachoeira do Sul, no km 145 da rodovia P. Alegre - Uruguaiana, 17 October 1984 (fl./fr.), *G. Mattos & N. Silveira* 30782 (HAS); Candiota, BR 293, em frente a Usina Presidente Médici, 2 November 1997 (fl.), *E. N. Garcia & J. Jarenkow* 238 (MBM); Canoas, Bairro São José, Av. João Leivas de Carvalho, 31 December 2001 (fl./fr.), *A. S. Flores & R. S. Rodrigues* 730 (UEC); Cristal, Paradoiro Gril, há 158 km de PoA, 7 December 1990 (fr.), *L. A. Z. Machado* 656 (SMDB); Dom Pedrito, Coxilha de São Sebastião, Cabanha Dois Pinheiros, December 1981 (fr.), *N. Bastos s.n.* (BLA); *ibid.*, km 203 da BR 293 2km a leste do primeiro acesso a ser trilado na rodovia Bagé-Dom Pedrito, 2 December 1982 (fl./fr.), *J. F. M. Valls et al.* 6910 (CEN); *ibid.*, porteira do Sarandi na Fazenda Santa Placida de Anibal Osorio, 3 December 1982 (fl.), *J. F. M. Valls et al.* 6946 (CEN); Espirito Santo p. Porto Alegre, 1945 (fl./fr.), *K. Emrich s.n.* (PACA); Estrada do Rio Grande do Sul, ca. De 10km de Quaraí na

rodovia para Alegrete, 19. October 1984 (fr.), *G. Mattos & N. Silveira 26122* (HAS); Faz. da Ronda p. Vacaria, 11 January 1947 (fl./fr.), *B. Rambo s.n.* (PACA); Faz. do Jarau p. Quaraí, January 1945 (fl.), *B. Rambo s.n.* (PACA); Granja Neugebauer p. Itapoan, 3 April 1949 (fr.), *B. Rambo s.n.* (PACA); Guabiju, 29 March 1991 (fl./fr.), *L. A. Z. Machado 1344* (SMDB); Guaíba, Fazenda Maximiano, 7 November 1992 (fr.), *N. R. Bastos et al. s.n.* (PACA); *ibid.*, na estação experimental, 17 January 1984 (fl./fr.), *N. Silveira 790* (HAS); Ibaré, há 13 km de Ibaré, 30 March 1991 (fl./fr.), *L. A. Z. Machado 1428* (SMDB); Itaqui - Sobradinho/Manoel Viana, 15 January 1991 (fr.), *Machado et al. 1056* (SMDB); Jarí p. Tupanceretan, 25 January 1942 (fr.), *B. Rambo s.n.* (PACA); Lavras do Sul, Arr. Jaguarizinho, 30 March 1991 (fl./fr.), *L. A. Z. Machado 1430* (SMDB); *ibid.*, Fazenda dos Ferreira, 7 December 1993 (fr.), *N. R. Bastos 412* (PACA); Morro Agudo p. Porto Alegre, 13 April 1949 (fr.), *B. Rambo s.n.* (PACA); Morro da Polícia p. Porto Alegre, 8 November 1948 (fl./fr.), *B. Rambo s.n.* (PACA); Morro do Vigia p. Livramento, 12 January 1941 (fr.), *B. Rambo s.n.* (PACA); Passo do Socorro p. Vacaria, 26 December 1951 (fr.), *B. Rambo 51497* (MBM); Passo Fundo, ao leste da cidade, 29 January 1990 (fr.), *A. Polking & L. A. Z. Machado 488* (SMDB); Pedro Osório, Alto Alegre, 6 December 1991 (fl./fr.), *L. A. Z. Machado 1598* (SMDB); Pelotas, estrada para o Laranjar, 10 November 1995 (fl./fr.), *R. Záchia 1946* (SMDB); Pestana p. Ijuí, 26 January 1955 (fl.), *Pivetta 1019* (PACA); Porto Alegre, Morro da Polícia, 20 November 1992 (fl./fr.), *N. R. Bastos s.n.* (PACA); Quaraí, 13 February 1972 (fl./fr.), *Andrade-Lima 72-6844* (IPA); Santana do Livramento, 3 March 2015 (fr.), *G. Schlineedwein s.n.* (BLA); *ibid.*, Estância São Miguel - Sarandi, November 1936 (fl./fr.), *E. F. Xavier s.n.* (BLA); Santiago, Capão Cipó, Assentamento Santa Rita, 9 March 1989 (fl./fr.), *L. A. Z. Machado 199* (SMDB); Santo Angelo, 17 March 1952 (fl./fr.), *B. Rambo s.n.* (PACA); São Francisco de Assis - Boqueirão, 16 January 1991 (fr.), *Machado et al. 1215* (SMDB); São Gabriel, January 1952 (fr.), *J. Barreto 110* (BLA); *ibid.*, July 1970 (fr.), *Valls & Pott s.n.* (BLA); *ibid.*, Estação Experimental de Forrageiras, January 1952 (fl./fr.), *I. L. Barreto 11* (BLA); *ibid.*, 5 March 1963 (fr.), *J. Mario 28* (BLA); Sanga Funda (rumo a Bagé), 29 March 1991 (fl./fr.), *L. A. Z. Machado 1372* (SMDB); São Luiz Gonzaga, BR 285, de S. Luiz Gonzaga em direção a Santo Antônio das Missões, 10 January 1999 (fr.), *E. Biondo s.n.* (SMDB); São Sepé, BR 392 próximo ao trevo Santa Maria - São gabriel, 06 November 1990 (fl./fr.), *M. L. Abruzzi 2037* (HAS); Tapes, ca. 10km depois do trevo em direção a Camaquã (BR-116), 16 December 1996 (fl./fr.), *J. A. Jarenkow 3330* (FLOR, MBM); Tupanciretã, 28 January 1942 (fl./fr.), *B. Rambo s.n.* (PACA); Uruguaiana, Arroio Imbaá, 18 November 1984 (fl./fr.), *M. Sobral 3445* (MBM); Vacaria, 6 February 1985 (fr.), *N. Silveira et al. 2418* (HAS); *ibid.*, na estação experimental, 23 February 1977 (fl./fr.), *G. Mattos 16712* (HAS); Viamão, Estação

experimental de Viamão, 13 March 1984 (fl./fr.), *J. Guaranja & J. Vasconcellos* 78 (HAS). Santa Catarina: Campos Novos, Rodovia BR 470, km 337, em frente a entrada da fazenda Bom Retiro, 12 January 2001 (fl./fr.), *L. D. Rogalski* 161 (ICN). **PARAGUAY**. Guairá: Vila Rica, Serro Pelado, January 1930 (fl.), *Jorgensen* 4563 (US). **URUGUAY**. Colonia: Carmelo, Cerros, 6 December 1934 (fl./fr.), *A. L. Cabrera* 3202 (NY). Florida: Cerro Colorado, Estancia San Pedro, December 1936 (fl./fr.), *Gallinal et al.* B751 (NY); Montevideo, “du Cerro”, December 1839 (fl./fr.), *M. A. Isabelle* 24 (NY). Rivera, Bajada de Pena, ruta 30 km 253 31°08'33"S 55°54'54" W, 262 m.s.m., 26 November 2001 (fr.), *G. Seijo et al.* 2489 (MBM). Salto: Santo Antonio, Escuela de Agronomía, 2 February 1937 (fl.), *B. Rosengustt* 1069 (NY); Tacuarembó, Valle Edén, 18 February 2005 (fl./fr.), *M. Dematteis & A. Schinini* 1534 (NY).

Additional specimens examined:— **MEXICO**. Nuevo León, Sierra Madre Mts., Monterrey, 18 July 1933 (fl./fr.), *C. H. Muller & M. T. Muller* 501 (GH 00266851 digital image). **UNITED STATES**. Texas, rives de l'Aransato pres Goliad, May 1834 (fl./fr.), *J. L. Berlandier* 3131 (GH 02134195 digital image).

9. *Rhynchosia edulis* Griseb., Abh. Bohm. Ges. Wiss. Goet. 19: 123. 1874. *Eriosema edule* (Griseb.) Burkart. Darwiniana. 6(2): 261. 1943. Type:—ARGENTINA, “In Flusssande des Río Primero bei Córdoba, Avarillo del Campo”, November 1870 (fl./fr.), *P. G. Lorentz* 351 (Lectotype [designated here]: GOET 008904 [digital image!]; isolectotype: SI 002515 [digital image!]). Iconography: *Rodriguésia* 70: 9. 2019.

Rhynchosia melanosticta Griseb. Abh. Königl. Ges. Wiss. Göttingen. 19: 124. 1874. *Dolicholus melanostictus* (Griseb.) Kuntze. Revis. Gen. Pl. 3(3): 62. 1898. Type: ARGENTINA, “Tucuman, in fruticetis montium pr. Siambon”, s.d., *Lorenz s.n.* (Holotype: GOET 008903 [digital image!]).

Eriosema volubile Micheli. Mém. Soc. Phys. Genève. 28(7): 36. 1883. Type: PARAGUAY, “L'Assomption sur le bord des chemins”, May 1874 (fl./fr.), *Balansa* 1553 (Lectotype [designated by Grear 1978]: G 00379283 [digital image!]; isolectotypes: F 911437 [fragment] [digital image!], P 02748529 [digital image!]).

Eriosema volubile fo. *pubedensiore* (Micheli) Chodat & Hassl. Bull. Herb. Boissier. 2(4): 905. 1904. Type: PARAGUAY, “in dumeto pr. Venzuela”, 1900 (fl.) *Hassler* 6951 (Lectotype [first-step designated by Grear 1978; second-step designated here]: G 00379282 [digital image!]; isolectotypes: BM 000538488 [digital image!], G 00379281 [digital image!], NY 00007877[!]; paratype: *Hassler* 8068 BM 000538487 [digital image!]).

Rhynchosia nigropunctata S. Watson. Proc. Amer. Acad. Arts 22: 408. 1887. *Dolicholus nigropunctatus* (S. Watson) Rose. Contr. U.S. Natl. Herb. 10(3): 101. 1906. Type: MÉXICO, “Jalisco, Tequila”, 1886 (fl./fr.), *E. Palmer* 402 (Lectotype [designated by Grear 1978]: GH 00063808 [digital image!]; isolectotypes: US 00004690 [digital image!]).

- Rhynchosia rupicola* Brandegee. Zoë. 5(10B): 202–203. 1905. Type: MÉXICO, Sinaloa, Cerro Colorado, November 1902 (fl./fr.), *Brandegee s.n.* (Lectotype [designated by Grear 1978]: UC 83531 [digital image!]; isoelectotype: GH 00063816 [digital image!]).
- Dolicholus apoloensis* Rusby. Bull. New York Bot. Gard. 6(22): 515–516. 1910. *Rhynchosia apoloensis* (Rusby) J.F. Macbr. Publ. Field Mus. Nat. Hist., Bot. Ser. 4(4): 91. 1925. Type: BOLIVIA, Apolo, February 1902, (fl.) *Williams 97* (Lectotype [designated by Grear 1978]: NY 00007793 [!]; isoelectotypes: BM 000931749 [digital image!]; paratype: *Williams 106* NY 00007794[!]).
- Dolicholus ixodes* Standl. Contr. U.S. Natl. Herb. 18(3): 107–108. 1916. *Rhynchosia ixodes* (Standl.) Standl. Publ. Field Mus. Nat. Hist. Bot. Ser. 4(8): 214. 1929. Type: PANAMÁ, Vicinity of Penomé, 22.III.1908, (fl.) *R. S. Williams 119* (Holotype: US 00004680 digital image!; isotype: NY 00007784[!]; paratype: *R. S. Williams 581* US 678154 [digital image!]).
- Eriosema nigropunctatum* Brandegee. Univ. Calif. Publ. Bot. 7(10): 327. 1920. Type: MÉXICO, Vera Cruz, “Palmilla near Zacuapan”, IX.1919, (fl./fr.) *C. A. Purpus 8386* (Holotype: UC 200794 [digital image!]; isotypes: GH 00066302 [digital image!], MO 859773 [digital image!], NY 00007842[!]).
- Rhynchosia rariflora* Standl. Publ. Field Mus. Nat. Hist., Bot. Ser. 17(3): 264–265. 1937. Type: México, Guaseremos, Río Mayo “valley margins”, September 1936 (fl./fr.), *H. S. Gentry 2883* (Holotype: F 863596 [digital image!]; isotypes: ARIZ 04033 [digital image!]; GH00063815 [digital image!], MEXU 00246959 [digital image!], MO 125148 [digital image!], S 6-5331 [digital image!], US 00004825 [digital image!]).
- Rhynchosia pinetorum* Standl. Publ. Field Mus. Nat. Hist., Bot. Ser. 17(4): 370. 1938. Type: HONDURAS, Siquatepeque, Dpto. Comayagua, July 1936 (fl./fr.), *T. G. Yuncker et al. 5791* (Holotype: F 857675 [digital image!]; isotypes: GH00063810 [digital image!], K 000082211 [digital image!], MO 1116261 [digital image!], NY 00026930[!]).

Fig. 7 D–G

Vine herbaceous, prostrate to twining, stems branched, pilose to pubescent, indument white to yellow, with non-glandular trichomes, yellow vesicular glands and bulbous-based trichomes. *Stipules* 2–8.3 × 0.5–1.5 mm, free, persistent, lanceolate to triangular, externally pilose to pubescent with brown to black vesicular glands and bulbous-based trichomes. *Leaves* trifoliolate, petiole 1–5.2 cm long; leaf rachis 0.5–2.2 cm long; stipels persistent; *leaflets* 1,2–6.8 × 1–4.4 cm, ovate, deltoid, or rhombic, surface not bullate, acute to attenuated at apex, truncate to rounded at base, entire-margined, pilose to pubescent, with brown to black vesicular glands on the abaxial surfaces. *Inflorescences* axillary, paniculate, 7–21 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 0.5–4 mm long. *Flowers* 5–8 mm long excluding the pedicel; *calyx* 3–5 mm long, pubescent with brown to black vesicular glands and bulbous-based trichomes, lobes lanceolate, not exceeding the corolla in length; *standard petal* 5.7–9 × 4–7.5 mm, oblong to obovate, rounded at apex, pilose to

pubescent, with brown to black vesicular glands at the apex and bulbous-based trichomes, claw 0.5–1.5 mm long, auricle ca. 0.5 mm long; *wing petals* 5–9 × 1–1.5 mm, oblong, claw 0.5–2 mm long, auricle 0.5–1 mm long; *keel petals* 4.5–10 × 1.5–3 mm, falcate, claw 1–2.5 mm long; stamens 6–10 mm long; ovary 2.9–3.4 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.5–2.5 × 0.5–0.7 cm, brown, without constrictions between the seeds, oblong to narrowly obovate in outline, pilose, with yellow to black vesicular glands and bulbous-based trichomes. *Seeds* 3–4 × 3–4 mm, suborbicular, unicolored, brown to black.

Nomenclatural and taxonomic notes:—Grisebach (1874) described the species *R. edulis* and *R. melanosticta* in *Plantae Lorentzianae*. According to the protologue, these species differ by characteristics related to the habit and inflorescence, being *R. edulis* an herb, with erect stems and peduncles equaling the petioles and *R. melanosticta* with twining stems and peduncles twice than the petioles. When analyzing the type material of both, we believe that it does not justify the maintenance of these two names. Therefore, we will follow Grear's (1978) decision by agreeing that *R. melanosticta* is synonym of *R. edulis*, since the name *R. edulis* appeared before in the publication.

In the protologue of *R. edulis*, Grisebach (1874) mentioned a collection from “Cordoba, in arenosis ad fl. Rio Primiero”. Grear (1978) erroneously cited as the holotype the gathering *Lorentz & Hieronymus 1202* from Salta, Argentina, deposited in B. The collection that matches the one cited in the protologue is *Lorentz 351*. There are two duplicates of this gathering, one of them deposited in GOET and the other in SI. As the author did not specify a particular specimen as type, we designated here the specimen in GOET (GOET 008904) as the lectotype of *R. edulis* (see Turland et al. 2018, Art. 9.11).

The description of *Eriosema volubile* was based on the collection “*Assomption in fruticetis n. 1553, 1853*”. When Grear (1978) cited the gathering *Balansa 1553* at G as the holotype, he unintentionally lectotypified it (see Turland et al., 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

Watson (1887) described *R. nigropunctata* under the collections: “Tequila, on the borders of ravines 402” and *Ervendberg 35*. Grear (1978) inadvertently lectotypified the gathering *Palmer 402* when cited it as the holotype.

In the protologue of *Eriosema volubile* fo. *pubedensiore* the authors cited two collections: “Valenzuela, Jan. n. 6951” and “in dumeto pr. Bellavista Apa, Dec., n. 8068”. Grear (1978) unintentionally lectotypified the gathering *Hassler 6951* deposited in G when cited it as the holotype. However, there are two duplicates of the gathering in this herbarium (G 00379282

and G 00379281) and Grear (1978) did not specify a particular specimen as type. His type designation should be treated as the first-step lectotypification and we designate here the specimen with barcode number G 00379282 as the second-step lectotype of *E. volubile* fo. *pubedensiore* (see Turland et al., 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

The type collection of *R. rupicola* and *Dolicholus apolensis* presents duplicates in different herbaria, and the authors did not specify a particular specimen as type. Grear (1978) inadvertently lectotypified the specimens with barcode numbers UC 83531 and NY 00007793 of *R. rupicola* and *D. apolensis* respectively when cited them as holotype (see Turland et al., 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

Rhynchosia edulis has an extensive range and occurs in many habitats. It also has variable vegetative characteristics, which explains the assignment of different names by taxonomists (Grear 1978). This species resembles *R. minima* vegetatively and in flowers characteristics (Fig. 7G), since their habit and leaflet shape are quite similar (Fig. 7 D) and they have a wide distribution in South America. However, *R. edulis* is characterized by having bulbous-based trichomes all over the plant, being more abundant in the fruit (Fig. 7 E–F) (vs. bulbous-based trichomes absent in *R. minima*), dark vesicular glands arranged just on the abaxial surface (vs. yellow vesicular glands arranged on both surfaces) and inflorescence paniculate (vs. inflorescence racemose).

Reproductive phenology:—This species can be found with flowers in all seasons of the year; and with fruits from January to June and August to December.

Distribution and habitat:—*Rhynchosia edulis* occurs in the southern United States, Mexico and in some counties of Central America (Costa Rica, El Salvador, Honduras, Nicaragua) and South America. It also has a wide distribution in South America, occurring in Argentina, Bolivia, Brazil, Colombia, Paraguay, Peru and Venezuela (Fig. 8). It can be found in pastures, grasslands, disturbed areas, roadsides, cerrado areas and forest edges.

Conservation status:—Least Concern (LC). *Rhynchosia edulis* is one of the most widespread species of *Rhynchosia* in South America. It is classified as LC for its wide value of EOO (21,818,239 km²).

Specimens Examined:—**ARGENTINA.** Cordoba: Dep. Capital, Villa Warcalde, recta Martinoli, antes de La Carolina, 11 February 1960 (fr.), *L. A. Espinar 726* (NY); *ibid.*, Villa Belgrano, 28 April 1963 (fl./fr.), *L. A. Espinar 1624* (NY). Dep. Colón, Sierra Chica, Casa Bamba, 27 November 1898 (fl./fr.), *F. Kurtz 10297* (MBM). Corrientes: Dep. Santo Tomé, Ruta 38, 26 km NW de Ruta 14, 1 December 1981 (fl.), *S. G. Tressens et al. 1394* (MBM).

Formosa: Dep. Pilcomayo, Sol de Mayo, 14 km SW de Laguna Blanca, 25 October 1995 (fl./fr.), *A. Schnini & G. Cuadrado 30331* (NY). Misiones: Candelaria, Santa Ana, 14 November 1945 (fl.), *J. E. Montes 1457* (NY). **BOLIVIA**. Beni: Ballivian, Carmen Florida, Río Beni, 7 km upstream from Rurrenabaque, Tacana Indian Village, 16 September 1989 (fl.), *D. E. Williams 998* (NY); Itenez, Magdalena, 11 April 1979 (fl.), *A. Krapovickas & A. Schinini 34801* (NY). Cochabamba: Narciso Campero Leyes, Comunidad Sauce Phuju, 22 February November (fl./fr.), *R. G. Pardo 18* (NY); Santibanez, 6 m NE of El Convento, 13 March 2003 (fl./fr.), *L. Rico et al. 1561* (NY). La Paz: Sud Yungas, Chicaloma, 06 February 1996 (fl.), *Beck St. 22592* (NY). Santa Cruz: Andres Ibañes, alrededores de Tierras Nuevas – El Palmar, 8 km al SW de la Ciudad de Santa Cruz de la Sierra, 13 November 1994 (fl./fr.), *I. G. Vargas 3648* (NY); Serranía del Mutún, 09 March 2008 (fl.), *D. Villarroel et al. 2033* (UB); Santiesteban, 12.2 km N of Mineros, 20 February 1994 (fl./fr.), *M. Nee 45080* (NY); Velasco, barbecho al borde del camino, 1 km al S de San Ignacio, 4 April 1986 (fl.), *R. Seidel 165* (NY); Warnes, Santa Rita del Monte, from La Angostura to Bermejo, 24 February 2003 (fl./fr.), *L. Rico et al. 1363* (NY). Tarija: Cercado, cerca Vivero CODETAR/Coimata, 19 December 1985 (fl.), *E. Bastian 189* (NY). **BRAZIL**. Bahia: Barra da Estiva, Side road ca. 2km. from Estiva, about 12 km. N. of Senhor do Bonfim on the BA 130 to Juazeiro, 27 February 1974 (fl./fr.), *R. M. Harley et al. 16514* (NY); Lauro de Freitas, Caji, em frente ao supermar, 15 July 1997 (fl.), *R. Soeiro s/nº* (RB). Ceará: S. loc., s.d. (fl./fr.), *F. Alemão & M. Cysneiros 408a* (R). Espírito Santo: Vitória, Vila Velha, 6 March 1946 (fl.), *Brade et al. 18086* (RB). Goiás: 25km S de Niquelândia margem da mata de Galeria, 24 January 1972 (fr.), *H. S. Irwin et al. 34941* (UB); Niquelandia, CODEMIN, cerca de 500m do cruzamento para Rosariana, na bica do lado esquerdo, 15 April 1996 (fr.), *R. Marquete et al. 2537* (NY, RB); Estr. Jataí/Caiaponia a 115 km de Itajaí, alt 740 m, 20 June 1978 (fr.), *G. J. Shepherd et al. 7474* (UEC); Gallery forest and adjacent cerrado, ca. 17km S. of Niquelândia, elev. ca. 750m, 23 January 1972 (fr.), *H. S. Irwin et al. 34902* (UB); Posse, Rodovia Brasília-Fortaleza, 220km de Formosa, 08 January 1965 (fl.), *R. P. Belém & J. M. Mendes 108* (IPA, NY). Mato Grosso: Cáceres, Faz. Descalvados, 5 November 1978 (fl./fr.), *A. C. Allem 2428* (NY); Poconé, Carretera MTII (Brozo-Poconé) 56km of nordeste de Poconé, 31 August 1977 (fl./fr.), *R. Shultz-Kraft et al. s.n.* (NY). Mato Grosso Do Sul: Corumbá, Estrada Miranda, 23 July 1977 (fl.), *P. E. Gibbs et al. 5389* (UEC); *ibid.*, Fazenda São Bento, Dist. Nabileque, 16 November 1977 (fl.), *A. Allem & G. Vieira 1252* (CEN); *ibid.*, Serra Grande, Planalto Residual do Urucum, interior de Floresta Estacional Residual, 21 December 2004 (fr.), *R. R. Silva & J. S. Velasquez 1307* (UEC); *ibid.*, Serra Santa Cruz, Planalto Residual do Urucum. Borda de Floresta Estacional Semidecidual, estrada para mina 7, 10 November 2003

(fr.), *R. R. Silva & R. Silva* 920 (UEC); Estrada Campo Grande Aquidauana, km 110, Fazenda Leão December 1976 (fl.), *G. J. Shepherd et al.* 391 (UEC); Estrada para Rochedo, entrada para a fazenda Novo Mundo, 25 January 1979 (fl./fr.), *E. P. Heringer et al* 788 (UEC); Ladário, Serra do Rabichão, Planalto Residual do Urucum, acesso Fazenda Uruba, 10 December 2003 (fr.), *R. R. Silva & M. V. Silva* 641 (UEC); *ibid.*, 26 February 2004 (fl.), *R. R. Silva & M. V. Silva* 749 (UEC); Maracaju, estrada BR 267, 23 March 2002 (fl./fr.), *A. Sciamarelli et al.* 1549 (UEC); Paranaíba, cultura de milho, 1 March 1981 (fr.), *L. Oliveira* 34 (UEC); Sete Quedas, 20 March 1982 (fl./fr.), *M. R. Melo* 375 (UB). Minas Gerais: Diamantina, ca. 20km E. of Diamantina, cerrado, 22 March 1970 (fr.), *H. S. Irwin et al. s.n.* (UB); Joaquim Felício, 3km N. of Joaquim Felício, 5 March 1970 (fl./fr.), *H. S. Irwin et al. s.n.* (UB); Ouro Preto, Distrito de Cachoeira do Campo, 16 May 2017 (fl./fr.), *L. M. P. A. Bezerra* 85 (BOTU); Paraopeba, Faz. do Zé Alfredo, 23 June 1957 (fl.), *E. P. Heringer* 5652 (UB); Ritópolis, Ibitutinga, Estrada secundária à BR-494 , junto à antiga estação de trem, 1 February 2013 (fl.), *M. Sobral et al.* 15394 (RB); Rod. Araxá/Uberaba, km 381 (cerrado), alt. 1000 m., 22 February 1978 (fl./fr.), *J. Semir et al.* 685 (UEC); Rod. BR 116 entre Caratinga e Governador Valadares, km 477, 08 March 1977 (fl./fr.), *G. Shepherd et al.* 4368 (UEC); São João Del Rei, 5 km da cidade (aterro), 07 April 1978 (fl./fr.), *G. Bufarah et al.* IZ-397 (UEC); Tiradentes, campo rupestre próximo à cidade, 06 December 1983 (fl./fr.), *H. F. Leitão Filho et al.* 15275 (UEC); Uberlândia, Rodovia Uberlândia a Catalão, 06 June 1978 (fr.), *P. R. Salgado & D. Bianchine* IZ-527 (UEC). Paraná: Laranjeiras do Sul, Km 127, 12 February 1969 (fl.), *G. Hatschbach* 21128 (NY); Ponta Grossa, Parque Vila Velha, s.d. (fl.), *F. Trzeciak* 57 (UEC); Sengés, Rio Cajuru, margens, 04 December 1988 (fl./fr.), *M. Siveira et al.* 81 (UEC). Rio Grande do Sul: Torres, Faxinal, 28 March 1998 (fl./fr.), *A. Flores* 197 (ICN). Santa Catarina: Laguna, Praia do Sol, 17 March 2005 (fl./fr.), *G. Hatschbach et al.* 79242 (MBM). São Paulo: Estrada de Salto de Pirapora a Pilar do Sul, próximo a Fazenda Palmeiras, 03 December 1998 (fr.), *A. M. G. A. Tozzi & J. L. A. Moreira* 348 (UEC); Iperó, Fazenda Ipanema, porteira da Fepasa, alt. 520 m, 04 December 1998 (fr.), *A. M. G. A. Tozzi & J. L. A. Moreira* 386 (UEC); Matão, cultivada no Instituto de Pesquisas IRI, procedente dos arredores de Matão, s.d. (fl.), *Iri* 1036 (UB); Pereira Barreto, Ilha Solteira, Perimetral, 28 November 1990 (fl.), *R. S. Saito* 5 (UEC); Santo Antônio da Alegria, 10 November 1994 (fr.), *A. M. G. A. Tozzi & J. C. Galvão* 94-218 (UEC); São José do Rio Preto/Mirassol, 20°48'36"S 49°22'50"W, 22 September 1995 (fl./fr.), *A. A. Rezende* 184 (UEC); *ibid.*, 23 January 1996 (fl.), *A. A. Rezende* 296 (UEC); Sorocaba, nativo à margem da Rodovia Castelo Branco, 11 February 1976 (fl.), *H. F. Leitão Filho et al.* 1664 (UEC); Taquarivaí, estrada para Itapeva próximo ao Rio Apiaí Mirim, beira da mata mesófila, 07 December 1993

(fr.), *V. C. Souza et al 4894* (UEC); Votorantim, estrada do Carafá, 727, entrada da fazenda João Urquiza, 16 December 2012 (fr.), *V. C. Souza 35111* (RB); *ibid.*, Serra de São Francisco, Represa de Itupararanga, Cerrado, 12 January 1984 (fl.), *V. F. Ferreira 3197* (RB). Tocantins: Aurora do Tocantins, Rodovia Campos Belos a Taguatinga, próxima ao Rio Sobrado, 11 February 1994 (fl.), *G. Hatschbach & J. M. Silva 60401* (NY). **COLOMBIA**. Cundinamarca: Bogotá, Honda 80 km NO de Bogotá, 3 April 1981 (fl./fr.), *R. Schulze-Kraft, R. Reid & G. Keller Grein 56-1* (NY); Hacienda el Cucharó, between Tacaima and Pubenza, 7 May 1944 (fl.), *E. P. Killip et al. 38320* (US); Sucre: Archipiélago de San Bernardo, Isla Mucura, December 1980 (fl.), *G. Moreno & R. Lopez 20* (NY). Tolima: Carretera Mariquita – Ibagué, 58 km S de Mariquita, 3 April 1981 (fl./fr.), *R. Schulze-Kraft, R. Reid & G. Keller Grein 60-2* (NY). **PARAGUAY**. Amambay: cerca de Bellavista, malezas junto al río Apa, February 1982 (fl./fr.), *J. F. Casas & J. Molero FC6273* (NY); Cordillera; Dep. Cordillera, Caacepepe, (Barrio Buena Vista) on selva degradada, 2 February 1987 (fl./fr.), *E. Bordas 4149* (NY); Estero de Ypoá, 8 km S of Puerto Guyrati, around Arroyo Surubiy, 24 February 1993 (fl.), *E. Zardini & T. Tilleria 35251* (NY). **PERU**. San Martín: entre Banos i Bellavista, 12 September 1948 (fl./fr.), *R. A. Ferreyra 4836* (US); camino al Km 9, banda de Shilcayo, 12 January 1982 (fr.), *L. Ramirez 28* (NY). **VENEZUELA**. Aragua: Maracay, Girardot, parcela ubicada em la Av: circunvalación, urbanización El Castaño, 28 October 1985 (fr.), *H. Rodriguez 1806* (NY). Bolívar: 35 km SE de Uputa, em a vía a Guasipati, 13 October 1979 (fr.), *N. Xena 473* (NY). Miranda: en campos de Los Chorros, 20 December 1937 (fr.), *F. Tamayo 333* (US). Monagas: Carretera Maturín – Barcelona, 5 km al Oeste de Maturín, 28 February 1978 (fl./fr.), *R. Shultze-Kraft, D. Escobar & E. Garcia s.n.* (NY). Trujillo: Carretera 7: Agua Viva – Boconó, 68 km al N de Boconó, 30 April 1981 (fl./fr.), *R. Shultze-Kraft & A. Flores* (NY).

Additional specimen examined:— **COSTA RICA**. Las Cañas, Hacienda La Pacifica, Jaragua Garden, 20 November 1962 (fl.), *A. T. Semple L100* (US). **EL SALVADOR**. San Salvador, Cerro de San Jacinto, August 1922 (fr.), *S. Calderón 1067* (US). **HONDURAS**. El Paraiso; Along Rio Lizapa, between Galeras and Lizapa Grande, 24 June 1947 (fl./fr.), *R. A. Molina 163* (US). **MÉXICO**. Chiapas, Slopes on the bank of the Rio Lagas four miles SW of Soyala along the road to the Pan American Highway, 26 June 1964 (fl.), *D. E. Breedlove 6568* (US). **NICARAGUA**. Managua, steep northeast slope among rocky outcrops; 43 miles towards Managua from Nicaraguan-Honduran border by the Inter-American Highway through Choluteca, Honduras and Somoto, 1 August 1946 (fl./fr.), *T. Morley 752* (US). **UNITED**

STATES. Arizona, Sycamore Canyon (near Ruby), Santa Cruz Co., 24 September 1939 (fr.), *T. H. Kearney 14458* (US).

10. *Rhynchosia erythrinoides* Schlttdl. & Cham., *Linnaea* 5: 587. 1830. Type:—MEXICO, “Inter Misantlam et Nantlam in sylvis”, March 1829 (fr.), *C. J. W. Schiede & F. Deppe s.n.* (Lectotype [designated by Ståhl et al. 2016]: HAL 0098589 [digital image!]; isolectotypes: BM 000799992 [digital image!], HAL 0107630 [digital image!] LE 00002544 [digital image!]).

Leycephyllum micranthum Piper, *J. Wash. Acad. Sci.* 14(15): 364. 1924. Type: COSTA RICA. Las Vueltas, Tucurrique, January 1899 (fl.) *A. Tonduz 12951* (Holotype: US 00004550 [digital image!]; isotypes: BAB 00000489 [fragment] [digital image!], BM 000799991 [digital image!], K 000082212 [digital image!], M 0240742 [digital image!], P 00708602 [digital image!], P 00708603 [digital image!], US 01108197 [digital image!]).

Figs. 5 D–E; 7 H–I.

Vine suffrutescent, twining, stems branched, glabrescent to sericeous, indument white, with few non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* deciduous. *Leaves* trifoliolate, petiole 1.5–3.1 cm long; leaf rachis 1.5–2 cm long; stipels absent; leaflets 1.1–4.6 × 1.4–3.1 cm, ovate, rhombic to rounded, surface not bullate, acuminate to rounded at apex, obtuse to rounded at base, entire-margined, pilose, with yellow vesicular glands on both surfaces. *Inflorescences* axillary, paniculate, 6.5–25 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 1–2 mm long. *Flowers* 5–8 mm long excluding the pedicel; calyx 3–5 mm long, pilose to pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes triangular, not exceeding the corolla in length; standard petal ca. 7 × 4 mm, oblong, apiculate at apex, glabrescent to pilose, with yellow vesicular glands but lacking bulbous-based trichomes, claw ca. 0.7 mm long, auricle ca. 0.5 mm long; wing petals ca. 4.8 × 1.5 mm, oblong, claw ca. 0.6 mm long, auricle ca. 0.5 mm long; keel petals ca. 5.7 × 2 mm, falcate, claw ca. 1.8 mm long; stamens ca. 6 mm long; ovary ca. 1.8 mm long, pilose, with yellow vesicular glands. *Fruits* 1.7–2.2 × 0.9–1.1 cm, reddish-brown to black, strongly constricted between the seeds, oblong to obovate in outline, glabrescent, with yellow vesicular glands, bulbous-based trichomes absent. *Seeds* ca. 6 × 4 mm, suborbicular, bicolored, black and red, the red confined to hilar area.

Nomenclatural and taxonomic notes:—*Rhynchosia erythrinoides* was described in 1830 by Schlechtendal and Chamisso based on the collection “Inter Misantlam et Nantlam in sylvis”. Gear (1978) just cited two presumed isotypes deposited in BM and LE. Ståhl et al. (2016) designated the gathering *C. J. W. Schiede & F. Deppe s.n.* at HAL with barcode number 0098589 as the lectotype of *R. erythrinoides*, claiming that is the only original material annotated by one of the authors (Chamisso). We will follow this designation here.

Rhynchosia erythrinoides resembles *R. melanocarpa* and *R. nainceckensis* due to its leaflet shape, reddish-brown to black fruit constricted between the seeds (Figs. 5 D–E; 7 I), and the bicolor black and red seeds with a restricted red area around the hilum. However, it differs from them by the defoliation during anthesis and fruit formation (Fig. 7 H) and by the characteristics listed in Table 1.

Reproductive phenology:—Flowering from January to April and June; fruiting from February to May and August to October.

Distribution and habitat:—*Rhynchosia erythrinoides* occurs in southern Mexico and in some Central American countries, such as Costa Rica, Dominican Republic, Guatemala, Haiti, Honduras, Jamaica, Nicaragua and Panama. Gear (1978) mentioned that this species can also be found in Honduras, however this occurrence was not confirmed in this work. In South America its distribution is restricted to Colombia, Ecuador and French Guiana (Fig. 8). *Rhynchosia erythrinoides* occurs in wet forests, rocky fields, secondary vegetations and roadsides.

Conservation status:—Least Concern (LC). According to the value of EOO (7,522,014 km²; GeoCAT, accessed in May 2022), *R. erythrinoides* is classified as LC (IUCN 2022) due to its wide distribution in southern Mexico, the countries of Central America and some countries in South America.

Specimens Examined:—**COLOMBIA.** El Valle: Cordoba Valle del Cauca, 17 February 1939 (fl./fr.), *E. P. Killip & H. Garcia 33398* (BM 13715310). **ECUADOR.** El Oro: Portovelo, October 1918 (fr.), *J. N. Rose & G. Rose 23432* (US 2346848). **FRENCH GUIANA.** s.loc., 1967 (fr.), *L. C. Richard s.n.* (P).

Additional Specimens Examined:—**COSTA RICA.** Forested slopes above the lumber camp at the Rio Coton (Las Alturas), 15 January 1967 (fl.), *W. Burger & G. Matta 4560* (BM 013715021). **CUBA.** La Caridad, February 1889 (fl./fr.), *H. F. A. Eggers 4710* (US 995699). **DOMINICAN REPUBLIC.** Monte Plata: Pilancón, Bayaguana, 31 March 1973 (fl./fr.), *A. H.*

Liogier 18866 (NY). **GUATEMALA**. Alta Verapaz, Pansamala, May 1887 (fr.), *H. von Tuerckheim* 1227 (US 2346235). **HAITI**. Hispaniola, Vicinity of Bassin Bleu, Morne Haut Piton Ridge, April 1929 (fl./fr.), *E. C. Leonard & G. M. Leonard* 15087 (US 00874996). **JAMAICA**. Bluefields Mountain, 7 March 1908 (fl./fr.), *N. L. Britton* 1962 (NY); Chester Vale, 11 August 1895 (fr.), *W. H. Harris* 5875 (NY); Monte Diablo, 2 April 1903 (fl.), *W. H. Harris* 8494 (NY); Portland, Near Green Hill P.O., 30 March 1963 (fl.), *G. R. Proctor* 23411 (NY); Saint Ann, Reynolds Mine area near Lydford P.O., 23 September 1954 (fr.), *R. A. Howard* 14100 (NY). **MEXICO**. Catemaco, Cumbre de Bastonal, 15 January 1974 (fl.), *F. Ponce & R. Cedillo* 11 (BM 13715022). **NICARAGUA**. Chontales, June 1868 (fl.), *R. Tate* 104 (267) (BM 13715026). **PANAMA**. Darien, Enseada del Guayabo, River Valley filled with landslide debris, 18 km SE Jaqué, 12 January 1983 (fl.), *N. Garwood et al.* 170 (BM 13715020).

11. *Rhynchosia franciscana* L.P. Queiroz & D.B.O.S. Cardoso, Syst. Bot. 43(4): 975. 2018. Type:—BRAZIL, Bahia, Mun. Casa Nova, Fazenda Santarém, 9°31'47" S, 41°21'0340 W, October 2004 (fl./fr.), *L. P. de Queiroz et al.* 9639 (Holotype: HUEFS 89016 [digital image!]; isotypes: ALCB [not seen], CEPEC [not seen], CTES [not seen], E [not seen], HUEFS [not seen], K [not seen], MO [not seen], NY [not seen], P [not seen], RB [not seen]). Iconography: Systematic Botany, 43(4): 976. 2018.

Vine herbaceous or suffrutescent, twining, stems branching, villous, indument light yellow, with non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* early deciduous. *Leaves* trifoliolate, petiole 2–2.4 cm long; leaf rachis 0.6–0.8 cm long; stipels deciduous; *leaflets* 3.8–4.3 x 2.8–3 cm, deltoid or ovate, surface not bullate, obtuse at apex and base, entire-margined, tomentose, with yellow vesicular glands on both surfaces. *Inflorescences* axillary, racemose or paniculate, 15.5–19 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 5–6 mm long. *Flowers* 35–39 mm long excluding the pedicel; *calyx* 15–17 mm long, pubescent, with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate to triangular, not exceeding the corolla in length; *standard petal* 20–22 × 18–20 mm, elliptical, emarginate at apex, pilose, with yellow vesicular glands but lacking bulbous-based trichomes, claw ca. 7 mm long, auricle ca. 2 mm long; *wing petals* 10–12 × 4–5 mm, oblong, claw ca. 5 mm long, auricle 2 mm long; *keel petals*

17–18 × 8–9 mm, falcate, claw ca. 7 mm long; *stamens* ca. 25 mm long; *ovary* ca. 6 mm long, pubescent, with yellow vesicular glands. *Fruits* ca. 5 × 1 cm, brownish, without constrictions between the seeds, oblanceolate in outline, tomentose, with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* ca. 6 × 5 mm, reniform, unicolored, brown.

Nomenclatural and taxonomic notes:—*Rhynchosia franciscana* was described in 2018 by Queiroz and Cardoso. This species is easily distinguishable from other South American taxa due to its well-developed 35–39 mm long flowers.

Reproductive phenology:—Flowering in June and October; fruiting in June, September and October.

Distribution and habitat:—*Rhynchosia franciscana* is an endemic species from the sand dunes of the middle São Francisco River, within the Caatinga vegetation, in the state of Bahia, Brazil, in the municipalities of Barra and Casa Nova (Fig. 9; Queiroz & Cardoso 2018).

Paratypes:—BRAZIL, Bahia, Barra, dunas interiores da margem esquerda do médio rio São Francisco, June 200 (fl.), A. T. Rodarte 86 (ALCB 50785 [digital image!]); Casa Nova, 10 km do asfalto da BR 235, direção pau a pique, September 1989 (fr.), G Fotius 4251 (ALCB 107469 [digital image!] INPA 248819 [digital image!]); *ibid.*, ca. 30 km de Remanso para Casa Nova, June 2001 (fr.), T. S. Nunes *et al.* 532 (ALCB 53969 [digital image!], CEPEC 93052 [digital image!]); *ibid.*, estrada para fazenda Santarém, October 2004, L. P. Queiroz 9614 (HUEFS [not seen]).

Conservation status:—Vulnerable (VU). According to the value of EOO (7,832 km², GeoCAT, accessed in May 2022), *R. franciscana* is classified as VU following the IUCN red list (IUCN 2022) criteria and subcriteria, respectively, VU B1 (i, iii). Also, Queiroz & Cardoso (2018) stated that this species seems to be rare, since there are just few known herbarium collections.

Specimens Examined:—BRAZIL. Bahia: Casa Nova, 10 km do asfalto da BR 235, direção pau a pique, 18 September 1989 (fr.), G Fotius 4251 (ALCB, INPA).

12. *Rhynchosia hauthalii* (Kuntze) Grear, Mem. New York Bot. Gard. 20(3): 89. 1970.

Basionym:—*Dolicholus hauthalii* Kuntze, Revis. Gen. Pl. 3(3): 60. 1898. Type: PARAGUAY, “Sude Paraguay”, November 1892 (fl./fr.), *O. Kuntze s.n.* (Neotype [designated by Grear 1978]: NY 00026946[!]). Iconography: *Rodriguésia* 70: 9. 2019.

Eriosema rotundifolium Micheli, Mém. Soc. Phys. Genève 28(7): 35. 1883. Type: PARAGUAY, “Cerro Peron, prope Paraguari in pratis”, November 1876, *Balansa 1538* (Lectotype [designated by Grear 1978]: G [not seen]; isolectotypes: F 940492 [digital image!], K000502984 [digital image!], P 02748615, 02748616 [digital image!]; paratypes: *Balansa 1538a*, P 02748618, 02748613 [digital image!]).

Rhynchosia uruguayana Arechav. Anales Mus. Hist. Nat. Montevideo 3: 395. 1901. Type: [not seen].

Eriosema rotundifolium var. *macrophyllum* Chodat & Hassl. Bull. Herb. Boissier, sér. 2. 4(9): 905. 1904. Type: PARAGUAY, ‘in glareosis pr. Valenzuela’, January 1900 (fl.) *Hassler 6946* (Lectotype [first-step designated by Grear 1978; second-step designated here]: G 00400123 [digital image!] isolectotypes: G 00400124, 00400125 [digital image!]; NY 00007876[!]; UC 940780 [digital image!]; paratype: *Hassler 5496*, BM 000538491 [digital image!]; K 000502985 [digital image!]; P 02748612 [digital image!], P 02748614 [digital image!], P 02748617 [digital image!]; S S-R-9749 [digital image!]).

Subshrub prostrate, stems simple, pilose, indument light yellow, with non-glandular trichomes but lacking yellow vesicular glands and bulbous-based trichomes. *Stipules* 3–6.8 × 1–2 mm, free, persistent, lanceolate, externally pilose with sparsely bulbous-based trichomes and yellow vesicular glands. *Leaves* trifoliolate, petiole 0.9–2.5 cm long; leaf rachis 0.9–2 cm long; stipels persistent; *leaflets* 2.6–6.1 × 2.2–5.8 cm, obovate to rounded, surface not bullate, mucronate, or rounded at apex, rounded at base, entire-margined, pilose, with yellow vesicular glands on both surfaces. *Inflorescences* axillary, racemose, 7.1–18 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 1.5–2.5 mm long. *Flowers* 8–11 mm long excluding the pedicel; *calyx* 4–8.1 mm long, pubescent with yellow vesicular glands and bulbous-based trichomes, lobes lanceolate, not exceeding the corolla in length; *standard petal* 7–10 × 5.3–6 mm, obovate, rounded at apex, glabrescent to pilose, with sparsely vesicular glands and bulbous-based trichomes, claw ca. 2 mm long, auricle ca. 0.5 mm long; *wing petals* 9–10 × 1–2 mm, oblong, claw 2–2.5 mm long, auricle 0.5–1 mm long; *keel petals* 8.5–10 × 2–3 mm, falcate, claw 2–3 mm long; *stamens* 8.2–11 mm long; *ovary* 3.3–4 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.8–2.2 × 0.5–0.6 cm, greenish to brown, without constrictions between the seeds, oblong in outline, pubescent to hirsute, with yellow to brown

vesicular glands and bulbous-based trichomes. *Seeds* 2.5–4 × 2.5–3.5 mm, suborbicular, unicolored, brown to black.

Nomenclatural and taxonomic notes:—This species was first described as *Eriosema rotundifolium* by Micheli (1883). As the binomial *R. rotundifolia* Steudel (1841: 454) already existed, Kuntze (1898) described *Dolicholus hauthalii*, citing the collection “Paraguay, Paraguari, Ibitimi – *Hauthal 36*”.

Efforts to obtain the gathering *Hauthal 36* were unsuccessful. Grear (1978) cited a Kuntze gathering from “Sude Paraguay” as the holotype. Considering that Kuntze handled this specimen from NY (NY 00026946), Grear (1978) inadvertently designated this material as the neotype of *D. hauthalii* (see Turland et al., 2018, Art. 9.10).

In the protologue of *Eriosema rotundifolium* two gatherings from different locations were mentioned: *Balansa 1538* and *Balansa 1538a*. When Grear (1978) cited the collection *Balansa 1538* as the holotype, he unintentionally lectotypified it (see Turland et al., 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

Eriosema rotundifolium var. *macrophyllum* was described based on the gatherings *Hassler 5496* and *6946*. Grear’s (1978) citation of the gathering *Hassler 6946* at G as the holotype constitutes and inadvertent lectotypification (see Turland et al., 2018, Art. 9.10, Ex. 11; Prado et al. 2020). As there are two duplicates of the gathering at G and he did not specify a particular specimen as type, the procedure of Grear (1978) is treated as the first-step lectotypification we designate here the specimen with barcode number G 00400123 as the second-step lectotype of *Eriosema rotundifolium* var. *macrophyllum* (see Turland et al. 2018, Art. 9.17).

Since we couldn’t see the type material of *R. uruguayana* we decided to keep this taxon as a synonym of *R. hauthalii* based on the characteristics provided in the protologue.

Rhynchosia hauthalii is characterized by having prostrate stems, simple, leaflets obovate to rounded and racemose axillary inflorescences. It resembles *R. lateritia*, since they have prostrate stems and a well-developed axillary racemose inflorescence (up to 18 cm in *R. hauthalii* and 21 cm in *R. lateritia*). However, they are easily differentiated by the calyx 4–8.1 mm long and not exceeding the corolla in length in *R. hauthalii* (vs. 9–10 mm long exceeding the corolla in length in *R. lateritia*).

Reproductive phenology:—Flowering in January, March to May and October to December. Fruiting in January, March to May, November and December.

Distribution and habitat:—*Rhynchosia hauthalli* occurs in Brazil, Paraguay and Argentina (Fig. 10). Miotto (1988) cited this species for Uruguay, but this occurrence has not been confirmed in this work. This species could be found in cerrado environments, pastures, roadsides, forest edges, grasslands and sandy soil fields.

Conservation status:—Least Concern (LC). According to the value of EOO (286,657 km²; GeoCAT, accessed in May 2022), *R. hauthalii* is classified as LC (IUCN 2022) considering that it is commonly well-sampled in herbaria (especially those from southern Brazil), and for being often found in conservation areas such as Parque Nacional de Itapuã, Rio Grande do Sul, Brazil.

Specimens Examined:—**ARGENTINA.** Corrientes: Dep. Empedrado, 13 November 1954 (fl./fr.), *A. Burkart* 2982 (P); *ibid.*, Estancia “Las Tres Marias”, 13 November 1954 (fl./fr.), *T. M. Pedersen* 2982 (NY). **BRAZIL.** Paraná: Guarapuava, Cadeado, 14 December 1973 (fl.), *G. Hatschbach* 33529 (MBM, NY); Rio Grande do Sul: Alegrete, Parada Perau, 29 October 1989 (fl.), *Machado & Alvarez* 289 (SMDB); Caçapava do Sul, BR-292, ca. 5km do acesso à cidade, 9 November 1996 (fl.), *J. A. Jarenkow* 3241 (MBM); *ibid.*, Irapuá, Coxilha-Alta, 30 December 1988 (fl.), *L. A. Z Machado* 123 (SMDB); Manoel Viana (Vila Kramer) – S. Fco. de Assis, 16 May 1991 (fr.), *Machado et al.* 1197 (SMDB); Passo Fundo, na rodovia Marau, 4 December 1986 (fr.), *J. Mattos & N. Silveira* 30406 (HAS); Pelotas, Fazenda do Sr. Ary Alcantara, 20 December 1962 (fl.), *Barreto-Kappel* 4001 (BLA); Porto Alegre, Morro da Polícia, 17 April 1986 (fl./fr.), *H. Janke* 3 (HAS); *ibid.*, Morro Santana, 24 November 2011 (fr.), *F. Schmidt-Silveira* 34 (ICN); *ibid.*, s.d. (fl.), *B. Rambo s.n.* (PACA); Santa Maria, Itagui, 18 April 1972 (fr.), *Dobereiner & Tokarnia s/nº* (RB); *ibid.*, Campus UFSM, 01 December 1988 (fl./fr.), *L. A. Z. Machado* 56 (SMDB); *ibid.*, atrás do Hospital Veterinário, na estrada em direção ao Tambo (lado direito), 25 March 1999 (fr.), *E. Biondo s.n.* (SMDB); *ibid.*, Distrito de Santo Antônio, Morro Pedra do Lagarto, 19 November 2014 (fl./fr.), *H. F. Menezes HEL021* (SMDB); Santiago, Boqueirao divisa com S. Fco. de Assis, 16 January 1991 (fl.), *Machado et al.* 1207 (SMDB); *ibid.*, Capão do Cipó, 12 January 1991 (fl.), *Machado et al.* 827 (SMDB); São Borja, BR 287, 14 January 1991 (fl.), *Machado et al.* 988 (SMDB); São Francisco de Assis, a 27 km ao Norte, estrada de acesso a Santiago, 7 March 1990 (fl./fr.), *L. A. Z. Machado* 589 (SMDB); *ibid.*, 16 January 1991 (fr.), *Machado et al.* 1241 (SMDB); São Gabriel, 29 May 1991 (fl.), *L. A. Z. Machado et al. s.n.* (SMDB); Sobradinho/Manoel Viana – Itaquí, 15 January 1991 (fl.),

Machado et al. 1057 (SMDB); Tupanciretã, Passo da Lage, 11 January 1991 (fl./fr.), *Machado et al. 780* (SMDB); Viamão, Parque Nacional de Itapuã, 15 December 2005 (fr.), *S. T. S. Miotto & M. S. Pereira 2271* (ICN); *ibid.*, 2 December 1984 (fr.), *M. Sobral 84* (MBM). **PARAGUAY.** Itapuá: Parque Nacional San Rafael, San Pedro Mi, 14 November 2001 (fl./fr.), *G. Caballero Marmorì 3922* (MBM). Misiones: Santiago, 19 November 1956 (fl./fr.), *T. M. Pedersen 4352* (US).

13. *Rhynchosia lateritia* Burkart, Legum. Argent. 2: 545. 1952. Type:—ARGENTINA, Misiones, Apóstoles, sabana quebrada, November 1943 (fr.), *A. Burkart 14356* (Lectotype [designated here]: SI 002517 [digital image!]; isolectotype: SI 002518 [digital image!]). Iconography: *Rodriguésia* 70: 9. 2019.

Subshrub prostrate, stems simple, pilose to villous, indument light yellow, with non-glandular trichomes and sparsely yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 5–6 × 1–1.5 mm, free, deciduous, lanceolate, externally pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 2.3–4.2 cm long; leaf rachis 1.2–2 cm long; stipels deciduous; *leaflets* 3–8.5 × 1.9–5.9 cm, ovate, elliptical, obovate or rounded, surface not bullate, cuneate to rounded at apex and base, entire-margined, pilose, with yellow vesicular glands on both surfaces. *Inflorescences* axillary, racemose, 7–21 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 0.5–2.2 mm long. *Flowers* 7–12 mm long excluding the pedicel; *calyx* 9–11 mm long, pubescent, with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, generally all of them equaling or exceeding the corolla in length (but sometimes slightly smaller within the same specimen); *standard petal* 11–12 × 6.5–8 mm, obovate, emarginate to rounded at apex, pilose, with yellow vesicular glands but lacking bulbous-based trichomes, claw 1.5–2 mm long, auricle ca. 0.5 mm long; *wing petals* 10.5–11.5 × 2–3 mm, oblong, claw 2.5–3 mm long, auricle 0.5 mm long; *keel petals* 10–11 × 3–4 mm, falcate, claw 2.5–3.5 mm long; *stamens* 12.5–13.5 mm long; *ovary* 3.5–4.2 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.1–2.3 × 0.6–0.8 cm, brown, without constrictions between the seeds, oblong in outline, pilose to pubescent, with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 3–4 × 3 mm, ovate, unicolored, brown.

Nomenclatural and taxonomic notes:—*Rhynchosia lateritia* was described by Burkart (1952) based on the gathering *Burkart 14356* deposited in SI. There are two duplicates of this collection in SI (SI 002517 and SI 002518), but no particular specimen was specified as type by the author in the original publication. Therefore, we designated the specimen with barcode number SI 002517 as the lectotype of *R. lateritia* (see Turland et al., 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

This species resembles *R. hauthalii*, but differs from it by the characteristics listed in the taxonomic notes of this species.

Reproductive phenology:—Flowering in March, October and December; fruiting in October.

Distribution and habitat:—*Rhynchosia lateritia* occurs in Argentina and Paraguay (Fig 10). Grear (1978) and Fortunato (1983) cited the collection *Montes 3379* from Brazil. We have the opportunity to examine this material and we believe that, as it is a vegetative collection, it may be *R. hauthalii*. It occurs in grassy and clay fields and in cerrado areas.

Paratypes:—ARGENTINA, Misiones, Loreto, March 1945 (fl.), *J. E. Montes 634* (SI 002519 [digital image!], SI 002520 [digital image!]); Porto Rico, November 1948, *Montes 3379* (SI [not seen]); s.loc., October 1947, *E. Grondona & R. Spegazzini 1585* (SI [not seen]); Santa Ana, November 1912, *Rodrigues s.n.* (SI [not seen]).

Conservation status:—Endangered (EN). According to the value of EOO (3,095 km²; GeoCAT, accessed in May 2022), *R. lateritia* is classified as EN following the IUCN red list (IUCN 2022) criteria and subcriteria, respectively, B1b (i, iii). This species was described in 1952 and few specimens of it have been collected so far.

Specimens Examined:—ARGENTINA. Corrientes: Santo Tomé, 3 km SW de Gdor. Virasoro, 02 December 1981 (fl./fr.), *S. G. Tressens et al. 1426* (MEXU 339855). Misiones: Candelaria, Loreto, Ruta Nac. 12, 6 October 2007 (fl.), *H. A. Keller et al. 4566* (UEC). Posadas, in graminosis prope “La Granja” prädium, 14 December 1907 (fl.), *E. L. Ekman 1680* (NY). PARAGUAY. Paraguari, Ybytinù, 10 September 1952 (fl.), *J. E. Montes 12969* (P 02748609).

14. *Rhynchosia leucophylla* (Benth.) Benth., Fl. Bras. 15(1B): 202. 1862.

Basionym:—*Arcyphyllum leucophyllum* Benth., Linnaea 22: 525. 1849. Type: BRAZIL, “In Prov. São Paulo” s.d. (fr.), *Riedel 443* (Lectotype [designated by Grear 1978]: K 000502960 [digital image!]). Iconography: Rodriguésia 70: 9. 2019.

Rhynchosia leucophylla fo. *elliptica* Chodat & Hassl. Bull. Herb. Boissier, sér. 2. 4(9): 903. 1904. Type: PARAGUAY, “in campo pr. Igatimi”, December 1898-99, (fl./fr.), *E. Hassler 5620* (Lectotype [first-step designated by Grear 1978; second-step designated here]: G 00400122 [digital image!]; isolectotypes: BM 000538510 [digital image!]; G 00400158 [digital image!]; G 00400159 [digital image!]; K 000502958 [digital image!]; NY 00026947[!]; P 00708609 [digital image!], P 00708610 [digital image!]; UC 950971 [digital image!]).

Rhynchosia leucophylla fo. *pubescens* Chodat & Hassl. Bull. Herb. Boissier, sér. 2. 4(9): 903. 1904. Type: PARAGUAY, “in campis pr. Igatimi”, December 1898-99, (fl./fr.), *E. Hassler 5621* (Lectotype [designated by Grear 1978]: G 00400157 [digital image!]; isolectotypes: BM 000538511 [digital image!]; G 00400156 [digital image!]; K 000502959 [digital image!]; NY 00026948[!]; P 00708611 [digital image!]).

Rhynchosia leucophylla fo. *laxifolia* Chodat & Hassl. Bull. Herb. Boissier, sér. 2. 4(9): 903. 1904. Type: PARAGUAY, “in campis pr. flumen Jejui Guazu”, December 1898-99, *E. Hassler 5725* (Holotype: G [not seen]).

Subshrub erect, stems simple to branched, densely pubescent, indument cinereous, with non-glandular trichomes and sparsely yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 2–3.8 × 1.5–3 mm, free, deciduous, lanceolate, externally pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, sessile to subsessile, petioles up to 5 mm long; leaf rachis 0.4–0.8 cm long; stipels absent; *leaflets* 2.5–7.2 × 1.3–5.6 cm, ovate, elliptical, obovate, oblong or rounded, surface not bullate, obtuse to rounded at apex, cuneate to obtuse at base, entire-margined, pubescent to tomentose, with sparsely yellow vesicular glands on the abaxial surface. *Inflorescences* terminal or axillary, racemose, 4.3–15.6 cm long, many-flowered, equaling or exceeding the length of the subtending leaf, bracts deciduous; pedicel 2–5 mm long. *Flowers* 8–11 mm long excluding the pedicel; *calyx* 8–13 mm long, pubescent with yellow vesicular glands and bulbous-based trichomes, lobes lanceolate, all of them equaling or exceeding the corolla in length; *standard petal* 8–9 × 4–5 mm, oblong to obovate, retuse to rounded at apex, glabrous, lacking vesicular glands and bulbous-based trichomes, claw 1.5–2 mm long, auricle ca. 0.5 mm long; *wing petals* 7.5–9 × 1–1.5 mm, oblong, claw 2.5–3 mm long, auricle 0.5–1 mm long; *keel petals* 8–9.5 × 1.5–2 mm, falcate, claw 2.5–3 mm long; *stamens* 9–11 mm long; *ovary* 3.5–4 mm long, pubescent, with few yellow vesicular glands. *Fruits* 1.2–1.7 × 0.5–0.6 cm, cinereous, without constrictions between the

seeds, elliptical or oblong in outline, densely pubescent, with few yellow vesicular glands lacking bulbous-based trichomes. *Seeds* 3–4 × 2–3 mm, suborbicular, unicolored, brown to black.

Nomenclatural and taxonomic notes:—*Rhynchosia leucophylla* was first described as *Arcyphyllum leucophyllum* by Bentham (1849) based a Riedel gathering from “prov. São Paulo”. Grear (1978) lectotypified the specimen *Riedel 443* deposited in K, probably considering that Bentham handled it to describe this taxon. The procedure of Grear (1978) was corrected (see Turland et al. 2018: Art. 9.4), and we followed here. Grear (1978) cited the collection *Riedel 203* as paratype, but this cannot be considered as such because this material was not mentioned in the protologue.

Grear (1978) cited the gathering *Hassler 5620* at G as the lectotype of *R. leucophylla* fo. *elliptica*. As there are three duplicates of the gathering in this herbarium (G 00400122; G 00400158; G 00400159) and the author did not specify a particular specimen as type, the designation of Grear (1978) should be treated as the first-step lectotypification. Thus, we designate here the specimen with barcode number G 00400122 as the second-step lectotype of the *R. leucophylla* fo. *elliptica* (see Turland et al. 2018, Art. 9.17). This was also observed in *R. leucophylla* fo. *pubescens*. There are two duplicates of the gathering *Hassler 5621* at G (00400157; 00400156) and Grear (1978) did not designate a particular one as type. Therefore, the specimen with barcode number G 00400157 is here designated as the second-step lectotype of *R. leucophylla* fo. *pubescens*.

Even analyzing collections of several herbaria, we couldn't see the type material of *R. leucophylla* fo. *laxifolia*. Thus, we decided to keep this taxon as a synonym of *R. leucophylla* based on the characteristics provided in the protologue.

Rhynchosia leucophylla presents variations in the shape of the leaflet which can be ovate, elliptical, obovate, oblong or rounded. Even so, this species is easily recognizable by the erect subshrub habit, the presence of the cinereous indument throughout the plant's body, the sessile to subsessile leaf, glabrous corolla and calyx lobes equaling or exceeding the corolla in length.

Reproductive phenology:—Flowering from January to March, May, July, November and December; fruiting from January to May and November.

Distribution and habitat:—*Rhynchosia leucophylla* occurs in Brazil and Paraguay (Fig. 10) in areas of Cerrado domain, shrub fields pastures and roadsides.

Conservation status:—Least Concern (LC). According to the value of EOO (231,220 km²; GeoCAT, accessed in May 2022), *R. leucophylla* is classified as LC (IUCN 2022). This species is commonly found in Mato Grosso do Sul state, Brazil, and does not fit in the threatened categories of the IUCN red list (IUCN 2022).

Specimens Examined:—**BRAZIL.** Mato Grosso do Sul: Amambaí, arredores da tribo Caiuá, 1979 (fr.), *W. G. Garcia 13875* (UEC); Bela Vista, lado direito da BR 267 (sentido Porto Murtinho), 26 April 2012 (fr.), *W. Vargas et al. 10* (MBM); *ibid.*, Rod. BR-267, próximo do trevo para Bela Vista, 11 March 2003 (fl./fr.), *G. Hatschbach et al. 74572* (MBM); Bonito, Rodovia Bonito, Campo dos Índios, próximo do Córrego Três Morros, 8 November 2002 (fl.), *G. Hatschbach et al. 73906* (MBM); *ibid.*, 10 March 2003 (fr.), *G. Hatschbach 74468* (MBM); *ibid.*, Rod. MS-270, km 15-20, 21 May 2002 (fl./fr.), *G. Hatschbach et al. 73242* (MBM); Dourados, Rio Dourado, 16 May 1976 (fl./fr.), *G. Hatschbach 38687* (MBM, NY); Maracajú, 03 February 1952 (fl./fr.), *E. Kuhlmann s.n.* (SP); Rio Brilhante, Entroncamento, 16 February 1970 (fl./fr.), *G. Hatschbach 23623* (MBM); Sidrolândia, Santa Fé, 23 January 1971 (fl./fr.), *G. Hatschbach 25055* (MBM). São Paulo: Capão Bonito, mais ou menos no km 14 da rodovia Bonito-Itapeva, 09 December 1966 (fl.), *J. Mattos & N. Mattos 14871* (SP); *ibid.*, Parque Florestal Getulio Vargas, 14 November 1967 (fl./fr.), *J. Mattos & N. Mattos 15127* (NY, SP). **PARAGUAY.** Amambay: Colonia Estrella, 45 km NW de P. J. Caballero, 8 December 1997 (fl./fr.), *A. Schinini & M. Dematteis 33558* (NY); Pedro Juan Caballero, Fazenda Cerro-Cora, 15 November 1964 (fl.), *J. C. Gomes 1593* (SP); Sierra de Amambay, 27 July 1910 (fl.), *E. Hassler 9783* (P). Caaguazú: Campo 9, cercado arenoso, 20 February 1982 (fl./fr.), *J. F. Casas & J. Molero 6348* (NY); East of Caaguazú, 28 December 1994 (fl.), *E. M. Zardini & L. Guerrero 42081* (NY).

15. *Rhynchosia lewisii* Bezerra & Fort.-Perez, Phytotaxa 406 (2): 84–090. 2019. Type:—BRAZIL, Bahia, Santa Teresinha, caminho para a Torre, 12°46'S 39°31'W, 16 August 2013 (fl./fr.), *M. L. Guedes et al. 20795* (Holotype: ALCB 97782!; isotype: UB!). Iconography: Phytotaxa 406 (2): 86. 2019.

Vine herbaceous, stems branched, pubescent, indument white to light yellow, with non-glandular, yellow vesicular glands and bulbous-based trichomes. *Stipules* 4–7 × 0.5–1 mm, free, persistent, lanceolate to triangular, externally pubescent with yellow vesicular glands and

bulbous-based trichomes. *Leaves* trifoliolate, petiole 1.9–3.2 cm long; leaf rachis 0.9–1.4 cm long; stipels absent; *leaflets* 1.9–10.3 × 0.9–4.4 cm, rhombic, lanceolate, or ovate, surface not bullate, acute to attenuate at apex, cuneate to rounded at base, entire-margined, pilose, with yellow vesicular glands on the abaxial surface. *Inflorescences* axillary, paniculate, 8–17.5 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 3–5 mm long. *Flowers* 4–7 mm long excluding the pedicel; *calyx* 3–4 mm long, densely pubescent with yellow vesicular glands and bulbous-based trichomes, lobes lanceolate to triangular, not exceeding the corolla in length; *standard petal* 6 × 6 mm, orbicular, rounded at apex, pilose, with yellow vesicular glands and bulbous-based trichomes, claw ca. 2.2 mm long, auricle ca. 1 mm long; *wing petals* 5.5–5 × 2–2.2 mm, obovate, claw ca. 2 mm long, auricle 1 mm long; *keel petals* 4.5–5 × 2–2.2 mm, falcate, claw ca. 2 mm long; *stamens* 7–7.5 mm long; *ovary* ca. 3 mm long, densely pubescent, with yellow vesicular glands. *Fruits* 1–2.1 × 1–1.1 cm, greenish, oblong in outline, slightly constricted between the seeds, pilose, with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 5–6 × 4–5 mm, oblong to obovate, bicolored, yellow to orange and black, areas of coloration almost equal.

Nomenclatural and taxonomic notes:—*Rhynchosia lewisii* was recently described by Bezerra and Fort.-Perez (2019c). It receives this name in honor of Dr. Gwilym P. Lewis for his dedicated studies on Leguminosae.

Rhynchosia lewisii is characterized by the persistent stipules, pedicel 3–5 mm long, fruit slightly constricted between seeds and bicolored yellow to orange and black seeds (Bezerra et al. 2019c).

Reproductive phenology:—This species was collected with flowers in August, September and October, and fruits in August.

Distribution and habitat:—*Rhynchosia lewisii* occurs in a fragment of tropical forest from Serra da Jiboia, Santa Teresinha, Bahia, Brazil (Fig. 9). This species was only found in this region, which indicates that is probably endemic to the state of Bahia (Bezerra et al. 2019c).

Paratypes:—**BRAZIL.** Bahia: Santa Teresinha, Serra da Jibóia, Mata Estacional Semidecidual, 12°50'39" S 39°28'59" W, 25 October 2010 (fl.), *M. L. Guedes et al.* 17793 (ALCB, VIES); *ibid.*, ca. de 4 km da Pedra Branca, Mata Higrófila, 12°51'10" S 39°28'32" W, 27 September 2000 (fl.), *L. P. Queiroz et al.* 6386 (HUEFS); *ibid.*, trilha em área florestada passando as torres de transmissão, 12°51'12" S 39°28'33" W, 08 October 2018 (fl.), *L.C. Marinho* 1428 (HUEFS).

Conservation status:—Endangered (EN). This species was assessed as EN by Bezerra et al. (2019c) following the criteria and subcriteria B2a+B2b (iii).

Specimens Examined:— **BRAZIL.** Bahia: Santa Teresinha, caminho para a Torre, 12°46'S 39°31'W, 16 August 2013 (fl./fr.), *M. L. Guedes et al.* 20795 (ALCB, UB); *ibid.*, Mata Estacional Semidecidual, 12°50'39" S 39°28'59" W, 25 October 2010 (fl.), *M. L. Guedes et al.* 17793 (ALCB, VIES); *ibid.*, ca. de 4 km da Pedra Branca, Mata Higrófila, 12°51'10" S 39°28'32" W, 27 September 2000 (fl.), *L. P. Queiroz et al.* 6386 (HUEFS); *ibid.*, trilha em área florestada passando as torres de transmissão, 12°51'12" S 39°28'33" W, 08 October 2018 (fl.), *L. C. Marinho* 1428 (HUEFS).

16. *Rhynchosia lineata* Benth., Fl. Bras. 15(1B): 202. 1862. Type:—BRAZIL, “Province de Rio-Grande”, 1883, (fl.), *C. Gaudichaud* 1502 (Lectotype [designated here]: P 02749054 [digital image!]). Iconography: *Rodriguésia* 70: 9. 2019.

Fig. 11 A–B

Subshrub erect, stems simple or branched, pilose to pubescent, indument white to light yellow, with non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 2–3 × 0.5–2 mm, free, persistent to late-deciduous, lanceolate, externally pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 0.5–1.2 cm long; leaf rachis 0.4–0.7 cm long; stipels absent; *leaflets* 1.7–5.6 × 0.3–1.4 cm, narrowly lanceolate to linear, surface not bullate, attenuate to acuminate at apex, acute at base, entire-margined, pubescent to tomentose, with yellow vesicular glands on both surfaces. *Inflorescences* terminal or axillary, racemose, 3.4–8.7 cm long, many-flowered, equaling or exceeding the length of the subtending leaf, bracts deciduous; pedicel 1.5–2 mm long. *Flowers* 7–9 mm long excluding the pedicel; *calyx* 7.6–9.4 mm long, pilose to pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, all of them equaling or exceeding the corolla in length; *standard petal* 6–8 × 3–5 mm, elliptical or oblong, emarginate or rounded at apex, glabrous, lacking vesicular glands and bulbous-based trichomes, claw 1–2 mm long, auricle ca. 0.5 mm long; *wing petals* 5–7.5 × 1–1.5 mm, oblong, claw 1–2 mm long, auricle ca. 0.5 mm long; *keel petals* 6–9 × 1.5–2.5 mm, falcate, claw 1.5–2.5 mm long; *stamens* 6–10 mm long; *ovary* 2.9–4.1 mm long, densely pubescent, with yellow vesicular glands. *Fruits*

1.1–1.9 × 0.5–0.6 cm, brown, without constrictions between the seeds, oblong or elliptical in outline, pilose to pubescent, with few yellow vesicular glands and bulbous-based trichomes. *Seeds* 2–3 × 2–3 mm, suborbicular, unicolored, brown to black.

Nomenclatural and taxonomic notes:—In the protologue of *Rhynchosia lineata*, four collections were mentioned: “Habitat in prov. Rio Grande do Sul: Arsene Isabelle”, “Hb. Imp. Br. n. 1502”, “in silvis prope Aldea ejusdem prov.: Tweedie” and “in Banda Oriental: A. de St. Hilaire”. Gear (1978) lectotypified the collection the collection A. de St Hilaire 2509 housed in K (K 000502968). As Bentham (1862) did not mention the collection number “2509” in the protologue and there is no information in the exsiccate that matches the protologue, we decided not to follow the decision of Gear (1978). In this way, we select here the collection “Hb. Imp. Br. n. 1502” with barcode P 02749054 as a lectotype of *R. lineata*.

Rhynchosia lineata is characterized by having an erect subshrub habit, by the leaflets that are narrowly lanceolate to linear and by the glabrous corolla (Fig. 11 A–B). The arrangement of flowers in the peduncle is variable, usually they are distributed from the base, but they can also be observed only in the apex, resembling *R. corylifolia*.

Reproductive phenology:—*Rhynchosia lineata* was found with flowers from January to March and October to December and with fruits from January to March and December.

Distribution and habitat:—*Rhynchosia lineata* is distributed in northeastern Argentina, Brazil and Uruguay (Fig. 10). Miotto (1988) mentions that this species also occurs in Paraguay, but in this work this occurrence was not confirmed. This species occurs in cerrado areas and in grassy or rocky fields.

Paratype:—BRAZIL, “in prov. Rio Grande do Sul”, 1835 (fl.), *M. Isabelle s.n.* (P 02749056 [digital image!]).

Conservation status:—Least Concern (LC). According to the value of EOO (275,677 km²; GeoCAT, accessed in May 2022), *R. lineata* is classified as LC, considering that there are innumerable records for this species from Brazil and Argentina.

Specimens Examined:—ARGENTINA. Corrientes: Dep. Santo Tomé, Virasoro, al Oeste 12 km, 14 November 1944 (fl.), *F. Ibarrola 1240* (NY). Entre Rios: Fedaracion, Salto Grande, 14 December 1974 (fl.), *A. Burkart et al. 30875* (US); Misiones: Dep. Candelaria, Mártires Brete, 17 February 1945 (fl.), *A. Burkart 15448* (MBM). BRAZIL. Rio Grande do Sul: Alegrete, Cerro do Tigre, February 1990 (fl.), *M. Sobral 6372* (FLOR, UEC); *ibid.*, parada de trem Perau, 29 October 1989 (fl.), *L. A. Z. Machado 265* (SMDB); *ibid.*, próximo a parada de Trem Tigre,

05 January 1990 (fl./fr.), *A. Alvarez & L. Machado 472* (SMDB); Augusto Pestana, Pestana p. Ijuí, 19 February 1954 (fl.), *Pivetta 1041* (PACA); Bossoroca, Bossoroca/Coimbra, 12 January 1991 (fl.), *L. A. Z. Machado et al. 835* (SMDB); *ibid.*, 12 January 1991 (fr.), *L. A. Z. Machado et al. 839* (SMDB); Caçapava do Sul, Caiera, BR 392, 24 December 1988 (fl.), *L. A. Z. Machado 106* (SMDB); *ibid.*, Passo do Salso, 26 December 1988 (fl./fr.), *L. A. Z. Machado 111* (SMDB); Campanha, January 1972 (fl.), *Pott 122* (BLA); Carazinho, about 10 km SW of Carazinho, on road to Cruz Alta, 17 March 1991 (fl./fr.), *T. M. Pedersen 15728* (MBM, NY); Caxias do Sul, Vila Oliva p. Caxias, 29 January 1946 (fl.), *E. Rambo s.n.* (PACA); *ibid.*, Vila Seca, 12 January 2000 (fl.), *L. Scur 360* (MBM); Erechim, Gaurama Km 12, 11 December 1964 (fl.), *K. J. F. Valls 4625* (BLA); Esmeralda, 9 km após Esmeralda em direção a L. Vermelha, 5 January 1978 (fl./fr.), *S. Miotto 823* (BLA); Ijuí p. Tupanciretã, 30 January 1942 (fl.), *B. Rambo s.n.* (PACA); Ipiranga do Sul, BR 153, 27 December 1995 (fl.), *R. Wasum et al. 11404* (MBM, NY); Jari, Jari p. Tupanciretã, 27 January 1942 (fl.), *B. Rambo 9430* (PACA); Manoel Viana, Manoel Viana/Santiago, 16 January 1991 (fl.), *Machado et al. 1139* (SMDB); Nonoai, Nonoai p. fl. Uruguay, March 1945 (fl.), *B. Rambo s.n.* (PACA); Passo Fundo, In campestribus dumetosis, 1941 (fl.), *I. Edesio s.n.* (PACA); Santa Cruz do Sul, Sítio, 14 December 1950 (fl.), *A. Sehnem 5082* (PACA); Santa Maria, 15 October 1938 (fl.), *E. Rambo s.n.* (PACA); *ibid.*, Estação Experimental de Silvicultura, 2 January 1956 (fr.), *O. R. Camargo 2069* (BLA); *ibid.*, 25 January 1956 (fl.), *O. Camargo 101* (PACA); *ibid.*, 10 March 1956 (fl.), *O. Camargo 46* (PACA); *ibid.*, Santa Flora, 28 March 1991 (fl.), *Machado et al. 1320* (SMDB); Santiago, a 2 km da cidade, saída para São Francisco de Assis, 07 March 1990 (fl.), *I. Barreto & L. Machado 578* (SMDB); *ibid.*, Capão do Cipó, Assentamento Santa Rita, 05 January 1989 (fl.), *L. A. Z. Machado 135* (SMDB); São Borja, BR 287, 14 January 1991 (fl.), *Machado et al. 1013* (SMDB); São Francisco de Assis, rumo à Santiago, 16 January 1991 (fl.), *Machado et al. 1240* (SMDB); Sobradinho, Sobradinho/Manoel Viana, 15 January 1991 (fl./fr.), *Machado et al. 1055* (SMDB); Soledade, Boqueirão do Butiá, RS 332, Km 106, 09 January 1999 (fl.), *S. T. S. Miotto s.n.* (SMDB); Tupanciretã, January 1935 (fl.), *A. A. Araujo 1* (BLA); *ibid.*, 27 January 1942 (fl.), *B. Rambo 3860* (SP); *ibid.*, Estação Experimental, 7 February 1969 (fl./fr.), *Pott 78* (BLA); *ibid.*, Passo da Lage, 11 January 1991 (fl./fr.), *Machado et al. 776* (SMDB); Vacaria, Est. Exp. De Vacaria, 24 January 1990 (fl.), *Machado & Polking 545* (SMDB). Santa Catarina: Campos Novos, 31 January 1963 (fl.), *R. Reitz 6417* (FLOR). URUGUAY. Dep. Cerro Largo, Cerro de las Cuentas, unica ruata en esquedal, 29 December 1938 (fl.), *Rosegardt B-2783* (NY). Dep. Durazno, Estancia Las Palmas, March 1922 (fl./fr), *C. Osten 16858* (BHCB); Dep.

Rivera, Cuñapirú, 26 January 1977 (fl./fr.), *T. M. Pedersen 11644* (MBM, NY); *ibid.*, 19 January 1995 (fl./fr.), *T. M. Pedersen 16207* (MBM).

17. *Rhynchosia mantaroensis* J.F. Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 8(2): 105. 1930.

Vine suffrutescent, twining, stems simple or branched, sericeous, puberulous, or pilose to pubescent, indument white to light yellow, with non-glandular trichomes and sparsely yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 2.5–6.5 × 1.6–3 mm, free, persistent, lanceolate to triangular, externally pubescent to tomentose with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 1.3–3.5 cm long; leaf rachis 0.5–1.1 cm long; stipels persistent; *leaflets* 1.8–8.2 × 1.3–4.8 cm, ovate, elliptical, or deltoid, surface not bullate, acute to acuminate at apex, obtuse to rounded at base, entire-margined, pubescent, villous or densely tomentose, with yellow vesicular glands on abaxial surface. *Inflorescences* axillary, racemose or paniculate, 6–29.5 cm long, many-flowered, equaling or exceeding the length of the subtending leaf, bracts deciduous; pedicel 0.5–4 mm long. *Flowers* 9–13 mm long excluding the pedicel; *calyx* 5–9 mm long, pubescent with yellow and black vesicular glands and sparsely bulbous-based trichomes, lobes triangular, not exceeding the corolla in length; *standard petal* 10–12 × 7–9 mm, obovate, rounded at apex, pilose to pubescent, with yellow vesicular glands and rare bulbous-based trichomes, claw ca. 2 mm long, auricle ca. 0.5 mm long; *wing petals* 9–10 × 1.3–1.6 mm, oblong, claw ca. 2 mm long, auricle ca. 0.5 mm long; *keel petals* 9–11 × 2.6–3 mm, falcate, claw 3–4 mm long; *stamens* 10–12 mm long; *ovary* 3.5–4 mm long, pubescent, lacking vesicular glands. *Fruits* 1.8–3 × 0.7–1.3 cm, greenish to brownish, without constrictions between the seeds, oblong in outline, pubescent to hirsute, with yellow vesicular glands and bulbous-based trichomes. *Seeds* 3–4.5 × 2.5–3 mm, suborbicular, unicolored, brown to black.

Key to varieties of *Rhynchosia mantaroensis*

Leaflets pubescent to villous beneath; inflorescences 6–10.5 cm long; pedicel 2–4 mm long ...
Rhynchosia mantaroensis var. *mantaroensis*

Leaflets densely tomentose beneath; inflorescences 12.6–29.5 cm long; pedicel 0.5–1.5 mm long ... *Rhynchosia mantaroensis* var. *cuprinervia*

17.1. *Rhynchosia mantaroensis* var. *mantaroensis*. Type:—PERU, Tayacaja, Dep. Huancavelica, “Manto Valley, near la Mejorada”, March 1926 (fl./fr.), A. *Weberbauer* 7606 (Holotype: F 0043559F [digital image!]; isotypes: BM 000931748 [digital image!], G 00367753 [fragment] [digital image!], G 00367757 [digital image!], GH 00063822 [digital image!], K 000502953 [digital image!], NY 00026949[!], S-R-9726 [digital image!], US 00004685 [digital image!]).

Stems puberulous to sericeous, becoming glabrous with age. *Stipules* 2–4 × 1–1.5 mm, pubescent with yellow vesicular glands. *Leaflets* 1.7–4.8 × 1.1–2.7 cm, ovate, acute to acuminate at apex, rounded at base, pubescent to villous. *Inflorescences* 6–10.5 cm long, pedicel 2–4 mm long. *Calyx* 5–7 cm long, pubescent with yellow and black vesicular glands. *Immature fruit* 1.4–2.3 × 0.4–6 cm, pubescent to hirsute, with yellow vesicular glands and bulbous-based trichomes.

Nomenclatural and taxonomic notes:—*Rhynchosia mantaroensis* var. *mantaroensis* is characterized by the stems twining, inflorescence racemose to paniculate, many-flowered, up to 10.5 cm. It resembles *R. edulis*, since they have an oblong fruit with bulbous-based trichomes. However, in *R. mantaroensis* var. *mantaroensis* the vesicular glands on the abaxial surface of the leaflets are yellow (vs. vesicular glands in the abaxial surface of the leaflets dark yellow, brown to black in *R. edulis*), and the inflorescences are up to 10.5 cm long (vs. inflorescences up to 21 cm long).

Reproductive phenology:— Flowering in March May and November; fruiting March, May, June and November.

Distribution and habitat:—*Rhynchosia mantaroensis* var. *mantaroensis* occurs in southern Peru (Fig. 12). This taxon can be found in shrubby sandy soil fields.

Conservation status:—Near Threatened (NT). With an EOO of 25,325 km² this taxon is classified as NT following the terms of IUCN Red List (IUCN 2022). We believe that efforts to collect and conserve this taxon are needed, since there are few records of it and none of them are recent.

Specimens Examined:—PERU. s.loc., 1839-1840 (fl.), M. Cl. Gay s.n. (P 02749565). Apurimac-valley, s.d (fl./fr.) R. *Histch* 7654 (NY). Cuzco: Anta, Dist. Limatambo, Sauceda, Matorral, 04 June 2004 (fr.), W. *Galiano*, E. *Suclli* & A. *Rodríguez* 6511 (NY); Paruro, bajando

de Agusbamba a Mayhua, March 1938 (fl.), *C. Vargas* 877 (F V0368662F). Huancavelica: alrededores de Mejorada, 24 March 1951 (fl.), *O. Tovar* 289 (US 2100557); *ibid.*, entre Izcuchaca y Mejorada, 2 November 1963 (fl./fr.), *O. Tovar* 4465 (US 2490538). Junin: La Mejorada, Mantaro Valley, 23 May 1929 (fl./fr.), *E. P. Killip & A. C. Smith* 23344 (NY).

17.2. *Rhynchosia mantaroensis* var. *cuprinervia* Grear, Mem. New York Bot. Gard. 1(1): 40–43. 1978. Type:—PERU, Cajamarca, Celedin, Rocky hillsides, 4 km east of Celedin on road to Balsas, at first creek crossing in hills above town, May 1964 (fl.), P. C. Hutchison & J. K. Wright 5164 (Holotype: UC 1347746 [digital image!]; isotypes: F 0043760F [digital image!], G 00367759 [digital image!], GH 00063823 [digital image!], K 000502952 [digital image!], MICH 1104296 [digital image!], MO 277412 [digital image!], NY 00026950[!], P 02748515 [digital image!], US 00170459 [digital image!]).

Figs. 5 F–G; 11 C–F

Stems pilose tomentulose to pubescent, not becoming glabrous with age. *Stipules* 4–6.5 × 1–3 mm, externally pubescent to tomentose with yellow vesicular glands. *Leaflets* 2.3–8.2 × 1.5–4.8 cm, ovate to deltoid, acute to acuminate at apex, obtuse to rounded at base, densely tomentose. *Inflorescences* 12.2–29.5 cm long, pedicel 0.5–1.5 mm long. *Calyx* 7–10 cm long, pubescent with yellow and black vesicular glands. *Fruits* 1.8–2.8 × 0.5–0.8 cm, pubescent, covered by bulbous-based trichomes.

Nomenclatural and taxonomic notes:—Grear (1978) established the variety *R. mantaroensis* var. *cuprinervia* by having more robust leaves, inflorescences crowded with more and bigger flowers than the typical variety (Figs. 5 G; 12 C–F). Additional characteristics that differentiate *R. mantaroensis* var. *cuprinervia* from the typical variety are listed in the identification key of the varieties of *R. mantaroensis*.

Reproductive phenology:—Flowering in January and from April to November; fruiting from May to July and August.

Distribution and habitat:—*Rhynchosia mantaroensis* var. *cuprinervia* occurs in Ecuador and northern Peru (Fig. 12). It can be found in limestones slopes, roadsides, pastures and degraded and fragmented forests.

Conservation status:—Least concern (LC). With an EOO of 84,649 km² (GeoCAT, accessed in May 2022), *R. mantaroensis* var. *cuprinervia* is classified as LC following the IUCN red list

(IUCN 2022). This taxon is commonly found in ruderal areas, such as roadsides, pastures and degraded environments.

Specimens Examined:—**ECUADOR.** Cañar: Azogues, Parroquia Javier Loyola, 30 July 1991 (fl./fr.), *C. E. Cerón 15781* (NY). Loja: Cerro de Chilla, Saraguru-Manú, 02 May 1994 (fl./fr.), *P. M. Jorgensen et al. 686* (NY). “Vicinity of Tablon de Ona”, 27 September 1918 (fl.), *J. N. Rose A. Pachano & G. Rose 23112* (NY). **PERU.** Amazonas: Bongorá, 17 August 1963 (fl./fr.), *R. Ferreyra & C. Acleto 15209* (NY); Chachapoyas, Leimebamba, Afuera del pueblo Yerbabuena, rumbo a Chachapoyas, 7 July 2001 (fl./fr.), *A. F. Salinas s.n.* (NY); *ibid.*, rocky slopes of Caño Santa Lucia just east of Chachapoyas, 28 May 1962 (fl.), *J. J. Wurdack 570* (NY); *ibid.*, Utcubamba River Valley between Tingo and Samanaga, 26 May 1984 (fl.), *D. N. Smith & J. Cabanillas 7144* (NY). Cajamarca: Cajabamba, alrededores de Cajabamba, 18 November 1983 (fl.), *A. Sagástegui et al. 11236* (NY); Cajamarca, Cochambul, ruta Cajamarca-San Marcos, arriba de Llacanora, 15 June 1976 (fl.), *I. Sánchez & J. Sánchez 1921* (NY); *ibid.*, Km 31 on hwy from near Pacasmayo to Cajamarca, 4 January 1983 (fl.), *W. D. Stevens 22063* (NY); Chota, 2-3 km E of village of El Campamento, ca. 20 km NW of Huambos, 22 April 1993 (fl.), *M. O. Dillon et al. 6458* (NY); Contumazá, El Chorillo, 14 May 1994 (fl.), *A. Sagástesi, S. Leiva & P. Lezama 15255* (NY); Jaén, Carretera entre Sallique y la Unión, 18 July 1998 (fl./fr.), *C. Diaz, T. Guevara & E. Tineo 9870* (NY); San Miguel, entre lives y Payac, 11 May 1977 (fl.), *A. Sagástegui, J. Mostacero & E. Alvitez 8796* (NY); San Pablo, lugar entre Sangal por la Carretera Chilete-San Pablo, 5 June 1982 (fl./fr.), *J. Sánchez 9882* (NY). La Libertad: Huamachuco, Yanasara, 28 May 1962 (fl.), *J. Infantes 2132* (NY). Lambayeque: Lambayeque, Abra de Porculla, entre Olmos e Jaen, 28 June 1959 (fl.), *R. Ferreyra 13754* (NY); *ibid.*, La Calle, Penachi, 19 October 1985 (fl.), *S. L. Quiroz 1436* (NY).

18. *Rhynchosia melanocarpa* Grear, Mem. New York Bot. Gard. 31(1): 43. 1978. *Rhynchosia phaseoloides* var. *erecta* Micheli, Mém. Soc. Phys. Genève 28: 32. 1883. Type:—PARAGUAY, Ibitimi, November 1874, *Balansa 1852* (Presumed holotype: G [not seen]; isotype: P 00708619 [digital image!]). Iconography: *Rodriguésia* 70: 13. 2019.

Fig. 11 G–J

Vine climbing or suffrutescent, twining, stems simple or few branched, pilose to pubescent, indument white to light yellow, with non-glandular trichomes and few yellow vesicular glands but lacking bulbous-based trichomes absent. *Stipules* 2–4.4 × 1–2 mm, free, deciduous, lanceolate, externally pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 3–8.5 cm long; leaf rachis 0.8–4.3 cm long; stipels persistent; *leaflets* 2.3–12.5 × 2–11.1 cm, ovate or deltoid to rhombic, surface not bullate, attenuate to acuminate at apex, truncated to cuneate at base, entire-margined, pilose to pubescent, with yellow vesicular glands on abaxial surface. *Inflorescences* axillary, paniculated, 5–30 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 2–4 mm long. *Flowers* 5–10 mm long excluding the pedicel; *calyx* 3–4 mm long, pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, not exceeding the corolla in length; *standard petal* 4.5–10 × 4–5 mm, oblong to obovate, rounded at apex, pilose to pubescent, with yellow vesicular glands but lacking bulbous-based trichomes, claw 1–2 mm long, auricle ca. 0.5 mm long; *wing petals* 6–10 × 1–2 mm, oblong, claw 1–2 mm long, auricle ca. 0.5 mm long; *keel petals* 6–10 × 2–3 mm, falcate, claw 1–3 mm long; *stamens* 6–8 mm long; *ovary* 2.5–3.2 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.4–2.1 × 0.5–0.6 cm, reddish-brown to black, strongly constricted between the seeds, oblong to ovate in outline, glabrescent, with few yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 4–6 × 3–4 mm, suborbicular, bicolored, black and red, the red confined to hilar area.

Nomenclatural and taxonomic notes:—Grear (1978) raised the variety *R. phaseoloides* var. *erecta* to species level. Since the epithet (erect) did not really represent the habit of the plant (twining) and had previously been used as a synonym for *R. tomentosa*, he named the species as *Rhynchosia melanocarpa* because of its blackened fruit.

Rhynchosia melanocarpa is characterized by the leaves with prominent stipels (Fig. 11 H), the reddish-brown to black fruits, with constriction between the seeds, and by the bicolored black and red seeds, the red confined to hilar area (Fig. 11 G; Bezerra et al. 2019a). This species resembles *R. erythrinoides* and *R. nainceckensis* due to their habit, inflorescence and dark constricted fruits (Fig. 11 G–J). They can be differentiated according to the characteristics listed in Table 1.

Reproductive phenology:—Flowering from February to April, June and September; fruiting in January, February and from April to October.

Distribution and habitat:—*Rhynchosia melanocarpa* occurs just in South America, in Argentina, Bolivia, Brazil, Paraguay, Peru and Venezuela (Fig. 12). It occurs in disturbed areas, forests edges and roadsides.

Conservation status:—Least Concern (LC). Following the terms of IUCN red list (IUCN 2022), *R. melanocarpa* is classified as LC due to its wide value of EOO (10,445,838 km²; GeoCAT, accessed in May 2022). This species is commonly found in some countries of South America, especially in Brazil, and is also well sampled in herbaria.

Specimens Examined:—**ARGENTINA.** Misiones: Iguazú, Pedro, Bossetti, Propriedad Pérez Companc, Faja Ecológica, borde del selva, 21 May 1999 (fr.), *H. A. Keller 56* (NY); San Ignacio, interior de selva entre peñones, dossel de yvyra katu y sotobosque de melastomatáceas, 19 January 2012 (fr.), *H. A. Keller & C. J. Keller 10602* (UEC). **BOLIVIA.** Beni: Fátima de Chimane, à 700m du village, 9 July 1987 (fr.), *A. Fournet 782* (NY); Rurrenabaque, 9 October 1921 (fr.), *H. H. Rusby 58335* (NY). La Paz: Coroico, 11 September 1894 (fl.), *Bang 2427* (NY); Iturrealde, along Rio Madre de Dios, 9 km (by air) NE of Puerto Heath, 26 August 1985 (fr.), *M. Nee 31588* (NY). Pando: Madre de Dios, Santo Domingo, 3 hours by boat aboe Riveralta on Río Madre de Dios, 10 September 1981 (fr.), *J. C. Solomon 6206* (NY). Santa Cruz: Chiquitos, Valle de Tucavaca entre Santiago y Santo Corazón, km 50 de Santiago, 25 April 2008 (fl./fr.), *J. R. I. Wood et al. 24475* (UB); “Del Lara, monte del Palometillas”, 3 September 1916 (fr.), *F. Iteubach 2908* (NY). **BRAZIL.** Amazonas: Boca do Acre, Rio Purus, 19 September 1966 (fr.), *G. T. Prance et al. 2390* (INPA, NY). Ceará: Crato, Serra do Araripe, June 1934 (fl./fr.), *Luetzelburg s.n.* (IPA). Distrito Federal: 45 km. S.W. of Brasília, rd. to Anápolis, 6 September 1964 (fr.), *H. S. Irwin & T. R. Soderstrom 6063* (NY); Brasília, 5 October 1961 (fr.), *E. P. Heringer 9445* (UB); Chapada da Contagem, 4 February 1968 (fl./fr.), *H. S. Irwin et al. 19503* (NY, UB). Goiás: BR 153 Brasília – Belém, imediações do município Ceres, 21 August 1978 (fl./fr.), *A. Allem & G. Vieira 2080* (CEN); Campinaçu, estrada Minaçu para o canteiro de obras da AHE cana brava, faz. Fortuna, margem esquerda do Rio Tocantins, 4 October 2020 (fr.), *T. B. Cavalcanti et al. 2641* (CEN); Gallery forest ca. 45 km S. of Caiapônia, road to Jataí, 28 June 1966 (fl.), *H. S. Irwin et al. 17917* (NY, UB); Luziânia, Rodovia Brasília – Cristalina, BR 040, km 48, s.d. (fr.), *L. Coradin et al. s.n.* (CEN); Margem do rio Corumbá, 29 September 1968 (fl./fr.), *E. P. Heringer s.n.* (UB); Monte Alegre de Goiás, Fazenda Nica 13°08'57"S 46°39'32"W, 15 June 2000 (fr.), *M. L. Fonseca et al. 2303* (RB); Padre Bernardo, Fazenda Rio Verde, 6 September 1976 (fr.), *D. C. Giacometti s.n.* (FLOR). Maranhão: Loreto, 20 – 25 km S of city of Loreto, on trail between Fazenda Aldeia e Fazenda Morros, 12 April 1962 (fl./fr.), *G. Eiten & L. T. Eiten 4292* (UB). Mato Grosso: 75 Km N. of

Xavantina, 550 m alt., 5 June 1966 (fl.), *H. S. Irwin et al 16645* (NY, UB); Expedition Base Camp: 12° 49' S, 51° 46' W, 44 Km along road North from base camp., 1 November 1968 (fr.), *R.M. Harley et al. 10980* (NY, UB); Tapurah, beira da MT-010. ca de 24 Km ENE de Tapurah, 12°38'04"S, 56°20'06"W, 09 June 1997 (fl.), *V. C. Souza et al. 17551* (UEC); *ibid.*, estrada do Capixaba, 20km ENE de Tapurah, 12°37'25"S, 56°21'51"W, 11 June 1997 (fl.), *V. C. Souza et al. 17643* (UEC); Xavantina on the Rio das Mortes. 14°42'S 52°21'W, 450-500 m alt., 27 August 1968 (fr.), *G. Eiten & L. T. Eiten 8417* (SP, UB). Mato Grosso do Sul: Along road from Bonito to Miranda (MS-178), 2 September 2017 (fr.), *P. Acevedo-Rodríguez 16633* (NY). Minas Gerais: Brasilândia de Minas, Fazenda Brejão, 12 July 2000 (fr.), *J.A. Lombardi 3971* (MBM); Belo Horizonte, Caetano Furquim, 23 May 1935 (fr.), *M. Barreto 5652* (UB); *ibid.*, Matta do Açude, 4 September 1971 (fr.), *M. Barreto 5651* (BHCB); Carmo do Rio Claro, 18 March 1920 (fr.), *P. A. Correa s.n.* (SP); Paracatu, rod. Brasília-Belo Horizonte, 3 June 1960 (fl./fr.), *E. P. Heringer 7549* (UB); Uberlândia, Fazenda Irara, Mata semi-decídua, 01 December 2010 (fr.), *B. C. Vargas & G. M. Araújo 196* (UEC); Volta Grande, Rod. Recepção-Barragem, 18 September 2002 (fr.), *F. L. R. Filardi et al. 43* (VIC). Paraná: Campo Mourão, 11 November 2003 (fr.), *M. G. Caxambú 163* (MBM); Cianorte, Fazenda Lagoa, 28 April 1996 (fl./fr.), *G. Hatschbach 14267* (NY); Jaguariaíva, Chapada Santo Antônio, 26 November 1968 (fr.), *G. Hatschbach 20396* (MBM); São Jerônimo da Serra, Estrada da Reserva Indígena, 24 March 1988 (fl.), *M. Silveira et al. s.n.* (UEC). Pernambuco: Ipubi, Serra Branca, 6 May 1971 (fr.), *E. P. Heringer 573* (RB). São Paulo: Águas de Santa Bárbara, Estado Ecológico de Santa Bárbara, 25 April 1990 (fl.), *J. A. A. Meira Neto s.n.* (UEC); Araras, 25 July 1930 (fl./fr.), *A. Nunes s.n.* (SP); Atibaia, 2.6 km. alongroad east of Igreja de Sao Joao Batista at Praça Claudino Alves in Atibaia, 22 June 1960 (fr.), *G. Eiten & L. T. Eiten 2035* (NY); Botucatu, Rubião Junior, 26 September 1978 (fr.), *P. L. Bicudo s.n.* (NY); Campinas, May 1918 (fr.), *D. C. Novaes s.n.* (SP); Indaiatuba, 05 January 1954 (fr.), *A. S. Grotta s/nº* (UEC); Lençóis Paulista, estrada de terra, 12 June 1995 (fr.), *J. Y. Tamashiro et al. 1075* (SP); Mogi Guaçu, Martinho Prado, Reserva Biológica da Fazenda Campininha, 27 May 1998 (fr.), *L. P. Queiros 5098* (RB); *ibid.*, Martinho Prado Júnior, Reserva Biológica da Fazenda Campininha, 5 September 1980 (fl./fr.), *W. Mantovani 854* (SP); *ibid.*, 21 October 1977 (fl.), *J. Y. Tamashiro et al. 6530* (SP); *ibid.*, 25 May 1981 (fl./fr.), *W. Mantovani 1855* (SP); Mogi Mirim, 25 May 1927 (fl./fr.), *F. C. Hoehne s.n.* (NY, SP); Onda Verde, Faz. São João, 29 June 1994 (fl./fr.), *J. Y. Tamashiro et al. 285* (SP); Paulo de Faria, ca. de 12 km de Paulo de Faria em direção a Orindiúva, 14 October 1994 (fr.), *A. A. Souza et al. 123* (SP); Tatuí, 21 October 1953 (fl./fr.), *M. Kuhlmann 2885* (SP). Rio Grande do Norte: Martins, Sítio do Sr. Clesinho, entrada na saída para Umarizal, ca. 2 Km da

entrada, 29 April 2012 (fr.), *J. G. Jardim 6207* (NY). Tocantins: Dianópolis, próximo à velha britadeira, 29 September 2003 (fr.), *T. B. Cavalcanti et al. 3298* (CEN); Guarai, km 919 BR 153, Brasília – Belém, 26 August 1978 (fr.), *A. Allem & G. Vieira 2128* (CEN). **PARAGUAY**. s.loc., 1901/2 (fl./fr.), *E. Hassler 5064* (NY). Alto Paraná: Puerto Presidente Stroessner, km 12, em bosque alto, 16 October 1980 (fr.), *J. F. Casas & J. Molero 9140* (NY); Reserva Biológica Tati Yupi, s.d. (fr.), *A. Schinini & G. C. Marmori 27277* (MBM). **PERU**. Huánuco: Pachitea, Dep. Honoria, Bosque Nacional de Iparia: Region de bosque seco tropical (sensu Tosi 1960) a lo largo del Rio Pachitea cerca del campamento Miel de Abeja (1 km. arriba del pueblo de Tournavista o unos 20 km arriba de la confluencia con el Rio Ucayali, 7 March 1967, *J. Schunke 1724* (NY); *ibid.*, 28 June 1967 (fl.), *J. Schunke 2093* (NY). Madre de Dios: Tambopata, 19 February 1991 (fl.), *P. Baca 91* (NY). San Martín: Lamas, Alonso de Alvarado, caminho a Roque, 3 km de San Juan de Pacayzapa, 28 Abril de 1973, *J. Schunk 6076* (NY). **VENEZUELA**. Anzoátegui: Northeast of Bergantín, 12 March 1945 (fr.), *J. A. Steyermark 61477* (F V0368651F). Apure: Pedro Camejo, E side of the Galeras de Cinaruco, 6 km N of the southernmost tip, along Quebrada El Porvenir, ca. 53 airline km NE of Puerto Páez, 21 February 1979 (fr.), *G. Davidse & A. C. González 15553* (NY).

19. *Rhynchosia mineira* L.M.P. Bezerra & Fort.-Perez, Kew Bulletin 74:62, pg. 1-6. 2019. Type:—BRAZIL, Minas Gerais, Couto de Magalhães de Minas, BR-367 towards São Gonçalo do Rio Preto, 18°3'17.2"S, 43°26'00.2"W, alt. 995 m, 17 July 2017 (fl., fr.), *T. C. Monteiro et al. 79* (Holotype: BOTU!). Iconography: Kew Bulletin 74:62, pg. 2. 2019.

Subshrub prostrate, stems few branched, pubescent, indument yellow, with non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 5–10 × 3–4 mm, free, deciduous, ovate, externally pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 1.8–2.8 cm long; leaf rachis 1.5–2 cm long; stipels absent; *leaflets* 1.8–3.3 × 1.4–3.1 cm, rounded, ovate or rhombic, surface not bullate, acuminate to rounded at apex, obtuse to rounded at base, margins entire, pilose, with yellow vesicular glands on both surfaces. *Inflorescences* axillary, paniculate, 6.5–25 cm long, bearing 7–11 flowers, not exceeding the length of the subtending leaf, bracts deciduous; pedicel 1–2 mm long. *Flowers* 7–8 mm long excluding the pedicel; *calyx* 9–10 mm long, pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, all of them

equaling or exceeding the corolla in length; *standard petal* 6–7 × 3–4 mm, obovate, rounded at apex, glabrous, with yellow vesicular glands but lacking bulbous-based trichomes, claw 1–1.5 mm long, auricle ca. 0.5 mm long; *wing petals* 5–6.5 × 1–1.5 mm, oblong, claw ca. 1.5 mm long, auricle ca. 1 mm long; *keel petals* 6.5–7 × 2–2.5 mm, falcate, claw ca. 2 mm long; *stamens* ca. 7 mm long; *ovary* ca. 2 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.5–2.1 × 0.5–0.6 cm, greenish, without constrictions between the seeds, oblong or elliptical in outline, pubescent, with yellow vesicular glands but lacking bulbous-based trichomes. Only immature seeds seen.

Nomenclatural and taxonomic notes:—*Rhynchosia mineira* is characterized by corymbiform inflorescence not exceeding the length of the leaf, and calyx lobes equaling or exceeding the corolla in length. It resembles *R. arenicola* by having corymbiform inflorescence not exceeding the length of the leaf. However, they are easily differentiated by the characters listed in the taxonomic notes of this species (Bezerra et al. 2019b).

Reproductive phenology:—Flowering and fruiting in July.

Distribution and habitat:—*Rhynchosia mineira* is from the municipality of Couto de Magalhães de Minas in Minas Gerais state, Brazil (Fig. 12). Its occurrence is restricted to only one known location, which is, a degraded environment where there are agricultural crops and pasture. The species grows in “campo rupestre” (rocky fields) areas inside cerrado vegetation (Bezerra et al. 2019b).

Conservation status:— Critically Endangered (CR). According to Bezerra et al. (2019b) the conservation status of *R. mineira* is assessed as CR based on the criteria and subcriteria B2a+B2b(iii), following the terms of IUCN Red List (IUCN 2022).

20. *Rhynchosia minima* (L.) DC., Prodr. 2: 385. 1825.

Basionym:—*Dolichos minimus* L., Sp. Pl. 2: 726. 1753. *Dolicholus minimus* (L.) Medik., Vorles. Churpfälz. Phys.-Ökon. Ges. 2: 354. 1787. *Dolicholus flavus* Medik., Vorles. Churpfälz. Phys.-Ökon. Ges. 2: 354. 1787. (Lectotype [designated by Verdcourt 1971]: Tab XXI in Linnaeus, Hortus Cliffortianus (1737)). Iconography: Rodriguésia 70: 13. 2019.

Dolichos medicagineus Lam., Encycl. 2(1): 297. 1786. Presumed type: INDIA, “Habitat in India”, December 1794 (fr.), Klein s.n. (B -W1340-01 0 [digital image!]).

- Glycine rhombifolia* Willd., Sp. Pl. 3(2): 1065. 1802. *Rhynchosia rhombifolia* (Willd.) DC., Prodr. 2: 386. 1825. Presumed type: INDIA, “Nandaradah”, October 1794 (fr.), *Klein s.n.* (B-W 13466 -01 0 [digital image!]).
- Glycine reflexa* Baldwin ex Nutt., Gen. N. Amer. Pl. 2: 115. 1818. Type: UNITED STATES, s.loc., s.d. (fl./fr.), *Baldwin & T. Nuttall s.n.* (Lectotype [designated by Grear 1978]: NY 00578980[!]; isolectotypes: PH 00005450 [digital image!], PH 00025953 [digital image!], PH 00025952 [digital image!]).
- Glycine lamarckii* Kunth, Nov. Gen. Sp. 6: 424–425. 1823. Type: CUBA, Havana, Crescit locis umbrosis, prope Havanam (Insula Cubae), s.d. (fr.), *A. J. A. Bonpland & F. W. H. A. von Humboldt 1328* (Lectotype [designated here]: P 00660115 [digital image!]; isolectotypes: P 00709008 [digital image!], P 00709009 [digital image!]).
- Rhynchosia punctata* DC., Mem. Légum. 365. t. 56. 1825. Type: FRENCH GUIANA. Cayenne, s.d., *M. Patris s.n.* (Holotype: G [not seen]).
- Glycine littoralis* Vahl ex DC., Prodr. 2: 385. 1825. nom. nud.
- Rhynchosia ervoidea* DC., Mém. Légum. 368. 1825.
- Rhynchosia mexicana* Hook. & Arn., Bot. Beechey Voy. 287. 1838. Presumed type: MEXICO, s.loc., s.d. (fl.), *Lay & Collie s.n.* (E 00369050 [digital image!]).
- Phaseolus caribaeus* Eaton & Wright, Man. Bot., 8: 353–354. 1840.
- Rhynchosia laxiflora* Cambess., Voy. Inde 4: 44. 1841. Type: INDIA, s.loc., s.d. (fl./fr.), *V. Jacquemont 1394* (Lectotype [designated here]: Pl. 54 in Voyage dans l'Inde 44 [1841]).
- Rhynchosia aureoguttata* Andersson, Kongl. Vetensk. Acad. Handl. 41: 252. 1853. Type: ECUADOR, Galapagos, “hab in insula Charly”, s.d. (fl./fr.), *Andersson s.n.* (Lectotype [designated by Grear 1978]): S-R-9720 [digital image!]; isotypes: LD 1552766 [digital image!], UPS [not seen]).
- Rhynchosia exigua* Andersson, Kongl. Vetensk. Acad. Handl. 41: 252–253. 1853. Type: ECUADOR, Galapagos, “hab in insula Charly”, s.d. (fl.), *Andersson s.n.* (Lectotype [designated by Grear 1978]: S-R-9724 [digital image!]; isotypes: K [not seen], UPS [not seen]).
- Rhynchosia minima* var. *lutea* Eggers, Smithsonian Misc. Collect. 23(3): 43. 1879. Type: UNITED STATES, Virgin Islands, St. Croix, December 1873 (fl./fr.), *H. F. A. Eggers s.n.* (Lectotype [designated here]: C 10012337 [digital image!]; isolectotypes: C 10012338 [digital image!], C 10012339 [digital image!]).
- Rhynchosia minima* var. *pauciflora* Kuntze, Revis. Gen. Pl. 1: 204. 1891. Type: PUERTO RICO, Guayama, January 1874 (fl./fr.), *O. Kuntze 566* (Lectotype [designated by Grear 1978]: NY 00026934[!]; isolectotype: US 00004687 [digital image!]).
- Rhynchosia minima* var. *diminifolia* Walraven, Brittonia 22(1): 85. 1970. Type: UNITED STATES, Florida, Monroe Co, Big Pine Key, *Walraven 163* (Holotype: GA [not seen]).

Fig. 11 K–N

Vine herbaceous or suffrutescent, twining or prostrate, stems branched, pilose to pubescent, indument white to light yellow, with non-glandular trichomes and yellow to light brown vesicular glands but lacking bulbous-based trichomes. *Stipules* 1.5–5 × 0.5–1.5 mm, free,

persistent, narrowly lanceolate to lanceolate, externally pilose to pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 0.7–6 cm long; leaf rachis 0.5–1.5 cm long; stipels persistent to late-deciduous; *leaflets* 1.5–7 × 1–5 cm, ovate, deltoid, rhombic or elliptical, surface not bullate, attenuate to acuminate at apex, truncate, obtuse or rounded at base, entire-margined, pilose to pubescent, with yellow vesicular glands on both surfaces. *Inflorescences* axillary, racemose, 4–21.9 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 0.5–2.5 mm long. *Flowers* 3–8 mm long excluding the pedicel; *calyx* 2–5 mm long, pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, not exceeding the corolla in length; *standard petal* 4–7 × 3–5 mm, obovate to rounded, emarginate or rounded at apex, villous or pilose to pubescent, with yellow vesicular glands but lacking bulbous-based trichomes, claw 0.5–1.5 mm long, auricle ca. 0.5 mm long; *wing petals* 4–6 × 0.5–1 mm, oblong, claw 1–1.5 mm long, auricle ca. 0.5 mm long; *keel petals* 4–7 × 0.5–1 mm, falcate, claw 1–2 mm long; *stamens* 4–7 mm long; *ovary* 2.2–2.8 mm long, densely pubescent, with yellow vesicular glands. *Fruits* 0.7–2.3 × 0.5–0.8 cm, brownish to blackish, without constrictions between the seeds, falcate, pilose to pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 2–4 × 2–3 mm, ovate or reniform, unicolored, brown to black.

Nomenclatural and taxonomic notes:—*Rhynchosia minima* was described by Linnaeus (1753) as *Dolichos minimus*. It is the only species of the genus that has a cosmopolitan distribution. Since it was gathered in many places of the world and studied by several taxonomists, different names have been attributed to this taxon.

In the protologue of *Glycine lamarckii*, Kunth (1823) mentioned the collection “Crecit locis umbrosis, prope Havanam” but did not designate a specific type material. Grear (1978) in your revision for the Neotropical species of *Rhynchosia* just cited the collection *Bonpland 1328* (which the information matches the one of the protologue) deposited in P as isotype and no other reference to the type collection was made since then. Therefore, we designated here the specimen with barcode number P 00660115 as the lectotype of *G. lamarckii*.

Grear (1978) mentioned that the type species of *R. punctata* is housed in G, but we couldn't find it. Thus, we decided to keep this taxon as a synonym of *R. minima* based on the analysis of the illustration provided in the protologue. Also, efforts to obtain the type species of *Glycine littoralis*, *R. ervoidea* and *Phaseolus caribaeus* were unsuccessful, since the original description did not cite any material, and no reference to these names was observed in any

exsiccate. Therefore, we kept these taxa as synonym of *R. minima* according to the characteristics that were given in the protologue.

In the protologue of *R. laxiflora* no mention to a specific specimen as type was made and no exsiccate with the information that matches those given in the original description was found. In this way, we designate here the illustration Pl. 54 in *Voyage dans l'Inde* v. 44 (1841) as the lectotype of *R. laxiflora*.

Grear (1978) cited the gatherings *Andersson 379* and *380* at S as the holotypes of *R. aureoguttata* and *R. exigua* respectively. In *Flora of Ecuador*, Ståhl et al. (2016) correctly stated that Grear's (1978) reference to these collection numbers was incorrect, since the numbers "379" and "380" are in fact the sequence of numbers used in the original description of these taxa. Thus, Ståhl et al. (2016) designated the collections deposited in S as the lectotypes of *R. aureoguttata* and *R. exigua*. This procedure was justified on the grounds that there are duplicates of both taxa which could be available to Andersson when describing them and no specific specimen were designated as types by him. However, when citing the collections from S as the holotypes of *R. aureoguttata* and *R. exigua*, even incorrectly, Grear (1978) unintentionally lectotypified them (see Turland et al., 2018, Art. 9.10, Ex. 11; Prado et al. 2020). In this way, we will consider here the procedure of Grear (1978).

Eggers (1879) described *R. minima* var. *lutea* but did not cite a specific specimen as type. Grear (1978) cited a specimen deposited in C annotated by the author as *R. minima* var. *lutea* as "presumed isotype". Nonetheless, there are three duplicates of this collection housed there (C 10012337, C 10012338, C 10012339), and no other exsiccate of this collection was found. Thus, we have chosen here the specimen with barcode number C 10012337 as the lectotype of *R. minima* var. *lutea*.

Kuntze (1891) in the protologue of *R. minima* var. *pauciflora* mentioned the location "Portorico: Guayama" but he did not give any other information about the type specimen. Grear (1978) cited a specimen from NY as the holotype (from the reported locality). As there are duplicate of this collection deposited in US and the author did not specify a particular specimen as type, Grear's (1978) citation of the specimen at NY as the holotype constitutes and inadvertent lectotypification (see Turland et al., 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

Walraven (1970) mentioned that the holotype of *R. minima* var. *diminifolia* is deposited in GA, but efforts to obtain it were unsuccessful. As the author give a complete description of it in the protologue and all the characteristics match those of *R. minima*, we will keep *R. minima* var. *diminifolia* as synonym of this species.

Rhynchosia minima is commonly confused with *R. edulis* because they have similar characteristics regarding leaves and flowers (Fig. 11 K, N), but they are quite different concerning the fruit shape (falcate in *R. minima* [Fig. 11 L–M] vs. oblong to slightly-obovate in outline in *R. edulis*). Other characteristics that differentiate these species were discussed in the taxonomic notes of *R. edulis*.

Reproductive phenology:—Flowering and fruting from January to December.

Distribution and habitat:—*Rhynchosia minima* has a cosmopolitan distribution. It is widespread through South America, except for Uruguay, which is the only country with no record of this species (Fig. 13). It can be found in different kinds of environment, such as ruderal areas, pastures, roadsides, forest edges, grasslands and rocky fields.

Conservation status:—Least Concern (LC). *Rhynchosia minima* is assessed as LC in IUCN's Red List (Poveda 2012; IUCN 2022). This species is the most widespread of the genus and the only one which has a cosmopolitan distribution.

Specimens Examined:—**ARGENTINA.** Formosa: Pilcomayo, Laguna Niack Neck, Cnia, El Paraiso, 5 km W de Palma Sola, 28 February 1996 (fl./fr.), A. Schnini & C. Cuadrado 30451 (NY); *ibid.*, Norte a 2 km de Laguna Branca, 18 October 1948 (fl./fr.), I. Morel 6276 (NY). Jujuy: Ledesma, 8 km camino al bananal desde ruta 34 (Rio Piedras), 6 April 1972 (fl.), E. Parada 731 (NY); Perico, rio Perico, 28 March 1977 (fl./fr.), A. Krapovickas & A. Schinini 30643 (MBM); San Pedro de Jujuy, 16 May 1945 (fr.), J. Herrera 499 (NY). Salta: General José de San Martín, Yacimiento Río Pescado, 13 km del desvío de la Ruta Nac. 50 camino a los pozos gasíferos, 02 May 2003 (fr.), O. Morrone *et al.* 4556 (MBM); La Caldera, cerca del dique Campo Alegre, February 1987 (fl.), C. Palací 855 (NY); Orán, 200 m de la confluencia del rio Pescado y la ruta nac. 50, 12 March 2001 (fl./fr.), R. Fortunato *et al.* 7114 (NY). **BOLIVIA.** Beni: Gral. Ballivián, 2 kms de Santa Rosa hacia el rio Yata, 16 September 1993 (fl.), R. Michel & St. G. Beck 1174 (NY). La Paz: Abel Iturralde, Parque Nacional y Area Natural de Manejo Integrado Madidi, Cerranias de los alrededores del campamento de guardaparques El Bala, 06 December 2004 (fl.), A. Araujo *et al.* 1455 (NY). Santa Cruz: Andrés Ibanez, 10 km by gravel road SE of San José and the turnoff from the Santa Cruz-Samaipata highway, 3 April 2007 (fl./fr.), M. Nee 54966 (NY); *ibid.*, along new paved highway from Santa Cruz to Abapó, 10 km N of Basilio, 19 April 1998 (fl./fr.), M. Nee 49100 (NY); Chiquitos, Vale de Tucavaca entre Santiago y Santo Corazón, km 50 de Santiago, 25 April 2008 (fl./fr.), J. R. I. Wood *et al.* 24475 (UB); Cordillera, Santa Cruz ca. 200 kms hacia el Sud, 12 March 1981 (fr.), St. G. Beck 6465 (NY); Florida, zone of massive red sandstone mountains along highway

from Santa Cruz to Samaipata, 15 February 1998 (fl./fr.), *M. Nee* 48318 (NY); German Busch, 2 km del portón del Rincón del Tigre en el camino a Carmen Rivero Torrez, 31 March 2009 (fl.), *J. R. I Wood & P. Pozo* 25974 (UB); Ichilo, 55 km NW linea recta de Santa Cruz, 19 March 1981 (fl.), *St. G. Beck* 6619 (NY); Nuflo de Chavez, vicinity of Perseverancia, 12 September 1990 (fl./fr.), *R. Frey & K. U. Kramer* 741 (NY); Puerto Suarez, rodovia para Corumbá, 23 October 1988 (fr.), *G. Hatschbach et al.* 52506 (NY); Santiesteban, 7.5 km by road NW of bridge at Chané Independencia, 5 April 1998 (fr.), *M. Nee* 48851 (NY); San Ignacio de Velasco, 12 km hacia E, Mercedes de las Minas Barbecho de 1.5 anos, 24 April 1986 (fr.), *R. Seidel & St G. Beck* 322 (NY). **BRAZIL.** Amazonas: Ilha de Marrecão, 12 February 1977 (fl./fr.), *G. T. Prance et al.* 24386 (INPA, NY); Ilha do Careiro, 25 November 1985 (fl.), *Junk* 1057 (INPA); Manacapuru, 2 February 1963 (fl./fr.), *A. Castellanos s.n.* (INPA). Amapá: Macapá, saída para BR – 156, próximo a CODEASA, 25 August 1988 (fl./fr.), *N. M. S. et al.* 2079 (CEN). Bahia: Feira de Santana, km 04 da estrada do feijão, 04 June 1994 (fl./fr.), *E. Melo & F. França* 1094 (SP); Ilheus, elevação logo após a ponte Ilhéus/Pontal, 27 November 1983 (fl.), *A. M. Carvalho* 2063 (RB, UB, UEC); *ibid.*, área do CEPEC, km 22 da rodovia Ilhéus – Itabuna (BR 415), 02 September 1981 (fl./fr.), *J. L. Hage & H. S. Brito* 1286 (NY, RB); Irecê, Alto de Gabriela, córrego sobre calcário, 10 May 1984 (fl./fr.), *Fotius* 3848 (IPA); Itabuna, a 25 km para Buerarema, 10 July 1964 (fl./fr.), *N. T. Silva* 58347 (UB); Jussari, RPPN Serra do Teimoso, rodovia Jussari-Palmira, entrada ca 7,5 km de Jussari, Trilha para o topo da serra 15°9'43" S 39°32'20" W, 27 July 2005 (fl./fr.), *L. A. Q. et al.* 765 (RB); Salvador, Parque Metropolitano de Pitaçu, 14 February 1998 (fl./fr.), *A. S. Conceição & J. Costa* 178 (INPA); Santo Estevão próximo a BR 116, caatinga 12°29'55.1" S 39°20'53.5W, 29 July 2001 (fl.), *V. C. Souza et al.* 26715 (UEC); Uruçuca, BR 101, 21 January 1976 (fr.), *P. Montouchet* 2209 (UEC). Ceará: Entre Crato e Sítio Romualdo, 31 July 1964 (fl.), *A. Castellanos* 25202 (IPA); Estrada de Crato-Joazeiro, 17 May 1957 (fl.), *T. N. Guedes* 375 (UB); Quixeré, Chapada do Apodi. Fazenda Mato Alto, 110m alt., 5°11'0"S 37°49'0"W, 13 June 1996 (fl./fr.), *L. W. Lima-Verde et al.* 253 (IPA). Espírito Santo: Vitória, beira de praia, 07 September 1977 (fr.), *J. Semir et al.* 5846 (SP, UEC). Goiás: Campinaçu, 8 km do estádio de futebol de Minaçu, na estrada para o canteiro de obras da AHE Cana Brava, 03 October 2000 (fl./fr.), *T. B. Cavalcanti et al.* 2605 (CEN); Inhumas, rodovia Goiânia – Goiás, 07 September 1976 (fl./fr.), *P. Gibbs et al.* 2696 (NY, UEC); Posse, Fazenda Sabonete, 08 October 2000 (fl./fr.), *M. A. Silva et al.* 4446 (RB). Maranhão: Bacabeira, Perizes, 5 July 1954 (fl./fr.), *G. A. Black et al.* 56-16466 (UB); Island of São Luiz, 1940 (fr.), *R. Froes* 11883 (NY). Mato Grosso: Cáceres, Faz. Descalvados, 5 November 1978 (fl.), *A. Allem et al.* 2428 (NY). Mato Grosso Do Sul: Corumbá, Fazenda

Bodoquena, 26 October 1978 (fl.), *A. Allem et al.* 2377 (NY); *ibid.*, Serra Grande, Planalto Residual do Urucum, interior de Floresta Estacional Decidual, 27 April 2004 (fr.), *R. R. Silva & J. S. Velásquez* 903 (UEC); *ibid.*, Serra do Jacadigo, Planalto Residual do Urucum, 25 October 2033 (fl.), *R. R. Silva & J. S. Velásquez* 459 (UEC); Ladário, Lagoa do Arroz, campo úmido 19°02'40.7" S 57°28'26.2"W, 100m alt., 27 August 2004 (fl.), *R. R. Silva, & M. V. Silva* 1111 (UEC); Miranda, Tição de Fogo 18 km ao N-NE de Guaicurus, 8 April 1973 (fl./fr.), *J. S. Silva* 151 (SP); Porto Murtinho, Área do Exército, 11 May 2011 (fl./fr.), *Matos-Alves et al.* 632 (UEC). Minas Gerais: Coronel Xavier Chaves, beira da BR 383 próxima ao trevo para Prados, 4 February 2011 (fl.), *M. Sobral* 13562 (RB); Governador Valadares, 24 November 1941 (fl./fr.), *M. Magalhães* 801 (UB); Grão Mogol, 14 km após a cidade, na estrada para Cristália, 24 January 2002 (fl.), *R. S. Rodrigues et al.* 1363 (UEC); Iguatama, Fazenda Faroeste, margem esquerda do Rio São Miguel, 10 August 2003 (fl./fr.), *P. H. A. Melo & G. P. Santos* 811 (RB); Porteirinha, na trilha para Cachoeira, 28 June 2002 (fl./fr.), *R. S. Rodrigues & A. S. Flores* 1570 (UEC); Santa Maria Suaçuí, rodovia Santa Maria Suaçuí a Capelinha, 07 July 1978 (fl.), *P. R. Salgado & V. T. Paulino* IZ-702 (UEC). Paraíba: Carrapateira, Sítio Volta, nos arredores do Açude Volta 07°02'58.00" S 038°19'47.00" W, 24 September 2014 (fl.), *J. L. Costa-Lima et al.* 1861 (RB); Solânea, Curimataú, 19 July 2001 (fl.), *T. M. Grisi Veloso* 264 (IPA); Soledade, 1 January 1986 (fl.), *M. Sales & M. Rodal s.n.* (PEUFR); *ibid.*, Comunidade Rural - Barrocas, 21 April 2009 (fl./fr.), *A. Trajano* 88 (IPA); Riachão do Bacamarte, sítio Torre, 28 August 1998 (fl./fr.), *A. Laurênio et al.* 1206 (PEUFR). Pernambuco: Arcoverde BR 232, 21 May 1980 (fl./fr.), *L. Coradin et al.* 2475 (IPA); Brejinho, 19 May 1991 (fr.), *A. Bocage s.n.* (IPA); Caruaru, Brejo dos Cavalos, Parque Ecológico Municipal, 01 December 1994 (fl./fr.), *M. Sales et al.* 445 (PEUFR); Fernando de Noronha, 04 April 1993 (fl.), *A. M. Miranda et al.* 1061 (INPA); *ibid.*, caminho para baía do Sueste, 08 June 1999 (fl./fr.), *A. M. Miranda & M. Grillo* 3452 (UB); Lagoa Grande, Vitivinícola Santa Maria, 16 July 1998 (fl.), *L. H. Piedade-Kiill* 76 (RB); Ouricuri, Fazenda Estaca, 04 April 1984 (fr.), *G. C. Lima* 80 (IPA); Recife-Petrolina, 1979 (fr.), *D. Andrade-Lima et al.* 79-9356 (IPA); Serra Talhada, Açude do Saco, 06 September 1993 (fl./fr.), *F. Galindo s.n.* (IPA); Triunfo, divisa dos municípios Triunfo-Princesa Isabel propriedade do sr. Petrônio, 25 February 1986 (fr.), *V. C. Lima* 46 (IPA). Piauí: Parnaíba, Fazenda Monte Alegre S2°54'17" O41°46'36", 30 June 1994 (fl./fr.), *M. S. Bona Nascimento* 50 (IPA). Rio de Janeiro: Jacarepaguá, Ilha do Ribeiro, 9 June 1942 (fl.), *E. Pereiro* 46941 (UB); Saquarema, Boqueirão, 25 July 1988 (fl.), *A. M. Paiva et al.* 13 (RB). Rio Grande do Norte: Riacho de Santana, Sítio de Sr. Otílio, 05 January 1968 (fl.), *N. Lima* 45 (UB). São Paulo: Campos do Jordão, 10 May 1942 (fl./fr.), *O. Handro s.n.* (SP); Pereira Barreto, Sítio Laranja

Azeda, 26 November 1987 (fl./fr.), *M. A. Yokota & N. T. Sekiya 10* (UEC); São José do Barreiro, 16 May 1978 (fr.), *P. R. Salgado & V. F. Paulino IZ 439* (UEC); São Roque, mata secundária, 26 April 1994 (fl./fr.), *R. B. Torres et al. 117* (SP). Sergipe: Canindé São Francisco, caatinga Fazenda Poço Verde, 9 July 2005 (fl.), *D. V. Braga et al. s.n.* (IPA); *ibid.*, Fazenda Santa Maria, 9°37'01"S 37°53'01"W, 30 August 2005 (fl./fr.), *D. C. Moura 776* (IPA). Tocantins: Aurora do Tocantins, estrada para Lavandeira, ca. de 10km de Aurora do Tocantins, 22 July de 2000 (fl./fr.), *V. C. Souza et al. 24528* (UEC). **CHILE.** Tarapacá, Arica, 12 July 1970 (fl.), *O. Zoellner 4935* (MO). **COLÔMBIA.** Arauca: Arauca, Caño Limón, campo petrolero de la Occidental de Colombia, 9 September 1998 (fl.), *J. Forero & J. Betancur 149* (NY). Antioquia: Dabeiba, 30 km S de Dabeiba em la vía a Fueimia (corregimento), 23 November 1987 (fl.), *R. Callejas et al. 5820* (NY); Santa Fé de Antioquia, 87–92 km NE de Medellín margen izquierda del río Tonusco, 18 May 1990 (fl.), *R. Callejas & F. J. Roldán 9451* (NY). Bolivar: Buenavista, 24 January 1918 (fl./fr.), *F. W. Pennell 4010* (NY); entre Sincelejo y Colosó, 11 December 1962 (fl.), *R. R. Castañeda 9257* (NY). Cundinamarca: Girardot, 19 July 1917 (fl./fr.), *H. H. Rusby & F. W. Pennell 159* (NY). Magdalena: Isla de Salamanca, em Moahoma, en la playa, 2 December 1966 (fr.), *R. Romero-Castañeda 10513* (NY). Santa Marta, 1898-1899 (fl./fr.), *H. H. Smith 50* (NY). Santo André: San Andres Island, June 1929 (fl.), *R. A. Ivo 41* (NY). Sucre: Archipelago de San Bernardo, Isla Múcura, 5-30 December 1980 (fl.), *G. Moreno & R. López 20* (NY). Valle del Cauca: Cali, Universidad del Valle (Meléndez), lote de malezas frente a Unicentro a lo largo de Paso Ancho (Calle 13), 17 March 1985 (fl./fr.), *A. Silverstone-Sopkin 1940* (NY); Palmira, Granja Agrícola, 17 July 1963 (fl./fr.), *H. S. Mackee 10481* (P). **ECUADOR.** Esmeraldas: Timber towards Esmeraldas, 30 May 1955 (fl.), *E. Asplund 16529* (NY). Galapagos, s.d. (fl./fr.), *Bauhmer 110* (NY). Guayaquil: s.loc., September 1918 (fl./fr.), *J. N Rose & G. Rose 22463* (NY); Guayas, June 1923 (fl./fr.), *E. Asplund 7691* (NY); *ibid.* Isla Puná, path from Campo Alegre to midway Rio Hondo, 6 July 1987 (fl.), *J. E. Madsen 63789* (NY); *ibid.*, oil camp between Guayaquil and Salinas, June 1923 (fl./fr.), *A. S. Hitchcock 20122* (NY). Lojas: Road Catamayo,-Gozanama, ca. km 10, just past bridge, over Rio Catamayo, 9 April 1996 (fl./fr.), *B. B. Klitgaard et al. 121* (NY). Manabi: Pedernales Cantón, Camarones, 30 km S of Pedernales on coastal highway, 25 August 1998 (fl./fr.), *D. Neill & QCNE botany interns 11305* (NY). **GUYANA.** Champagne: 3.0 km South of coastal highway, between Mahaicony & Abary Rivers, 15 August 1995 (fl.), *S. R. Hill 27184* (NY). British Guyana: Demerara river, March 1898 (fl./fr.), *Jenman 7327* (NY); Vreed-en-Hoop, west bank of Demerara River, opposite Georgetown, 10-12 November 1919 (fl.), *A. S. Hitchcock 16718* (NY). **FRENCH GUIANA.** Iles du Salut: Ile Royale, Sur une grille d'enceinte de batimento,

21 February 1985 (fl./fr.), *G. Cremers 8426* (P). Plage des Hattes, région littorale, 26 March 1992 (fl./fr.), *G. Cremers 12911* (NY). **PARAGUAY**. Concepción: Estancia Bello Horizonte, 17 November 1993 (fl.), *E. M. Zardini & L. Guerrero 37269* (NY). Pte Rayes: Ruta Trans-Chaco, Río Monte Lindo, 14 March 1979 (fr.), *A. Schinine & E. Bordas 16595* (MBM). **PERU**. Cajamarca: Contumazá, El Cruce (abajo de Cascas), 04 October 1991 (fr.), *A. Sagástegui 14489* (NY); San Ignacio, Faical, 18 April 1996 (fl./fr.), *J. Campos & P. Diaz 2641* (NY). La Libertad: Trujillo, 15 June 1985 (fl.), *J. Mostacero et al. 712* (NY); *ibid.* em cultivo de maíz, 2 July 1971 (fr.), *A. Sagástegui 7578* (NY). Lima: Cieneguilla, 25 March 1966 (fl./fr.), *J. Lopez 191* (NY). Loreto: Maynas, Iquitos, Carretera de Nanay, ca. 4500 m de Punchana a Nanay, 27 September 1983 (fl./fr.), *M. Rimachi 7069* (NY); *ibid.*, Rio Itaya, Ushpa Caña across from Iquitos, 20 August 1981 (fl./fr.), *S. McDaniel & M. Rimachi 25396* (NY). San Matín: Juan Jui, Alto Río Huallaga, January 1936 (fl.), *G. Klug 4201* (NY). **SURINAME**. Beach west of the mouth of the Matapica river, north-east of Paramaribo, 01 April 1951 (fl./fr.), *J. & P. A. Florschütz 1921* (NY); *ibid.* March 1968 (fl./fr.), *LBB 11082* (NY); Coronie, N. Along canal, 22 October 1933 (fl./fr.), *J. Lanjouw 1097* (NY). Saramaca: Experimental Farm Coebiti, 14 December 1983 (fl.), *A. P. Everaarts 891* (NY). Wiawia: Reserve, 3 km E of Motcreek, 28 February 1969 (fl.), *L. B. B. Sterringa 12382* (US). **TRINIDAD AND TOBAGO**. Oropouche Lagoon, west coast, 25 March 1959 (fl./fr.), *R. S. Cowan 1253* (NY). **VENEZUELA**. Anzoategui: Peñalver, Sucre, 24 November 1987 (fr.), *A. Castillo & A. Franca 2607* (NY); Libertad, road from El Vigía to Buenos Aires, 8-15 airline km NE of Bergantín, 27 November 1981 (fl./fr.), *G. Davidse & A. C. González 19755* (NY). Barinas: a lo largo de los márgenes del Río Cáparo, entre Campamento Cachicamo y Boca de Garza, este de El Cantón, 12 April 1968 (fl.), *J. A. Steyermark, G. Bunting & C. Blanco 102243* (NY). Carabobo: 32 km N of Valencia, 10 July 1982 (fl./fr.), *C. D. Johnson 2390-82* (NY). Distrito Federal: Isla la Branquilla, playa La Muerta, sector noroeste de la isla, 25 January 2012 (fr.), *A. Fernández, G. Rivas & J. J. Rodríguez 29756* (NY); Vargas, Parroquia Catia la Mar, escuela naval, 06 June 1989 (fr.), *N. Ramírez 2673* (NY). Edo Miranda: waste ground along Avenida Sur, Santa Fé, Urb. Santa Fé, Caracas, 06 December 1975 (fl.), *J. A. Steyermark 112173* (NY). Santa Rosa – Clarines – Brarinas, 27 January 1947 (fl./fr.), *H. M. Curran 555* (NY). Tachira: Jauregui, J. T. Colmenares, Unidad Agropecuaria de Los Andes, Campo Introducción de Forrajeras, Morotuto, 03 September 1967 (fl./fr.), *J. A. Steyermark & E. R. Velasco 100033* (NY). Via Orituco Hato Becerra, Calabozo, Edo. Guárico, 06 July 1991 (fr.), *N. Ramírez 3149* (NY). Yaracuy: San Felipe, Camino El Guayabo – La Hoya, 0,5 km N de El Guayabo, 12 July 1973 (fl.), *G. Agostini, G. Morillo & B. Morillo 1852* (NY).

21. *Rhynchosia nainckensis* Fortunato, Darwiniana 24: 497–498. 1982. Type:—ARGENTINA, Formosa: Dep. Pilcomayo, Laguna Nainck, ruta 86, km 1334 ½, August 1981 (fr.), *R. Fortunato et al.* 57 (Holotype: BAB 00000498 [digital image!]; isotype: SI 002522 [digital image!]). Iconography: Rodriguésia 70: 13. 2019.

Vine suffrutescent, twining, stems branched, pilose, indument white to light yellow, with non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 2–3.1 × 0.5–1 mm, free, persistent, lanceolate, externally pilose with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 1–5.4 cm long; leaf rachis 1–2.1 cm long; stipels absent; *leaflets* 2.4–5.3 × 2–4.9 cm, ovate or deltoid to rhombic, surface not bullate, attenuate to acuminate at apex, obtuse or truncated at base, entire-margined, pilose, with yellow vesicular glands on the abaxial surface. *Inflorescence* axillary, racemose, 2.7–3.5 cm long, bearing 6–9 flowers, not exceeding the length of the subtending leaf, bracts deciduous; pedicel 1–1.5 mm long. *Flowers* 4–7 mm long excluding the pedicel; *calyx* 2–3.2 mm long, pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, not exceeding the corolla in length; *standard petal* 4–6 × 3–4.7 mm, orbicular, emarginate at apex, pilose to pubescent, with yellow vesicular glands but lacking bulbous based trichomes, claw 1–1.5 mm long, auricle ca. 0.5 mm long; *wing petals* 4–5 × 1–2 mm, oblong, claw 1.3–2 mm long, auricle ca. 0.5 mm long; *keel petals* 5–6 × 2–2.2 mm, falcate, claw ca. 1–2 mm long; *stamens* 5–5.5 mm long; *ovary* 2–3.3 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.1–1.6 × 0.6–0.8 cm, reddish-brown to black, strongly constricted between the seeds, oblong in outline, glabrescent, with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 4.7–5.5 × 3–4 mm, suborbicular, bicolored, black and red, the red confined to hilar area.

Nomenclatural and taxonomic notes:—*Rhynchosia nainckensis* was described by Fortunato (1982). The type material comes from the municipality of Laguna Nainck, province of Formosa, and for that reason received this name. It resembles *R. erythroides* and *R. melanocarpa*, but it is easily recognizable by the characteristics listed in table 1.

Reproductive phenology:—Flowering from February to April, June and September; fruiting in January to February, April to June and August to September

Distribution and habitat:—*Rhynchosia nainckensis* occurs in Argentina, Bolivia, Brazil and Paraguay (Fig. 14). It can be found on tropical and semideciduous forests and in sandy and clay fields.

Remaining syntypes:—ARGENTINA. Corrientes: General Paz, Itá Ibate, barrancas del Paraná, July 1979 (fr.), *D. Medán et al.* 26 (BAA 00004334 [digital image!], BAA 00004335 [digital image!]); San Cosme, May 1975 (fr.), *A. Schinini & C. Quarin 115* (CTES 0000684 [digital image!]); *ibid.*, Paso de la Patria, *T. Meyer 8869* (SI [not seen]); Formosa: Formosa, Río Salado, August 1967 (fr.), *A. Krapovickas 13013* (CTES 0000683 [digital image!]); Pilcomayo, laguna Nainck, *A. Cabrai & A. Molina 976* (BAB [not seen]). Salta: Orán, Tartagal, *S. Venturi 10760* (SI [not seen]); *ibid.*, El Cedral, *F. M. Rodriguez 1082* (SI [not seen]). PARAGUAY. Central, Jardín Botánico, claridad del monte en picada, *T. Rojas 12986* (SI [not seen]); San Pedro, Colonia Primavera, *A. Woolston 513* (SI [not seen]).

Conservation status:—Least Concern (LC). According to the value of EOO (1,393,554 km²; GeoCAT, accessed in May 2022), *R. nainckensis* is classified as LC, following the IUCN red list (IUCN 2022). Nevertheless, no recent records were observed for this species, since the most recent was gathered in 1995. Thus, we believe that efforts to collect and conserve this species are needed, even though it was assessed as LC.

Specimens Examined:—ARGENTINA. Corrientes: Dep. General Paz, Itá Ibate, barrancas del Paraná, 26 July 1979 (fr.), *D. Medán et al.* 26 (BAA). BOLIVIA. Santa Cruz: Ichilo, Estância San Rafael de Amboró, ca. 30km SE of Buena Vista along the Rio Surutú, 25 August 1985 (fl./fr.), *J. C. Solomon 14031* (NY). BRAZIL. Rio de Janeiro: Cabo Frio, Restinga de Cabo Frio, 18 November 1967 (fl./fr.), *D. Sune 1927* (RB). São Paulo: Dracena, Estância Boa Esperança, floresta mesófila, 6 September 1995 (fr.), *L. Bernacci et al. 2070* (SP); Núbia, Fazenda Caramuru (Suiços), Vegetação em recomposição, 4 September 1995 (fr.), *L. Bernacci et al. s/n.* (SP); Paulo de Faria, Estação Ecológica de Paulo de Faria, 19°55'S, 49°31'W, 23 August 1995 (fr.), *M. D. N. Grecco et al. 83* (SP). PARAGUAY. L'assomption, 1845 (fr.), *B. Balansa 1845* (P). San Pedro: Alto Paraguay, 28 April 1955 (fr.), *A. L. Woolston 513* (NY). Tarija: Gran Chaco 15 kms hacia el norte de Yacuiba, 23 September 1985 (fl./fr.), *Beck, Michel & Garcia 11470* (NY). Tavarory: Acosta ñu, 04 March 1992 (fl.), *E. Zardini & T. Tilleria 30980* (NY).

22. *Rhynchosia phaseoloides* (Sw.) DC., Prodr. 2: 385. 1825.

Basionym:—*Glycine phaseoloides* Sw., Prodr. 105. 1788. *Dolicholus phaseoloides* (Sw.) Kuntze, Revis. Gen. Pl. 3(3): 62. 1898. Type: JAMAICA, s.d. (fl./fr.), Swartz s.n. (Lectotype [first-step designated by Grear 1978; second-step designated here]: S S-R-2422 [digital image!]; isolectotypes: S 10-34209 [digital image!], S 10-34210 [digital image!]). Iconography: Rodriguésia 70: 13. 2019.

Fig. 15 A–C

Vine climbing or suffrutescent, twining, stems simple to branched, pilose to pubescent, indument white to light yellow, with non-glandular trichomes and yellow vesicular glands but lacking bulbous-based trichomes. *Stipules* 1.2–6 × 1–2 mm, free, deciduous, lanceolate, externally pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 1.2–7.7 cm long; leaf rachis 1.5–3.8 cm long; stipels absent; *leaflets* 2.1–9.7 × 1.9–9.5 cm, ovate, deltoid or rhombic, surface not bullate, attenuate to acuminate at apex, obtuse, truncate or rounded at base, entire-margined, pilose to pubescent, with yellow vesicular glands on the abaxial surface. *Inflorescences* axillary, paniculated, 5.5–30 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 0.5–1 mm long. *Flowers* 4–8 mm long excluding the pedicel; calyx 3–3.5 mm long, pubescent with yellow vesicular glands and bulbous-based trichomes, lobes lanceolate, not exceeding the corolla in length; *standard petal* 6–9 × 4–6 mm, obovate, emarginate to rounded apex, pubescent, with yellow vesicular glands and bulbous-based trichomes, claw 1–2 mm long, auricle ca. 0.5 mm long; *wing petals* 5–8 × 1–2 mm, oblong, claw 1–2 mm long, auricle ca. 0.5 mm long; *keel petals* 5–8 × 1.5–3 mm, falcate, claw 1–3 mm long; *stamens* 6–9 mm long; *ovary* 2.3–3.1 mm long, pubescent, with yellow vesicular glands. *Fruits* 0.9–2.5 × 0.8–10 mm, greenish to brownish, strongly constricted between the seeds, ovate or oblong in outline, pilose to pubescent, with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 4–6 × 3–5 mm, suborbicular, bicolored, black and red, areas of coloration almost equal.

Nomenclatural and taxonomic notes:—*Rhynchosia phaseoloides* was first described by Swartz as *Glycine phaseoloides* in 1788.

Grear (1978) selected a collection of Swartz from Jamaica housed in S as a lectotype of *G. phaseoloides*. However, there are three duplicates of this collection in this herbarium (S S-R-2422, S 10-34210, S 10-34209), and he did not specify a particular specimen as lectotype. In this way, the type designation of Grear (1978) should be treated as the first-step

lectotypification and select here the specimen with barcode number S-R-2422 as the second-step lectotype of *G. phaseoloides* (see Turland et al. 2018, Art. 9.17)

Grear (1978) cited *R. phaseoloides* var. *precatória* Griseb. as synonym of *R. phaseoloides*. Grisebach (1866) in the protologue described this taxon by having red seeds with black macules and cited the collection *Wright 134*. When analyzing this collection, we believe that *R. phaseoloides* var. *precatória* is synonym of *R. precatória*, so we will not follow the procedure of Grear (1978).

Rhynchosia phaseoloides is characterized by the twining stems, flowers almost sessile (pedicel 0.5–1 mm long), fruits constricted, greenish to brownish and bicolored red and black seeds with areas of coloration almost equal (Fig. 15 A–C).

Reproductive phenology:—Flowering from February to August, October and November; fruiting during all seasons of the year.

Distribution and habitat:—*Rhynchosia phaseoloides* has a wide distribution in South America and Caribbean. In South America this species occurs in Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Paraguay, Peru, Surinam, Trinidad and Tobago and Venezuela (Fig. 14). It can be found in different environments, such as pastures, roadsides, forest edges, rocky and sandy fields and disturbed areas.

Conservation status:—Least Concern (LC). *Rhynchosia phaseoloides* has an EOO of 20,042,871 km² (GeoCAT, accessed in May 2022), according the IUCN red list (IUCN 2022). It is widespread in South America and is also used for ornamentation due to its bicolored seeds.

Specimens Examined:—**ARGENTINA.** Misiones: Dep. Iguazú, Pedro Bossetti, propiedad Pérez Companc., faja ecológica, 25 May 1999 (fr.), *H. A. Keller 56* (MBM). **BOLIVIA.** s.loc., August 1907 (fl.), *O. Buchtien 1802* (NY). La Paz: Mapiri, August 1907 (fl.), *O. Buchtien 1802* (US). Santa Cruz: Guarayos, 60 km east of Ascension de Guarayos, 25 June 2003 (fr.), *N. Raes & G. Iraipi 240* (U). **BRAZIL.** Acre: Cruzeiro do Sul, BR 364, linha 01, 13 September 1985 (fr.), *A. Rosas Jr. et al. 311* (INPA, NY, RB). Alagoas: Quebrangulo, Reserva Biológica Federal de Pedra Talhada, 7 December 2014 (fl.), *L. Nusbaumer & A. Cailliau 4523* (NY). Amazonas: Manaus, BR 17, km 1, 4 August 1955 (fl./fr.), *Chagas s.n.* (UB); *ibid.*, Distrito Agropecuário da SUFRAMA, BR 174, km 64, then 23 km east on ZF3, Fazenda Esteio, 30 January 1992 (fr.), *M. Nee 42407* (INPA, NY); *ibid.*, km 11 da BR 17, 04 August 1955 (fr.), *W. A. Rodrigues s.n.* (INPA). Bahia: 1 km N. of Agua de Rega, road to Cafarnaum, elev. ca. 1000 m, 28 February 1971 (fr.), *H. S. Irwin et al. 31245* (UB); Jequié, BR 116, Vitória da Conquista, 10 March 1977 (fl.), *G. Shepherd et al. 4463* (UEC); Nilo Peçanha, Estrada Pratigi – Barra do Serinhaém, 25

November 2015 (fr.), *L. P. Queiroz et al. 16179* (RB). Ceará: Novo Oriente, Planalto da Ibiapaba, s.d. (fr.), *F. S. Araújo 468* (IPA); Serra do Ibiapaba entre Tianguá e Ubajara, 15 December 1966 (fr.), *D. Andrade Lima 66-4814* (IPA). Distrito Federal: Brasília, Bacia do Rio Bartolomeu, 12 June 1980 (fl./fr.), *E. P. Heringer et al. 5074* (UEC); *ibid.*, Fazenda Santa Cecília, Núcleo Rural Rajadinha II, 21 August 2012 (fr.), *M. H. Fernandes & H. S. C. Brant 232* (UB). Espírito Santo: Nova Venécia, Área de Proteção Ambiental da Pedra do Elefante, trilha principal na Mata da Fazenda Santa Rita, 16 July 2008 (fr.), *A. M. A. Amorim et al. 7508* (RB). Maranhão: Km 374 da Rodovia Belém-Brasília, 26 August 1960 (fr.), *E. Oliveira 1043* (UB); Loreto, Ilha de Balsas, 12 April 1962 (fl.), *G. Eiten & L.T. Eiten 4292* (RB). Mato Grosso: Alta Floresta, km 10, 17 June 1995 (fl.), *M. Macedo et al. 4202* (INPA); Aripuanã, 31 August 1976 (fr.), *J. B. Andrade 3349* (UEC); *ibid.*, near Humboldt Centre, on road to Rio Jurema, 8 October 1973 (fr.), *G. T. Prance et al. 18218* (INPA); Barra do Bugres, entre a cidade e Fernandópolis, +/- 10 km depois da usina - MT 246, 28 October 1983 (fr.), *N. Saddi 3670* (RB); Colider, Resgate de Flora da UHE Colider, 11 August 2014 (fr.), *M. A. S. Zanin et al. s.n.* (RB); *ibid.*, Rodovia Cuiabá – Santarém (BR 163), entre Peixoto de Azevedo e divisa MT/PA km 53, 30 August de 1984 (fr.), *L. Coradin et al. 7072* (CEN); Estrada entre a cidade de Juruena e Rio Juruena 10°18' S 58°23' W, s.d. (fr.), *V. C. Souza 18729* (UEC); Juruena, Estrada entre a cidade de Juruena e o Rio Juruena, ca. de 2 km do Rio Juruena, 10 July 1997 (fr.), *V. C. Souza et al. 18729* (UEC); Vila Bela da Santíssima Trindade, Fazenda Estrela do Guaporé, 3 September 1979 (fr.), *Z. F. Eleonore 10459* (UEC). Minas Gerais: ca. 34 km E. of Belo Horizonte, road (BR 31) to Roças Novas, ca. 1500 m elev., 17 January 1971 (fr.), *H. S. Irwin et al. 30587* (UB); Dionísio, Cemas, 06 February 1986 (fl.), *W. G. Campos 24* (BHCB); Novo Cruzeiro, beira de estrada no interior da Floresta Estacional Semidecidual, 02 October 2004 (fl.), *J. R. Stehmann et al. 3608* (BHCB). Pará: s.loc, km 163 da Rodovia Belém-Brasília, campo de viação, 2 May 1960 (fl.), *E. Oliveira 647* (UB); s. loc., Km 289-293 da Rodovia Belém-Brasília, 31 July 1960 (fr.), *E. Oliveira 943* (UB); s.loc., Rio Itacaiuna, 18 June 1949 (fl.), *R. L. Froes & G. A. Black 24538* (UB); Belterra, Floresta Nacional do Tapajós, ramal que corta o km 117 da Cuiabá Santarém 3°20'53"S 54°55'45"W, 8 November 2015 (fr.), *V. F. Mansano et al. 1078* (RB); Bragança, Colonia Benjamin Constant. Estrada Sul km 8, 11 October 1979 (fl.), *J. Jangoux & M. F. F. Silva 1168* (RB); Maraba, Carajás, Serra Norte, Mina de Manganês H – 7, 01 June 1983 (fr.), *M. F. F. Silva et al. 1432* (INPA); Marapanim, Marudazinho, 30 July 1958 (fl.), *P. B. Cavalcante 476* (INPA); Monte Dourado, Rio Jari, estrada que vai para Pilão, km 60, 04 October 1978 (fl.), *N. T. Silva 4915* (NY, UEC); Pau D'arco, Marajoara, 5 June 1997 (fl.), *J. Grogan 246* (INPA); Salinópolis, arredores da CELPA, 10 November 1976 (fr.), *M. G. Silva*

2835 (RB). Paraíba: Sousa, São Gonçalo, 30 July 1941 (fr.), *J. Gadelha 11* (IPA). Paraná: Diamante do Norte, Estação Ecológica do Caiuá, mata do Fundão, próximo ao rio Paranapanema, 20 November 2014 (fr.), *M. G. Buchoski & V. L. Silva 12* (HUEM); São Jerônimo da Serra, Estrada da Reserva Indígena, 24 March 1988 (fl.), *M. Silveira et al. s.n.* (UEC); Tuneiras do Oeste, Reserva Biológica das Perobas, estrada interna, 07 March 2012 (fr.), *M. G. Caxambu 3902* (FLOR). Pernambuco: Barreiros, Mata da Gia, 03 December 1999 (fr.), *J. R. R. Cantarelli, et al. 226* (PEUFR); Igarassu, Mata Atlântica, Usina São José Mata do Cabus, 01 February 2007 (fr.), *A. Bocage et al. s.n.* (IPA); *ibid.*, Refúgio Ecológico Charles Darwin, 21 January 1996 (fr.), *M. Falcão 83* (PEUFR); Ponta de Pedras, orla de mata na entrada para a cidade, 17 November 1997 (fr.), *M. B. Costa e Silva 1424* (PEUFR); s.loc., Restinga Venda Grande, 4 September 1949 (fr.), *Andrade Lima 49-302* (IPA); Serra Branca, 6 May 1971 (fr.), *E. P. Heringer et al. 573* (UB). Rio De Janeiro: Atafona, March 1942 (fl./fr.), *A. J. Sampaio 8883* (SP); Cabo frio, restinga da estrada para Masambaba, 24 April 1969 (fl./fr.), *D. Sucre et al. 4922* (RB); Engenheiro Paulo de Frontin, Morro Azul, trilha de acesso à mata do Instituto de Zoobotânica, 27 January 1998 (fr.), *M. C. F. Santos et al. 115* (RB); Nova Iguaçu, Parque Municipal de Nova Iguaçu, estrada da cachoeira, entre a sede e a primeira ponte sobre o rio D. Eugênia, lado esquerdo, 07 June 2006 (fr.), *M. C. F. Santos et al. 1824* (RB); Rio de Janeiro, Barra da Tijuca km 8 da Rio-Santos, 1 August 1977 (fr.), *L. Mautone 197* (RB). Rondônia: Jaciparaná, on the road WNW of village, 24 June 1968 (fr.), *G. T. Prance et al. 5166* (INPA); Porto Velho, área perturbada próximo a córrego, Linha de Transmissão Jirau, 19 October 2011 (fr.), *M. F. Simon et al. 1372* (INPA); *ibid.*, BR – 364, km 771 linha de transmissão (LT) 56.1, Fazenda Realeza, 27 July 2011 (fr.), *A. A. Santos & J. F. Lacerda Jr. 3431* (INPA). Santa Catarina: Armazém, Floresta Ombrófila Densa, 06 April 2010 (fl./fr.), *M. Verdi et al. 4185* (RB); Florianópolis, Ilha de Santa Catarina, Rio Vermelho, 17 December 1969 (fl.), *Klein & Bresolin 8513* (FLOR); Siderópolis, Santo Antônio, 28°37'12,00" S 49°30'00,00", 10 May 2011 (fl.), *A. Korte 6815* (RB). Sergipe: Estância, Praia do Abais, 28 November 1993 (fr.), *A. M. A. Amorim et al. 1553* (NY, RB). São Paulo: Amparo, Monte Alegre, 31 March 1943 (fr.), *M. Kuhmann 495* (SP); Campinas, disturbed forest along roadside, km 242 – 246, 22 July 1968 (fr.), *E. Forero et al. 6426* (INPA); Gália, Estação Ecológica de Caetetus (estação Ecológica Olavo Amaral Ferraz), 07 July 1994 (fr.), *J. R. Pirani et al. 3248* (SP, UEC); Ilha São Sebastião, 27 July 1971 (fr.), *J. Mattos & N. Mattos 15744* (SP); Monte Alegre, região montanhosa, 14 June 1994 (fr.), *L. C. Bernacci et al. 326* (SP); Nova Odessa, Instituto de Zootecnia, Fragmento de Floresta Estacional Semidecidual degradada, -22,76538. -47,279138, 01 July 2015 (fl.), *R. M. Barroso et al. s.n.* (UEC); s.loc. Estrada para Barra do Turvo,

24°47'04.6" S 48°28'43.3" W, s.d. (fl.), *H. F. Leitão Filho et al.* 32753 (SP, UEC); São Paulo, Butantam, 31 December 1917 (fr.), *F. C. Hoehne s.n.* (SP); *ibid.*, Chácara dos Morrinhos, 18 July 1940 (fr.), *B. Pickel* 4660 (IPA); *ibid.*, Reserva Biológica Parque Estadual das Fontes do Ipiranga, 25 February 1981 (fl.), *M. L. F. Melo et al.* 244 (SP); São Vicente, Prainha, 15 November 1943 (fl.), *F. C. Hoehne & M. Kuhlmann* 1088 (SP); Valinhos, Reserva Florestal de Valinhos, 16 June 1977 (fr.), *M. E. M. Ramos et al. s.n.* (UEC). **COLOMBIA**. Antioquia: Puerto Berrio, Vereda Alicante, Fica Penjamo, em la vía San Juan de Bedout – La Cabaña, 5 March 1990 (fr.), *R. Callejas, F. J. Roldán, V. Maza* 9376 (NY). Del Quindio: Calarca, La Moracita, Las Acacias, 21 April 1987 (fr.), *G. Arbelaez et al.* 2020 (NY). Meta: Rio Duda, Parque Nacional Natural Tinigua, Rio Duda, Serranía Chamusa, May 1997 (fr.), *P. Stevenson* 2078 (NY). Tolima: Falán, región de Calamonte, 7 December 1939 (fr.), *H. G. Barriga* 8385 (US). **ECUADOR**. Napo: Tena, Estación Biológica Jatun Sacha, 12 January 1995 (fr.), *N. Revelo* 98 (NY). **FRENCH GUIANA**. Cayenne, 17 July 1921 (fl.), *W. E. Broadway* 852 (NY). Saül: along airport road and vicinity of airstrip, 18 June 1988 (fl./fr.), *S. Mori & C. Gracie* 19015 (NY); *ibid.*, in vicinity of village and airport, 24 August 1987 (fl./fr.), *N. Marshall & J. Rombold* 172 (NY); *ibid.*, Monts La Fumée, 29 October 1982 (fr.), *S. Mori & B. Boom* 15141 (NY); *ibid.* Route de Bélizon, a environ 2 km de Saul, 1979 (fr.), *Granville* 5514 (NY). **GUYANA**. Berbice River, Waranania Ranch, 7 June 1958 (fr.), *S. G. Harrinson & R. Persauds s.n.* (NY); Kariako Village, Barama River, North-West district Mora riparian forest upstreams of Kariako Village, 20 January 1996 (fl.), *T. van Andel & A. Samuels* 908 (NY); Potaro-Siparuni, Paramakatoi, trail to Youwang & Monkey, 24 February 1996 (fr.), *D. Clarke* 1257 (NY); Region U, Takutu U, Essequibo, upper Essequibo River, adjacent mouth of Kuyuwini River, 2 October 1993 (fr.), *T. W. Henkel et al.* 3333 (NY); Rupunini, Kuyuwini Landing, 30 October 1992 (fl.), *M. J. Jansen-Jacobs et al.* 3189 (NY); *ibid.*, Rupununi Savanna, Mora Savanna, near Torobaroe, 19 November 1987 (fr.), *M. J. Jansen-Jacobs et al.* 1052 (NY); Upper Mazaruni River region, vicinity of Kamarang, 13 April 1987(fr.), *B. Boom & D. Gopaul* 7274 (NY). **PARAGUAY**. Alto Paraná: entre Hernandarias y Puerto Indio, 09 October 1980 (fr.), *J. F. Casas & J. Molero* 4141 (NY). Paraguari: National Park Ybycui, 3 km south of northwestern corner of park, 22 June 1991 (fr.), *E. Zardini & R. Velázquez* 27709 (NY). **PERU**. Cajamarca: San Ignacio, San José de Lourdes, Las Cañas, 28 August 1999 (fr.), *J. Campos & W. Vargas* 6158 (NY). Junín: Along Rio Perene, near “Hacienda 3”, 16–18 June 1929 (fr.), *E. P. Killip & A. C. Smith* 25201 (NY). Loreto: Coronel Portillo, 5 km w.s.w. Pucallpa, valley of Rio Ucayali, 1 November 1947 (fr.), *F. R. Fosberg* 28929 (US); Masisea, alt. about 275 m, 25 June 1929 (fr.), *E. P. Killip & A. C. Smith* 26843 (NY); Yurimaguas, lower Río Huallaga, September 1929

(fr.), *E. P. Killip & A. C. Smith 28305* (NY). San Martín: Mariscal Cáceres, Quebrada de Huaquisha, margen derecha del Río Huallaga, 2 July 1974 (fr.), *J. S. Vigo 7118* (NY); San Martín, Laguna Sauce, 18 October 1985 (fr.), *L. Ramírez & A. Sotero 078-85* (NY). **SURINAME.** Jodensavanne-Mapane kreek area (Suriname R), near camp 8 on loamy sand, 11 April 1960 (fr.), *J. P. Schulz 8460* (NY); Zanderij, 23 May 1917 (fr.), *Arbor 2892* (US). **TRINIDAD AND TOBAGO.** “Hts. of Aripo road”, roadside, 17 May 1963 (fr.), *M. B. Kalloo B.637* (NY). “North post to Maqueripe”, 22 March 1920 (fr.), *N. L. Britton et al. 908* (NY). **VENEZUELA.** Barinas: Pedraza, trail from Alto de La Aguada, 20 April 1988 (fr.), *L. J. Dorr et al. 4913* (NY). Bolívar: 1-10 km W from Rio Grande, E of El Palmar, roadside, 06 July 1975 (fr.), *A. Gentry & P. Berry 14998* (NY); Cedeño, Serranía de los Pijiguaos, 1989 (fr.), *N. Cuello 739* (NY); Las Trincheras, Selvas Pluviales y de galería de la Reserva Florestal Rio Caura, camino Rio Urbani, 15 February 1986 (fr.), *B. Stergios, G. Aymard & N. Cuello 8908* (NY). Distrito Federal: Vargas, subiendo por Macuto entre Paso de los Borrachos y San José de Gallipán, Parque Nacional El Avila, 19 April 1988 (fr.), *A. Castillo 2855* (NY). Sucre: Peninsula de Paria, Cerro Patao, Norte de Puerto de Hierro, Noreste de Guiria, July 1962 (fr.), *J. A. Steyermark 91325* (NY).

Additional specimens examined:—**CUBA.** Prope villam Monte Verde dictam, Cuba Orientali, 01 January 1859 (fl./fr.), *C. Wright 133* (P 02748847). **HAITI.** Amérique, St. Domingue, 01 January 1826 (fr.), *D. Poiteau s.n.* (P 02748844). **PUERTO RICO.** Utuado, ad los Angeles, 17 January 1887 (fl.), *P. Sintenis 5923* (P 02748846); *ibid.*, in declivibus ad Pellejas, 07 June 1886 (fr.), *P. Sintenis 4491* (P 02748842).

23. *Rhynchosia platyphylla* Benth., Fl. Bras. 15(1B): 201. 1862. Type:—BRAZIL, Minas Gerais, s.loc., 1816-1821 (fl.) *A. de Saint-Hilaire B1-365* (Lectotype [designated by Gear 1978]: P 00709015 [digital image!]). Iconography: *Rodriguésia* 70: 13. 2019.

Fig. 15 D

Subshrub prostrate, stems simple, pubescent, indument light yellow to brownish, with non-glandular trichomes, yellow to brownish vesicular glands and sparsely bulbous-based trichomes. *Stipules* 3–8 × 1–2 mm, free, persistent, lanceolate, externally pubescent with yellow vesicular glands and bulbous-based trichomes. *Leaves* unifoliolate, petiole sessile to subsessile,

up to 3mm long; *leaflets* 5–8.5 × 4.7–9 cm, ovate, elliptical or rounded, surface not bullate, rounded at apex, cordate at base, entire-margined, pilose, with yellow vesicular glands on the abaxial surface. *Inflorescences* axillary, racemose or paniculate, 5.5–10 cm long, many-flowered, equaling or exceeding the length of the subtending leaf, bracts deciduous; pedicel 3–6 mm long. *Flowers* 8.5–12 mm long excluding the pedicel; *calyx* 9–12 mm long, pilose to pubescent with yellow vesicular glands and bulbous-based trichomes, lobes lanceolate, all of them equaling or exceeding the corolla in length; *standard petal* 7–10 × 5–6.5 mm, obovate, emarginate to rounded at apex, glabrous, lacking yellow vesicular glands and bulbous-based trichomes, claw 1.5–2 mm long, auricle ca. 0.5 mm long; *wing petals* 7.8–9 × 1–2 mm, oblong, claw 1–2.3 mm long, auricle ca. 0.5 mm long; *keel petals* 7.7–8.9 × 2–3.2 mm, falcate, claw 1–3 mm long; *stamens* 7.5–9.5 mm long; *ovary* 2.6–3.5 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.4–2.5 × 0.6–0.8 cm, brown, without constrictions between the seeds, ovate, oblong or elliptical in outline, pubescent, with yellow vesicular glands and bulbous-based trichomes. *Seeds* 2–3.5 × 1.8–3 mm, suborbicular, unicolored, brown.

Nomenclatural and taxonomic notes:—*Rhynchosia platyphylla* was described by Bentham (1862) based on the gathering from "Habitat in Brasilia ab A. de St. Hilaire lecta in itinere a Rio de Janeiro ad S. Paulo, loco non indicato". No St. Hilaire material with this description was found. In this way, Grear (1978) lectotypified the collection *St. Hilaire 365*, deposited in P, considering that Bentham use this material to prepare the description of this taxa. This procedure is correct (see Turland et al. 2018, Art. 9.12) and we will follow here.

Rhynchosia platyphylla is an easily recognizable species of *Rhynchosia* because it is the only one in South America which has unifoliolate leaves (Fig. 15 D).

Reproductive phenology:—This species was collected with flowers in January, August, October to December; and with fruits in August, November and December.

Distribution and habitat:—*Rhynchosia platyphylla* is an endemic species from Brazil, which occurs in the midwest and southeast regions (Fig. 14). It occurs in cerrado areas and grassy and shrub fields.

Conservation status:—Least Concern (LC). With an EOO of 288,760 km² (GeoCAT, accessed in May 2022), *R. platyphylla* is classified as LC. There are many records of this species specially in Midwest Brazil. Also, it can be found in ruderal environments such as roadsides as well as in conservation units (Parque Nacional de Brasilia and Chapada dos Guimarães).

Specimens Examined:—**BRAZIL.** Distrito Federal: Brasília, 0.5 km W de estação de Corpo de Bombeiros em W5N, Asa Norte, 9 December 1983 (fl.), *J. H. Kirkbride Jr. 5512* (UB); *ibid.*,

estrada Brasilia – Belo Horizonte km 5, 29 November 1976 (fl./fr.), *G. Shepherd et al.* 3798 (UEC); *ibid.*, immediately E of Lagoa Paraná, 9 December 1965 (fl.), *H. S. Irwin et al.* 11136 (NY, UB); *ibid.*, Parque Nacional de Brasilia, próximo a área do exército, 07. December 2006 (fl./fr.), *J. Roveratti et al.* 640 (UB); *ibid.*, margem Córrego Capão Comprido, 29 October 1990 (fl.), *P. C. M. Ramos* 253 (UB); *ibid.*, Península Norte, 4 December 1983 (fl.), *J. A. Ratter & G. C. G. Argent s.n.* (UEC); *ibid.*, Reserva Ecológica do IBGE, área de amostragem nº 3 para coleta de material botânico, 18 December 1986 (fl.), *M. A. Silva & D. Alvarenga* 234 (SP); Planaltina, 8 August 1975 (fl./fr.), *E. P. Heringer* 15957 (RB); Sobradinho, 10 November 1986 (fl.), *E. R. Anjos s.n.* (NY, UB). Goiás: Estrada Brasília/Belo Horizonte, km 5, 29 November 1976 (fl.), *G. Shepherd et al.* 344 (UEC); Luziânia, arredores, 4 December 1992 (fl./fr.), *G. Hatschbach et al.* 58408 (MBM, NY). Mato Grosso: Chapada dos Guimarães, Trilha do Atmã, borda Cerrado 15°28'365 S 55°48'293'W, 15 January 2009 (fl.), *R. T. Queiroz et al.* 1371 (UEC). Minas Gerais: Itutinga, Rodovia Lavras - São João Del Rey, 10 December 1980 (fl./fr.), *H. F. Leitão et al.* 11898 (UEC, MBM).

24. *Rhynchosia reticulata* (Sw.) DC., Prodr. 2: 385. 1825.

Basionym:—*Glycine reticulata* Sw. Prodr. 105. 1788. *Arcyphyllum reticulatum* (Sw.) Elliott, J. Acad. Nat. Sci. Philadelphia 1(2): 372. 1818. *Dolicholus reticulatus* (Sw.) Millsp., Publ. Field Columb. Mus., Bot. Ser. 2(1): 53. 1900. Type: JAMAICA, s.loc., s.d. (fl./fr.), *O. P. Swartz s.n.* (Lectotype [first-step designated by Grear 1978; second-step designated here]: S-R-2423 [digital image!]; isolectotypes: LD 1263465 [digital image!], S10-36527 [digital image!], S10-36528 [digital image!], S10-36529 [digital image!]). Iconography: *Rodriguésia* 70: 17. 2019.

Glycine macrophylla Kunth, Nov. Gen. Sp. 6: 426–427. 1823. *Rhynchosia macrophylla* (Kunth) DC., Prodr. 2: 385. 1825. *Rhynchosia reticulata* var. *macrophylla* (Kunth) Kuntze, Revis. Gen. Pl. 1: 204. 1891. Type: CUBA, Havana, s.d. (fl.), *A. J. A Bonpland s.n.* (Lectotype [first-step designated by Grear 1978, second-step designated here]: P 00660119 [digital image!]; isolectotype: P 02748653 [digital image!]).

Rhynchosia aequinoctialis Duchass. & Walp. Linnaea 23: 743. 1850. Type: GUADELOUPE, s.loc., 1832 (fl.), *A. Duchassaing s.n.* (Lectotype [designated by Grear 1978]: P 00709024 [digital image!]; isolectotype: A 00063818 [digital image!]).

Rhynchosia reticulata var. *latifolia* (Nutt. ex Torr. & A. Gray) Kuntze, Revis. Gen. Pl. 1: 204. 1891. Type: ST. THOMAS, s. loc., February 1874 (fl./fr.), *O. Kuntze s.n.* (Lectotype [designated here]: NY 00026937[!]; isolectotype: K 000502989 [digital image!]).

Rhynchosia reticulata var. *elliptica* Kuntze, Revis. Gen. Pl. 1: 204. 1891. Type: CUBA, s. loc., s.d. (fl.), *J. Linden* 2071 (Lectotype [first-step designated by Grear 1978, second-step designated here]: K 000502987 [digital image!]; isolectotypes: BM 000931750 [digital

image!], BM 000931751 [digital image!], BM 000931752 [digital image!], G 00367755 [digital image!], G 00367760 [digital image!], K 000502991 [digital image!], NY 00026936[!]).

Dolicholus kuntzei Kuntze, Revis. Gen. Pl. 3(3): 61. 1898. *Rhynchosia kuntzei* Harms, Revis. Gen. Pl. 3(3): 61. 1898. *Rhynchosia reticulata* var. *kuntzei* (Kuntze) Grear, Mem. New York Bot. Gard. 31(1): 116. 1978. Type: BRAZIL, Mato Grosso, Jacobina, July 1892 (fl./fr.), *O. Kuntze s.n.* (Lectotype [designated here]: US 00004681 [digital image!]).

Dolicholus hondurensis Rose, Contr. U.S. Natl. Herb. 10(3): 101. 1906. *Rhynchosia hondurensis* (Rose) Donn. Sm., Enum. Pl. Guatem. 8: 172. 1907. Type: HONDURAS, Santa Barbara, near San Pedro Sula, May 1888 (fl.), *C. Thieme & J. D. Smith 5200* (Holotype: US 00004679 [digital image!]; isotypes: G 00367758 [digital image!], GH 00066353 [digital image!], US 00997213 [digital image!]).

Dolicholus ovatus Rusby, Bull. New York Bot. Gard. 4(14): 346. 1907. Type: BOLIVIA, La Paz, Yungas, Coripata, March 1894 (fl./fr.), *M. Bang 2098* (Lectotype [first-step designated by Grear 1978, second-step designated here]: NY 00007795[!]; isolectotypes: BM 000931744 [digital image!], E 00296691 [digital image!], GH 00066348 [digital image!], GH 00066355 [digital image!], K 000530056 [digital image!], K 000530057 [digital image!], MICH 1107268 [digital image!], MO 277414 [digital image!], NY 00007796[!], PH 00009636 [digital image!], US 00004691 [digital image!], US 00997229 [digital image!]).

Dolicholus angulatus Standl., Contr. U.S. Natl. Herb. 18(3): 107. 1916. Type: PANAMA, between Miraflores and Pedro Miguel, Canal Zone, January 1911 (fl.), *H. Pittier 2510* (Holotype: US 00004669 [digital image!]; isotype: NY 00007783[!]).

Fig. 15 E–H

Vine herbaceous or suffrutescent, twining, stems simple, pubescent, indument white to yellow, with non-glandular trichomes and vesicular glands but lacking bulbous-based trichomes. *Stipules* 3–10 × 1–6 mm, free, persistent to late-deciduous, lanceolate or ovate, externally pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 2–7 cm long; leaf rachis 0.8–2.9 cm long; *stipels* persistent; leaflets 1.8–11.3 × 1–7 cm, ovate, obovate, elliptical, or rhombic, surface not bullate, cuneate, attenuate, or acuminate at apex, obtuse to rounded at base, margins entire, pubescent or tomentose, with yellow vesicular glands on abaxial surface. *Inflorescences* axillary or terminal, racemose, 4.5–29 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 0.2–0.6 mm long. *Flowers* 6–11 mm long excluding the pedicel; *calyx* 8–11 mm long, pubescent with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, all of them equaling or exceeding the corolla in length; *standard petal* 5–8.4 × 3.8–5.6 mm, obovate to rounded, apiculate or rounded apex, glabrous to puberulous, with sparsely yellow vesicular glands but lacking bulbous-based trichomes, claw 1–2 mm long, auricle ca. 0.5 mm

long; *wing petals* 4.8–8.1 × 1–2 mm, oblong, claw 1–1.5 mm long, auricle ca. 0.5 mm long; *keel petals* 5–8.3 × 1–2.5 mm, falcate, claw 1–2.3 mm long; *stamens* 7–9 mm long; ovary 2.9–3.7 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.8–3 × 0.5–0.9 cm, brownish to dark brown, without constrictions between the seeds, oblong, elliptical, or obovate in outline, pilose, with yellow vesicular glands and sparsely bulbous-based trichomes. *Seeds* 4–5 × 3–5 mm, oblong to suborbicular, unicolored, brown to black.

Nomenclatural and taxonomic notes:—*Rhynchosia reticulata* was first described as *Glycine reticulata* by Swartz (1788). This species has a wide distribution in American continent and exhibits a great morphological diversity, which explains this complex of synonyms. In the protologue of *G. reticulata* the author just mentioned the location (Jamaica), and did not provide any other type information. Grear (1978) selected the gathering *Swartz s.n.* at S as the lectotype, but there are four duplicates of the gathering there (S-R-2423, S10-36527, S10-36528 and S10-36529) and he did designate a particular specimen as lectotype. Thus, his type designation should be treated as the first-step lectotypification and we select here the specimen with barcode number S-R-2423 as the second-step lectotype of *G. reticulata* (see Turland et al. 2018, Art. 9.17). For this same reason we designate here the specimens with barcode number P 00660119, K 000502987, and NY 00007795 as the second-step lectotypes of *Glycine macrophylla*, *Rhynchosia reticulata* var. *elliptica*, and *Dolicholus ovatus* respectively.

Kuntze (1891) described *R. reticulata* var. *latifolia* based on a gathering from “St. Thomas, Portorico”. There are two duplicates of this collection deposited in different herbaria and the author did not specify a particular specimen as type. Thus, we designated here the specimen at NY with barcode number NY 00026937 as the lectotype of *R. reticulata* var. *latifolia*.

The holotype of *Dolicholus kuntzei* was mentioned by Grear (1978) as a “not seen” material, deposited in B. The curator having informed to us that this material is not available because probably it was lost in the fire of the Berlin Botanical Museum in 1943. In this way, we designated here the isotype collection with barcode number US 00004681 as the lectotype of *D. kuntzei*.

Rhynchosia reticulata is characterized by having discolor leaflets, racemose inflorescences which exceeds the length of the subtending leaf, calyx lobes longer than the corolla and by its oblong, elliptical to obovate fruits (Fig. 15 E–H). It resembles *R. calycosa*

due to its twining stems and fruit shape, but they differ by the characters listed in the taxonomic notes of this species.

Reproductive phenology:—*Rhynchosia reticulata* can be found with flowers in all months of the year and with fruits from January to March and May to November.

Distribution and habitat:—This species has a wide distribution in the American continent, mainly through Central and South America. In South America it can be found in Bolivia, Brazil, Colombia, Ecuador, Peru, Uruguay and Venezuela (Fig. 16). Although Tropicos (www.tropicos.org) mentioned that *R. reticulata* also occurs in Argentina, French Guiana and Guyana in South America, these occurrences have not been confirmed in this work. *Rhynchosia reticulata* occurs in secondary vegetations, cerrado areas, forest edges, roadsides and pastures.

Conservation status:—Least Concern (LC). *Rhynchosia reticulata* has an EOO of 23,049,718 km² (GeoCAT, accessed in May 2022) and a wide distribution through Central and South America. It is well sampled in herbaria and commonly found in ruderal areas.

Specimens Examined:—**BOLIVIA.** Beni: Vaca Diez, along road between Rurrenabaque and Riberalta, between Porto Yata and jct. of hwy to Cobija, 13 August 2000 (fl./fr.), *T. B. Croat*, *A. C. Acebey & T. Kroemer 84869* (NY). Santa Cruz: Nuflo de Chaves, between kms 15 and 35 from Ascención de los Guarayos to Urubicha, 3 August 1983 (fl./fr.), *M. J. G Hopkins et al. 120* (NY). **BRAZIL.** Bahia: a 8 km de Tapiramutá, 31 August 1981 (fl./fr.), *L. M. C. Gonçalves 151* (RB); Jacobina: BR 324 - Itaitu, 26 June 1999 (fr.), *E. M. França & M. Silva 3175* (CEN, UB); ibid., ramal a direita a 5 km na rodovia BA-052, fazendinha do Boquierad, 28 August 1990 (fl.), *J. L. Hage et al. 2288* (MBM, UEC). Goiás: Alvorada do Norte, Rod. Belém – Brasília 10 km E Alvorada, 23 August 1978 (fl./fr.), *A. Allem & G. Vieira 2100* (UEC); Jaraguá, BR 153 Brasília – Belém, 21 August 1978 (fr.), *A. Allem & G. Vieira 2072* (CEN); ibid., 21 August 1978 (fr.), *A. Allem & G. Vieira 2074* (UEC); Niquelândia, nas margens do Rio Tocantinzinho, 21 July 1995 (fl./fr.), *T. B. Cavalcanti et al. 1516* (CEN); Nova Roma, estrada entre Nova Roma e Montes Belos, ca. 7 km de Nova Roma, 30 July 2000 (fr.), *V. C. Souza et al. 24660* (UEC). Mato Grosso: 96 km. S. of Xavantina, 18 June 1966 (fl.), *H. S. Irwin et al. 17412* (UB); Drainage of the upper Rio Araguaia, 18 June 1966 (fl.), *H. S. Irwin et al. 17412* (NY, UB). Minas Gerais: Antônio Carlos, Serra da Mantiqueira, 7 February 1972 (fl.), *P. L. Krieger 11495* (RB); Belo Horizonte, Vila Cruzeiro do Sul, 9 January 1933 (fl./fr.), *M. Barreto 5417* (SP); Caeté, Pico Aceso, 11 November 1942 (fl./fr.), *M. Magalhães 2589* (UB); Conceição da Barra de Minas, 21 February 2012 (fl./fr.), *M. Sobral 14688* (RB); Jacuí, Fazenda São José. 3 August 1981 (fr.), *A. M. G. Azevedo 13240* (UEC); Minduri, 1947 (fr.), *J. G.*

Kuhlmann s.n. (RB); Ouro Preto, Distrito de Cachoeira do Campo, 16 May 2017 (fl./fr.), *L. M. P. A. Bezerra* 88 (BOTU); *ibid.*, Parque Estadual do Itacolomi, Calais, 22 January 2004 (fl.), *V. F. Dutra et al.* 172 (RB); *ibid.*, 18 March 2004 (fl.), *V. F. Dutra & F. C. P. Garcia* 198 (RB); *ibid.*, próximo a entrada do Parque Estadual do Itacolomi, 12 December 1990 (fl.), *H. C. Lima et al.* 4050 (RB); Paraopeba, Faz.do Barro Vermelho - Rod. Cordsburgo, 10 June 1957 (fl./fr.), *E. P. Heringer* 5621 (UB); Ressaquinha, 2 December 1946 (fl.), *C. C. Duarte* 742 (NY, UB). Paraná: Jaguariaiva, perímetro urbano, 03 February 2011 (fl.), *S. T. S. Miotto et al.* 2562 (ICN). Pernambuco: Bonito, Reserva Ecológica da Mata Estadual de Bonito, agreste de PE, 10 October 1997 (fl.), *A. Sacramento et. al* 153 (UEC). Rondônia: Cacoal, BR 354, rodovia Cuiabá – Porto Velho, ao norte da cidade, morro da torre da EMBRATEL, 23 Jun 1984 (fl./fr.), *C. A. Cid et al.* 4745 (NY, RB); Roraima: Normandia, Fazenda Alvorada, 08 October 1995 (fr.), *I. S. Miranda* 965 (UEC). São Paulo: Campinas, s.d. (fl.), *C. Novaes* 280 (SP); Carapicuíba, 29 April 1934 (fl.), *A. Gehrt s.n.* (SP); Jundiaí, 14 March 1915 (fl./fr.), *A. C. Brade s.n.* (SP). **COLOMBIA.** Antioquia: Liborina, 3 km N de Liborina, 8 March 1986 (fl./fr.), *R. Calejas et al.* 2214 (NY). Cesar: Valledupar, Inspección de Atanquéz , 13 November 1985 (fr.), *J. H. Torres y P. Pinto* 2862 (NY). Nariño: Imués, El Pedregal, 2 May 1985 (fl.), *O. de Benavides* 5090 (NY); Tangua, entre Tangua y El Placer, 01 January 1977 (fl./fr.), *O. de Benavides* 779 (NY). Valle del Cauca: Cali, Restrepo, vereda de Río Grande entre Pavas y Restrepo abajo del puente, margen derecha, 01 November 1987 (fl.), *J. E. Ramos* 839 (NY). Dagua, Cañón del Rio Grande, antes de cruzar el puente sobreel río, 25 August 1987 (fl./fr.), *M. D. Heredia & L. M. Alvaré* 388 (NY); Patía, alrededores de Mojarras, 20 May 1989 (fl.), *B. R. Ramírez* 1525 (NY). **ECUADOR.** Loja: Bosque “El Tundo”, propiedad de la fundación ARCOIRIS, on track of road Sozoranga – Maracá km 1, 12 Jun 1996 (fl./fr.), *B. Stahl et al.* 184 (NY). **PERU.** Cajamarca: San Pablo, 22 May 1975 (fl.), *A. Sagástegui, J. Cabanillas & O. Dios* 8013 (NY). **URUGUAY.** Montevideo, 3 September 1870 (fl./fr.), *Ewernberg* 311 (P). **VENEZUELA.** Barinas: near Barinitas, 28 January 1965 (fr.), *F. J. Breteler* 4437 (NY). Bolivar: Sifontes, 3-12 km al SE del Campto, CVG Las Flores, September 1989 (fr.), *M. Colella, G. Molina & J. Penott* 1467 (NY). Falcon: Sierra de San Luis, entre Curimaga y la bifurcación del caminho al Hotel Parador, 20 July 1967 (fl.), *J. A. Steyermark* 99237 (NY). Merida: Merida, 01 January 1893 (fl./fr.), *Mocquerys* 1237 (P). Monagas: Carretera Quirequire, Aragua de Maturín, 10 km al O de Quirequire, después de Buenavista, 30 January 1981 (fl./fr.), *R. Schultze-Kraft & A. Flores* 52-4 (NY).

Additional Specimens Examined:—**BELIZE.** Cayo: San Ignacio. Camino de terracería 3.5 km al SW de San Ignacio, 07 March 1985 (fl.), *C. P. Cowan & R. Durán* 5115 (MEXU 458416).

Orange Walk: Savanna ca. 5 km N of August Pine Ridge on the road to Trinidad, 19 March 1987 (fl.), *G. Davidse & A. E. Brant* 32799 (MEXU 446578). **COSTA RICA**. Inter-american Hwy, near the Buenos Aires turnoff, 26 January 1967 (fl./fr.), *W. Burger & G. Matta* 4681 (NY). **CUBA**. Havana, Municipio Habana del Este, Playa de Cojimar, March 1906 (fl./fr.), *A. S. Hitchcock s.n.* (US 875055). **DOMINICAN REPUBLIC**. Barahona: Hispaniola, May 1910 (fl.), *P. Fuertes* 311 (US 875069); *ibid.* Montuada Nueva, SE of Polo, August 1946 (fl.), *R. A. Howard & E. S. Howard* 8424 (US 875071). **EL SALVADOR**. Morazán: Northeast of finca of General J. T. Calderón, Montes de Cacaguatique, 6 January 1942 (fl./fr.), *J. M. Tucker* 738 (NY). **GUATEMALA**. Huehuetenango: Chiantla, La Zeta, 20 July 2003 (fl./fr.), *M. Veliz et al.* 14865 (MEXU 1205094); Petén: La Cumbre, on Chacte abajo, 15 February 1971 (fl.), *E. Contreras* 10519 (MEXU 297183). **HAITI**. Hispaniola: Massif de la Selle, Port-au-Prince, Montfleury, 27 October 1927 (fl.), *E. L. Ekman* 9179 (US 875057). **HONDURAS**. Olancho: El Zarzal, Valle Lepaguare, 21 November 1936 (fl./fr.), *A. Molina* 13397 (NY). **JAMAICA**. Saint Andrew, Hope River valley above Gordon Town, 31 January 1960 (fl./fr.), *G. R. Proctor* 20550 (US 875047). **MEXICO**. Jalisco: La Huerta, Rancho Cuixmala, 3 November 1991 (fl./fr.), *E. J. Lott et al.* 4049 (NY). **PUERTO RICO**. Maricao ad margines sylvanum, 20 November 1984 (fl.), *P. Sintenis* 375 (US 520709). **NICARAGUA**. Zelaya: Between El Muelle delos Bueyes, 6 April 1961 (fr.), *G. S. Bunting & L. Licht* 1076 (NY). **PANAMA**. Penonome, March 1908 (fr.), *R. S. Williams* 580 (NY).

25. *Rhynchosia rojasii* Hassl., Repert. Spec. Nov. Regni Veg 7: 77. 1909. Type:— PARAGUAY, “Sierra de Amambay ad margines silvarum, in via sylvatica “Picada” dicta pr. Punta Porá, flor. et cum fruct. mat. mens.”, April 1907-08 (fl.), *Rojas* 10424 (Lectotype [first-step designated by Grear 1978; second-step designated here]: G 00400154 [digital image!]; isolectotypes: BAB 000498 [fragment] [digital image!]; BM 000538498 [digital image!]; C 10012341 [digital image!]; F 1539661 [digital image!]; G 00400118, 00400119, 00400120 [digital image!]; K 000502975 [digital image!]; LIL 000653 [digital image!]; MICH 1104298 [digital image!]; MO 277413 [digital image!]; NO 0109890 [digital image!]; NY 00026954[!]; P 00709025 [digital image!]; RB 00540411 [digital image!]; S S-R-9731 [digital image!]; SI 002527 [digital image!]; UC 934985 [digital image!]; US 00004824 [digital image!];). Iconography: *Rodriguésia* 70: 17. 2019.

Rhynchosia ituana Hoehne, Bol. Inst. Brasil. Sci. 2: 253. 1926. Type: BRAZIL, São Paulo, Itú, July 1917 (fl.), A. M. Diniz s.n. (Holotype: SP 001039!; paratypes: F. C. Hoehne s.n., SP 001074!, SP 001075!; F. C. Hoehne 15949, NY 00605720[!]; SI 002528 [digital image!]).

Vines herbaceous or suffrutescent, twining, stems simple or branched, pilose to pubescent, indument light yellow to yellow, with non-glandular trichomes, vesicular glands and few bulbous-based trichomes. *Stipules* 7.1–10 × 1–2.5 mm, free, persistent, lanceolate, externally pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 3.5–10.2 cm long; leaf rachis 2–3 cm long; stipels persistent; *leaflets* 4.1–11.7 × 2.8–8.9 cm, ovate, deltoid or rhombic, surface not bullate, attenuate or acute at apex, obtuse, truncate, or rounded at base, repand to entire-margined, pilose, with yellow vesicular glands on abaxial surface. *Inflorescences* axillary, racemose or paniculate, 13–28 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 2–4 mm long. *Flowers* 7–13 mm long excluding the pedicel; *calyx* 4–6 mm long, pubescent with yellow vesicular glands and sparsely bulbous-based trichomes, lobes lanceolate, not exceeding the corolla in length; *standard petal* 9–12 × 8–9 mm, oblong or obovate, retuse to rounded at apex, pilose to pubescent, with yellow vesicular gland but lacking bulbous-based trichomes, claw 1–1.5 mm long, auricle ca. 0.5 mm long; *wing petals* 9.5–10.5 × 1–2 mm, oblong, claw 1–2.5 mm long, auricle ca. 0.5 mm long; *keel petals* 10–12 × 2–4 mm, falcate, claw 2–3 mm long; *stamens* 10–13 mm long; *ovary* 2.9–3.5 mm long, pubescent, with yellow vesicular glands. *Fruits* 3–4 × 0.5–0.8 cm, greenish to brownish, without constrictions between the seeds, narrowly obovate in outline, pilose to pubescent, with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 4–6 × 3–4 mm, ovate or reniform, unicolored, brown to dark brown.

Nomenclatural and taxonomic notes:—*Rhynchosia rojasii* was described by Hassler (1909) based on the gathering *Rojas 10424*. There are several duplicates of the gathering deposited in different herbaria, and the author did not cite a specific specimen as type. Grear (1978) cited a specimen at G as holotype, but there are four duplicates of the gathering in this herbarium (G 00400154, G 00400118, G 00400119 and G 00400120) and he did not specify a particular one as type. Therefore, the citation of Grear (1978) should be treated as the first-step lectotypification and we designate here the specimen with barcode numer G 00400154 as the second-step lectotype of *R. rojasii* (see Turland et al., 2018: Art. 9.17).

Rhynchosia rojasii resembles *R. melanocarpa* by its vegetative and flowers characteristics, since they present persistent stipels, inflorescences exceeding the length of the

subtending leaf and by the length of the pedicels. However, they are easily differentiated by the fruits, which in *R. rojasii* is greenish to brownish (vs. reddish-brown to black in *R. melanocarpa*), without constriction between the seeds (vs. constricted between the seeds in *R. melanocarpa*) and narrowly obovate (vs. oblong to ovate in *R. melanocarpa*).

Reproductive phenology:—This species was found with flowers from April to July; and with fruits from May to July and September.

Distribution and habitat:—*Rhynchosia rojasii* occurs in Argentina, Brazil and Paraguay (Fig. 16). However, *Tropicos* (www.tropicos.org) mentions that this species also occurs in Bolivia, but in this work this occurrence was not confirmed. It can be found in forest edges, wet forests and limestone hills.

Conservation status:—Least Concern (LC). According to the value of EOO (810,908. km²; GeoCAT, accessed in May 2022), *R. rojasii* is classified as LC according to terms of IUCN red list (IUCN 2022). There are some records of this species in Argentina and Paraguay, and several of them in Brazil, especially in São Paulo state.

Specimens Examined:—**ARGENTINA.** Misiones: Guaraní, Predio Guaraní, 26°54'59'' S 54°12'18'' W, Camino al ayo, 17 September 1998 (fr.), *S. G. Tressens et al.* 6076 (MBM, NY); San Ignacio, Camiño a La Plantadora, July 1927 (fr.), *A. Scala s.n.* (NY). **BRAZIL.** Distrito Federal: Brasília, Córrego Landim, 9 July 1966 (fl./fr.), *H. S. Irwin et al.* 18101 (NY, UB). Minas Gerais: Pitangui, 20 June 1945 (fl.), *L. O. Williams & V. Assis* 7311 (SP). Paraná: Arapuã, orla da mata pluvial das marges do Rio Ivaí, 3 June 1963 (fl./fr.), *G. Hatschbach* 10103 (MBM); Foz do Iguaçu, Parque Nacional do Iguaçu, estrada do Tamanduá, 17 May 1949 (fr.), *A. P. Duarte & E. Pereira* 1790 (NY); Jundiá do Sul, Bairro Rio Vermelho, 3 May 2001 (fl.), *J. Carneiro* 1121 (MBM); Laranjeiras do Sul, Salto Osório, Rio Iguaçu, 18 May 1970 (fl./fr.), *G. Hatschbach* 24162 (MBM). Rio Grande do Sul: Tenente Portela, Parque Estadual do Turvo, 8 July 1980 (fr.), *J. R. Stehmann s.n.* (ICN). São Paulo: Campinas, Fazenda Santa Genebra, s.d. (fl.), *A. L. M. Franco* 31767 (UEC); *ibid.*, Reserva Municipal de Santa Genebra 22°49'45"S 47°06'33"W, 25 May 1996 (fl./fr.), *M. T. Grombrone-Guaratini, J. C. Galvão & R. Belinelo* 36 (UEC); Piracicaba, Mata da Pedreira, ESALQ/SP, 04 May 1984 (fl.), *E. L. M. Catharino* 60 (SP); Porto Feliz, Rodovia Marechal Rondon, km 142,5, 13 May 2018 (fl.), *G. M. Antar & V. B. Caetano* 2138 (CEN). São Paulo, Butantan, cultivada no horto Oswaldo Cruz, 28 April 1920 (fl.), *F. C. Hoehne* 15949 (NY); *ibid.*, cultivada no Jardim Botânico de São Paulo, 10 May 1940 (fl.), *O. Handro s.n.* (SP); São Roque, mata secundária, 26 April 1994 (fl.), *R. B. Torres et al.* 134 (SP). **PARAGUAY.** Alto Parana: Reserva Biológico Limoy de Itaipu Binacional, 18 April

1986 (fl.), *D. R. Brunner & S. Cabellero 1872* (RB). San Pedro: Yaguarete Forest, trail to Rio Araguay, 31 July 1996 (fl.), *E. M. Zardini & M. Vera 45368* (P); “Sierra de Amabay”, April 1907-08 (fl.) *T. Rojas 10424* (US).

26. *Rhynchosia schomburgkii* Benth., Fl. Bras. 15(1B): 203. 1862. Type:—GUYANA, “Sides of dry savannahs”, 1839 (fl.), *Robert Schomburgk* [ser. 1] 653 (Lectotype [first-step designated by Grear 1978; second-step designated here]: K 000502978 [digital image!]; isolectotypes: BM000931745 [digital image!]; G [not seen]; K 000502977 [digital image!], K 000502979 [digital image!]; P00709026 00709027 [digital image!]). Iconography: *Rodriguésia* 70: 17. 2019.

Dolicholus pittieri Standl., Contr. U.S. Natl. Herb. 17(5): 433. 1914. *Rhynchosia pittieri* (Standl.) Standl., Publ. Field Mus. Nat. Hist., Bot. Ser. 4(8): 214. 1929. Type: COLOMBIA, “Around Cali western Cauca Valley”, XII.1905 (fl./fr.) *H. Pittier 688* (Holotype: US 530856 [digital image!]; isotype: US 1059965 [digital image!]).

Rhynchosia caliensis Harms, Notizbl. Bot. Gart. Berlin-Dahlem 11: 783. 1933. Type: COLOMBIA, Cali, 1000-1200m, 20.V.1883, (fl./fr.) *F. C. Lehmann 2861* (Lectotype [designated by Grear 1978]: K 000502950 [digital image!]; isolectotype: US 01107536 [digital image!]; paratype: *J. Cuatrecasas 2002*, US 00004671 [digital image!]; G 00367703 [digital image!]).

Fig. 15 I–J

Subshrub erect to twining, stems branched, pubescent, indument white to light yellow, with non-glandular trichomes, vesicular glands and bulbous-based trichomes. *Stipules* 5–13 × 1–4 mm, free, deciduous, lanceolate, externally pubescent with yellow vesicular glands and bulbous-based trichomes. *Leaves* trifoliolate, petiole 2.1–5.1 cm long; leaf rachis 0.8–1.9 cm long; stipels persistent; *leaflets* 3.2–7 × 1.9–5 cm, ovate or elliptical, surface not bullate, attenuate to cuneate at apex, cuneate to rounded at base, entire-margined, pilose to pubescent, with yellow vesicular glands on both surfaces. *Inflorescences* axillary, paniculate or rarely racemose, 6–22 cm long, many-flowered, exceeding the length of the subtending leaf, bracts deciduous; pedicel 4.5–6 mm long. *Flowers* 13–18 mm long excluding the pedicel; *calyx* 8.5–17 mm long, pubescent, with yellow vesicular glands and bulbous-based trichomes, lobes lanceolate, only the ventral lobe exceeding the corolla in length; *standard petal* 11–18 × 6–11 mm, obovate, emarginate at apex, glabrous, without yellow vesicular glands and bulbous-based trichomes, claw 3–4 mm long, auricle ca. 0.5 mm long; *wing petals* 11–14 × 1–3 mm, oblong,

claw 2.5–4.5 mm long, auricle ca. 0.5 mm long; *keel petals* 11–15 × 4–5 mm, falcate, claw 4–4.5 mm long; *stamens* 14–18 mm long; *ovary* 2.5–4 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.6–3.5 × 07–10 mm, brown, without constrictions between the seeds, oblong in outline, pubescent, with yellow vesicular glands and bulbous-based trichomes. *Seeds* 4–5.5 × 3.5–4.5 mm, ovate or reniform, unicolored, brown to black.

Nomenclatural and taxonomic notes:—Bentham (1862) described *R. schomburgkii* in a short description comparing it with *R. reticulata*. As he did not provide any information about the type species in the protologue, Grear (1978) lectotypified the gathering *Schomburgkii* [ser. 1] 653 housed in K, considering that Bentham used this collection to describe *R. schomburgkii* (see Turland et al. 2018, Art. 9.4). However, there are three duplicates of the gathering in this herbarium (K 000502978, K 000502977 and K000502979) and Grear (1978) did not specified a particular one as the lectotype. Therefore, his procedure should be treated as the first-step lectotypification (see Turland et al. 2018, Art. 9.17) and we designate here the specimen with barcode number K 000502978 as the second-step lectotype of *R. schomburgkii*.

Rhynchosia schomburgkii is an easily recognizable species mainly by having only the ventral calyx lobe exceeding the corolla in length (Fig. 15 I). It is also characterized by twining stems (Fig. 15 J), stipules 5–13 × 1–4 mm, axillary inflorescences often paniculate and by the glabrous corolla.

Reproductive phenology:—Flowering in January, March to October and December; fruiting in April, May, July to October and December.

Distribution and habitat:—*Rhynchosia schomburgkii* is a species restricted to South America. It occurs in north of Brazil, Colombia, Guyana and Venezuela (Fig. 16). This species is reported from savannas, wet forests, roadsides and pastures.

Conservation status:—Least Concern (LC). With an EOO of 1,423,755 km² (GeoCAT, accessed in May 2022), *R. schomburgkii* is classified as LC based on the terms of IUCN red list (IUCN 2022). This species is commonly found in Northern Brazil, Venezuela and Colombia.

Specimens Examined:—**BRAZIL.** Roraima: 5 km S of Ilha de Maraca on the road to the Ecological Station on the SE end of the island, 9 October 1987 (fl./fr.), *J. Pruski et al.* 3437 (INPA, NY); 27 km de Boa Vista em direção a Bonfim, BR 401, 18 July 2006 (fl.), *A. S. Flores et al.* 1104 (RB); 65 km NW of Boa Vista, within a radius of 15 km from the vilage of Taiano, along roads and in agricultural fields, 11 October 1977 (fr.), *L. Coradin & M. R. Cordeiro* 605 (INPA, NY); Alto Alegre, BR 205 03°01'39.3"N 61°16'17.5" W., 9 September 2009 (fl./fr.), *A. S. Flores et al.* 2357 (RB); *ibid.*, Ilha de Maracá, estação, 12 March 1987 (fl.), *G. P. Lewis* 1487

(INPA); Boa Vista, along Boa Vista, Bonfim road, BR 401, KM 40, 15 October 1977 (fr.), *L. Coradin & M. R. Cordeiro* 703 (INPA, NY); *ibid.*, Reserva Ecológica de Maracá, 12 October 1987 (fr.), *G. P. Lewis* 1656 (NY); Estrada Boa Vista – Venezuela, Rio Surumu, 1 December 1977 (fl.), *W. C. Steward et al.* 163 (INPA, NY); Normandia, Fazenda Alvorada, 08 October 1995 (fl./fr.), *I. S. Miranda* 965 (INPA Serra da Lua, 12 January 1969 (fl.), *G. T. Prance et al.* 9203 (INPA, NY). **COLOMBIA.** Antioquia: Gomes Plata, 10-15 km en la vía Barbosa-Porce-Amalfi, N de Barbosa, 04 December 1989 (fl./fr.), *R. Callejas, O. Betancur & O. D. Escobar* 8928 (NY); Medellín, 15 October 1927 (fl.), *R. A. Toro* 751 (NY); San Jeronimo, km 10 of road San Jeronimo-Medellín, 19 September 1987 (fl.), *J. L. Zarucchi et al.* 5437 (NY). Valle del Cauca: Buga, “El Vinculo”, government owned regenerating forest about 20 years old, 14 July 1982 (fl./fr.), *H. Murphy* 675 (NY); Carretera Popayán a Pasto, entre El Bordo (Cauca) y La Unión (Nariño), 24 July 1948 (fl./fr.), *H. Garcia-Barriga, J. G. Hawkes & M. Villareal* 13004 (NY); Protedillo to Miraflores Palmira, 27 May 1922 (fr.), *F. W. Pennel & E. P. Killip* 6011a (NY); Yumbo, 20 May 1922 (fl./fr.), *F. W. Pennel* 5853 (NY). **GUYANA.** Kanuku Montains, 16 February 1985 (fl.), *M. J. Jansen-Jacobs et al.* 269 (NY). Rupununi: N of Shea, Camp1, 19 January 1994 (fl./fr.), *M. J. Jansen-Jacobs et al.* 3268 (P); St. Ignatius, July 1958 (fl.), *S. G. Harrisa* 1333 (NY); Stand 7 SE of Kumu Creek, 14-15 August 1963 (fl./fr.), *R. Goodland & P. F. Maycock* 423 (NY); Stand 11, Makushi area, 21 August 1963 (fr.), *R. Goodland & P. F. Maycock* 506 (NY); Potaro-Siparuni: Pakaraima Mountains, Upper Ireng River, E bank adjacent to Cipo settlement, 5 July 1994 (fl.), *T. W. Henkel* 5460 (NY); Trail from Kato to Paramakatoi, 12 March 1989 (fl.), *W. Hahn* 5631 (INPA, NY). **VENEZUELA.** As proximidades da divisa com o Brasil, km 3 a 9, morro com 1200m de altitude, 27 September 1979 (fl.), *N. A. Rosa & O. C. Nascimento* 3569 (INPA, NY); Bolívar: Represa Guri, 30 to 40 km E of Ciudad Piar by winding road, 7-8 April 1981 (fl./fr.), *R. Liesner & A. González* 11387 (NY); Roscio, 23 June 1981 (fl.), *E. Rutkis* 333 (NY); Santa Elena de Uairén, campo natural de terra firme, floresta nos arredores, 05 September 1979 (fl./fr.), *N. A. Rosa & O. C. Nascimento* 3312 (INPA, NY); Sifontes, Sabana 6 km al NE de Tumereno, March 1986 (fl.), *A. Fernandez* 2718 (INPA, NY); Vicinity of camp, 5 km from Hato de Nuria, E of Miamo, Altiplanicie de Nuria, alt 400m, 12 January 1961 (fl.), *J. A. Steyermark* 88376 (NY). Merida: Calzeta de la Botella, 14 April 1957 (fl./fr.), *A. L. Bernardi* 6521 (NY).

27. *Rhynchosia senna* Gillies ex Hook. & Arn., Bot. Misc. 3: 199–200. 1833. (Fig. 5 G–H). *Dolicholus senna* (Gillies ex Hook. & Arn.) Kuntze., Revis. Gen. Pl. 3(3): 62. 1898., pro parte.

Type:—ARGENTINA, Cordoba, Rio Cuarto, on the pampas of Cordoba, s.d. (fl./fr.), *J. Gillies s.n.* (Lectotype [designated by Grear 1978]: K 000530052 [digital image!]; isolectotypes: E 00183077 [digital image!], E 00183078 [digital image!], E 00183079 [digital image!], K 000530049 [digital image!]). Iconography: *Rodriguésia* 70: 17. 2019.

Rhynchosia texana Torr. & A. Gray, *Fl. N. Amer.* 1(4): 687. 1840. Type: UNITED STATES, Texas, s.d. (fl./fr.), *Drummond s.n.* (Lectotype [designated by Grear 1978]): NY!; isolectotypes: K 000900422 [digital image!], K 000900424 [digital image!], LE [not seen]).

Rhynchosia texana var. *angustifolia* A. Gray, *Smithsonian Contr. Knowl.* 3(5): 44. 1852. *Dolicholus angustifolius* (A. Gray) Kuntze, *Revis. Gen. Pl.* 3(3): 60. 1898. *Dolicholus texensis* (A. Gray) Vail, *Bull. Torrey Bot. Club* 26(3): 108. 1899. *Dolicholus texensis* var. *angustifolius* (A. Gray) Vail, *Bull. Torrey Bot. Club* 26(3): 108. 1899. *Rhynchosia senna* var. *angustifolia* (A. Gray) Grear, *Mem. New York Bot. Gard.* 31(1): 67. 1978. Type: UNITED STATES, Texas, Comanche Spring, New Braunfels, July 1850 (fl.), *F. J. Lindheimer 412* (Lectotype [designated by Grear 1978]: MO 277404 [digital image!]; isolectotypes: GH 00063793 [digital image!], K 000900417 [digital image!], MICH [not seen], NY [not seen], PH 00024230 [digital image!]).

Rhynchosia angustifolia Engelm. ex A. Gray, *Smithsonian Contr. Knowl.* 3(5): 44. 1852. nom. nud.

Rhynchosia texana fo. *cordobensis* Griseb., *Pl. Lorentz.* 74–75. 1874. Type: ARGENTINA, Cordoba, “em las cercanías de Córdoba”, 1870 (fl./fr.), *P. G. Lorentz 360* (Lectotype [designated by Grear 1978]: GOET [not seen]; isolectotype: SI 002529 [digital image!]).

Rhynchosia texana var. *microphylla* Hassl., *Repert. Spec. Nov. Regni Veg.* 16: 230. 1919. Type: PARAGUAY, Chaco, July 1906 (fl./fr.), *K. Fiebrig 1323* (Lectotype [designated by Grear 1978]: G 00379285 [digital image!]; isolectotypes: F [not seen], K 000502983 [digital image!]).

Rhynchosia senna fo. *minor* Griseb., *Pl. Lorentz.* 74. 1874. Type: ARGENTINA, Cordoba, “Auf Weiden bei San Francisco”, 1871 (fl.), *P. G. Lorentz 355* (Lectotype [designated here]: GOET 042400 [digital image!]).

Rhynchosia senna var. *foliolis late ovatis* Ball, *J. Linn. Soc., Bot.* 21: 216. 1884. Type: ARGENTINA, Buenos Aires, Bahia Blanca, 1881 (fl.), *G. Claraz 189* (Holotype: K 000530054 [digital image!]).

Rhynchosia senna var. *foliolis lanceolatis* Ball, *J. Linn. Soc., Bot.* 21: 216. 1884. Type: ARGENTINA, Buenos Aires, Bahia Blanca, 1881 (fl.), *G. Claraz 80* (Holotype: K 000530053 [digital image!]).

Rhynchosia senna var. *azuaensis* Grear, *Mem. New York Bot. Gard.* 31(1): 73–75. 1978. *Rhynchosia azuaensis* (Grear) B.L. Turner, *Lundellia* 14: 27. 2011. Type: Ecuador, Azuay, Valley of the Rio Paute, between Paute and Cuenca, March 1954, *W. H. Champ 2325* (Holotype: NY [not seen]; isotypes: F 0059821F [digital image!], US 00004823 [digital image!]).

Fig. 15 K–L

Subshrub prostrate to twining, stems branched, pilose to pubescent, white, with non-glandular indument but lacking vesicular glands and bulbous-based trichomes. *Stipules* 2–4 × 0.5–1 mm, free, persistent, narrowly lanceolate to lanceolate, externally pubescent with yellow vesicular glands but lacking bulbous-based trichomes. *Leaves* trifoliolate, petiole 0.5–2.8 cm long; leaf rachis 0.5–1.5 cm long; *stipels* deciduous; *leaflets* 0.9–2.3 × 0.4–1.5 cm, lanceolate or ovate, surface not bullate, cuneate to acuminate at apex, rounded at base, entire-margined, pilose, with yellow vesicular glands on both surfaces. *Inflorescences* axillary, fasciculate, 0.3–1.8 cm long, bearing 1–5 flowers, not exceeding the length of the subtending leaf, bracts deciduous; pedicel 7–11 mm long. *Flowers* 7–9 mm long excluding the pedicel; *calyx* 5–7 mm long, pubescent, with yellow vesicular glands but lacking bulbous-based trichomes, lobes lanceolate, not exceeding the corolla in length; *standard petal* 6–8 × 3–4 mm, obovate to oblong, emarginate or rounded at apex, pilose to pubescent, with yellow vesicular glands but lacking bulbous-based trichomes, claw 1–1.5 mm long, auricle ca. 0.5 mm long; *wing petals* 6–7 × 0.5–1 mm, oblong, claw ca. 1–2 mm long, auricle ca. 0.5 mm long; *keel petals* 6–7.5 × 1–2.5 mm, falcate, claw 1–2 mm long; *stamens* 4–9 mm long; *ovary* 2.5–3.2 mm long, pubescent, with yellow vesicular glands. *Fruits* 1.8–2.6 × 0.5–0.8 cm, brownish, without constrictions between the seeds, falcate, puberulous, with yellow vesicular glands but lacking bulbous-based trichomes. *Seeds* 2.8–3.8 × 3–4 mm, suborbicular, unicolored, brownish to black.

Nomenclatural and taxonomic notes:— Hooker & Arnott (1833) described *Rhynchosia senna*. Grear (1978) synonymized *R. texana* as *R. senna* var. *angustifolia* and raised other new variety for *R. senna*: *R. senna* var. *azuaensis*. Johnston (1984) stated that the correct name of *R. senna* var. *angustifolia* should be *R. senna* var. *texana*. Turner (2011) study the *R. senna* complex and accepts *R. senna* as a distinct species but treated *R. senna* var. *texana* as a biological species which has a bicentric distribution, reinstating the name *R. texana*. He also elevates *R. senna* var. *azuaensis*, taxon known by only a single collection from Azuay, Ecuador, to specific rank. Ståhl et al. (2016) in Flora of Ecuador discuss the similarity between these taxa and preferred a wider circumscription, treating all of these taxa under *R. senna*. In this work we will follow Ståhl et al. (2016).

Torrey and Gray (1838) described *R. texana* based on the gathering *Dummond s.n.* from Texas, but did not designate a specific specimen as type. As there are four duplicates of the gathering in different herbaria, Grear's (1978) citation of the specimen at NY as the holotype constitutes and inadvertent lectotypification (see Turland et al. 2018, Art. 9.10, Ex. 11; Prado et al. 2020).

In the protologue of *R. texana* fo. *cordobensis* the author cited the location “Cordoba” but did not give any other information. In this way, Grear (1978) when cited the gathering *Lorentz 122* as the holotype he unintentionally lectotypified it.

Grisebach (1874) mentioned in the protologue of *R. senna* fo. *minor* a gathering from “in pascuis pr. S. Francisco”. Grear (1978) cited as holotype a “not seen” material at GOET, but the curator having informed to us that there is no collection just as cited in the protologue there. Therefore, we designated here the gathering *Lorentz 355* deposited in GOET from “Auf Weiden bei San Francisco” as the lectotype of *R. senna* fo. *minor*.

Rhynchosia senna is characterized mainly by the prostrate stems, leaflets size and falcate fruits (Fig. 15 K–L). It is morphologically similar to *R. diversifolia* by its fasciculate inflorescence. The characteristics that distinguish them are listed in the taxonomic notes of this species.

Reproductive phenology:—Flowering from January to March, June, August and October to December; fruiting from January to May, July, August, November and December.

Distribution and habitat:—*Rhynchosia senna* occurs in Argentina, Brazil, southern Ecuador and Uruguay in South America (Fig. 16) and also in Mexico and southern United States. It can be found in rocky and shrub fields, roadsides, clay soils and dry fields.

Conservation status:—Least Concern (LC). *Rhynchosia senna* is assessed as LC in IUCN’s Red List (Groom 2012; IUCN 2022). As *R. diversifolia*, this species has a wide distribution in central South America and Mexico.

Specimens Examined:—**ARGENTINA.** Buenos Aires: Part. Torquinst, 10 km SE de Saldungaray por Ruta Prov. 72 hacia Dique Paso de Piedras, Arroyo Sauce Corto, s.d. (fr.), *G. Seijo 1348* (MBM); Sierra de la Ventana, February 1914 (fr.), *A. C. Scala s.n.* (SP). Catamarca: Andalgalá, November 1916 (fr.), *P. Jörgensen 1434* (SP). Chaco: Laguna Blanca, 28 December 1944 (fl./fr.), *Aguilar 108* (NY). Córdoba: Dep. Capital, Alrededores de la ciudad de Córdoba, cerca del camino a Alta Gracia, 26 November 1949 (fl./fr.), *A. T. Hunziker 8110* (MBM); Ischilín, 24 October 1971 (fl.), *T. M. Pedersen 9966* (MBM); Punilla, Ruta provincial 14,3 km NE de Copina, 12 December 1999 (fl./fr.), *G. Seijo 2032* (NY, SP); Valle Hermoso, 17 December 2009 (fl.), *J. J. Cantero 5998* (UEC). Corrientes: Curuzú Cuatiá, RP-25, by the bridge on the A Pelado, 23 November 1990 (fl./fr.), *T. M. Pedersen 15627* (MBM, NY). Entre Ríos: Diamante, suburbios, 27 January 1981 (fl.), *N. Troncoso & N. Bacigalupo 3011* (SP); Fedaración, Cantera Chaviyú, 24 November 1976 (fl./fr.), *N. Troncoso et al. 1365* (SP); Gualeguaychú, aerodromo Gualeguaychú, 17 April 1965 (fr.), *A. Burkart et al. 25738* (RB). La

Pampa: Sierra de Lihuel Calel, 6 November 1972 (fl.), *L. A. Mroginski & A. Fernandez* 22616 (MBM). Salta: Metán, 24 January 2002 (fl./fr.), *G. Seijo et al.* 2819 (MBM). San Luis: Chacabuco, La coma, 16 February 1944 (fl.), *Varela* 552 (NY). Tucuman: Capital, Parque 9 de Julio, 08 November 1923 (fr.), *Schreiter* 4071 (NY); Tafi del Vale, nos campos alrededores, 03 November 1960 (fl./fr.), *D. Andrade Lima* 60-3583 (IPA, MBM). **BOLIVIA.** La Paz: Murillo, La Paz – La Florida ca. 17 kms., Rio Abajo, Huajchilla, 11 May 1986 (fr.), *St. G. Beck et al.* 12478 (NY). Tarija: Cercado, cerca Concepcion, 19 February 1986 (fr.), *E. Bastión* 782 (NY). **BRAZIL.** Rio Grande do Sul: Alegrete, próximo a Hoemania, 18 February 1962 (fl.), *V. S. Fagundes* 2678 (BLA); Alto Alegre – Pedro Osório, 06 December 1991 (fr.), *L. A. Z. Machado* 1589 (SMDB). Bagé, 20 November 1993 (fr.), *N. R. Bastos* 361 (PACA); *ibid.*, 24 km da cidade, estrada Bagé/Serrilhada, 08 December 1990 (fl./fr.), *L. A. Z. Machado* 714 (SMDB); *ibid.*, rumo a Dom Pedrito - BR 293, perto da ponte, 11 November 1995 (fl.), *S. T. S. Miotto* 1979 (FLOR); Bossoroca, 12 January 1991 (fl.), *L. A. Z. Machado et al.* 845 (SMDB); Caçapava do Sul, 13 December 1982 (fl./fr.), *D. B. Falkenberg* 15 (FLOR); *ibid.*, 14 December 1982 (fl.), *D. B. Falkenberg s.n.* (FLOR); *ibid.*, 250 m de altitude, 21 January 1994 (fl./fr.), *D. B. Falkenberg et al.* 6464 (FLOR); *ibid.*, 18,5 km S de Caçapava do Sul (RS 357), 11 November 2006 (fl./fr.), *L. P. Queiroz* 12394 (INPA); *ibid.*, em campo úmido, 6 December 1993 (fr.), *N. R. Bastos* 386 (PACA); *ibid.*, Irapuá, Cerro da Vigia, January 1987 (fr.), *L. A. Z. Machado* 29 (SMDB); *ibid.*, Vila Progresso, 04 November 1989 (fr.), *L. A. Z. Machado* 359 (SMDB); Campanha, January 1972 (fl./fr.), *Pott* 128 (BLA); Ibaré, rumo a Bagé, 30 March 1991 (fl./fr.), *Machado et al.* 1427 (SMDB); Lavras do Sul, 23 July 1993 (fl.), *N. Bastos s.n.* (PACA); *ibid.*, 07 December 1993 (fr.), *N. R. Bastos* 421 (PACA); Quaraí, Rio Garopa para Quaraí, 14 January 1941 (fl./fr.), *B. Rambo s.n.* (PACA); Rio Pardo para Pantano Grande, August 1933 (fl./fr.), *Barreto* 32 (BLA); Santana do Livramento, November 1916 (fl./fr.), *E. F. Xavier s.n.* (BLA); Santiago, Capão do Cipó, Assentamento Santa Rita, 09 March 1989 (fl./fr.), *L. A. Z. Machado* 184 (SMDB); *ibid.*, 12 January 1991 (fl./fr.), *Machado et al.* 820 (SMDB); São Sepé, Colônia do Santa Barbara, 23 February 1989 (fl./fr.), *L. A. Z. Machado s.n.* (SMDB); Tupanciretã, Espinilho Grande, 11 January 1991 (fl.), *L. A. Z. Machado et al.* 800 (SMDB). **PARAGUAY.** Boquerón: Col. Menno, 5 km al W de Cascabel, (km 160 del FFCC), 10 December 1992 (fl./fr.), *A. Krapovickas & C. L. Cristobal* 4303 (NY). **URUGUAY.** Artigas: Loc. 3 km del desvio a T. Gomensoro, 10 December 1995 (fl./fr.), *V. S. Neffa et al.* 226 (NY). Salto: Salto, Cuchilla de Areranguá, along ROU-31, between km 160 from Salto and Los Orientales, 24 January 1965 (fl./fr.), *T. M. Pedersen* 16233 (MBM).

Additional Specimens Examined:—**ECUADOR.** Azuay, Valley of the Rio Paute, between Paute and Cuenca, 26 March 1954 (fl.), *W. H. Champ* 2325 (F, US). **MEXICO.** Querétaro de Arteaga: Querétaro, Camino a Los Cues, 28 June 1982 (fl.), *F. Ramos & M. Souza* 1813 (MBM). **UNITED STATES.** Texas, Comanche Spring; New Braunfels, July 1850 (fl.), *F. J. Lindheimer* 784 (US).

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Figures and Table

TABLE 1. Morphological characteristics that distinguish *R. erythrinoides*, *R. melanocarpa* and *R. nainceckensis*

	Stipules	Stipels	Pedicel	Inflorescence	Arrangement of vesicular glands on the leaflets
<i>R. erythrinoides</i>	Deciduous	Absent	1–2 mm long	6.5–25 cm long	On both surfaces
<i>R. melanocarpa</i>	Deciduous	Present	2–4 mm long	5–30 cm long	Just on abaxial surface
<i>R. nainceckensis</i>	Persistent	Absent	1–1.5 mm long	2.7–3.5 cm long	Just on abaxial surface

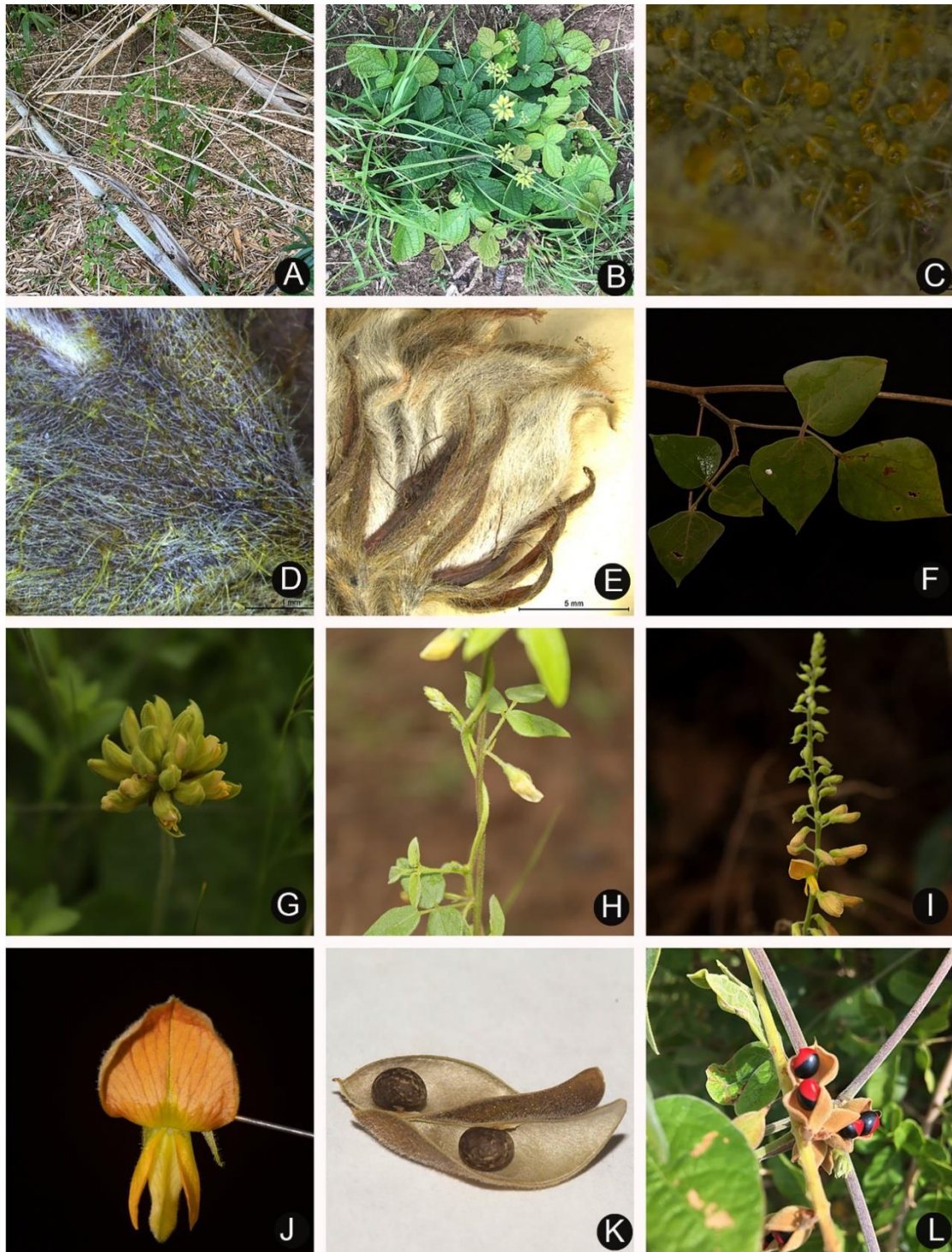


FIGURE 1. Morphological characteristics of South American *Rhynchosia* species. A. Twining stems in *Rhynchosia edulis*. B. Prostrate stems in *Rhynchosia corylifolia*. C. Vesicular glands on the calyx of *R. balansae*. D. Bulbous-based trichomes on the calyx of *R. schomburgkii*. E. Cinereous indument covering the fruit of *R. leucophylla*. F. Trifoliolate leaf of *R. melanocarpa*. G. Corymbiform inflorescence of *R. corylifolia*. H. Fasciculate inflorescence of *R. senna*. I. Racemose inflorescence of *R. melanocarpa*. J. Papilionaceous flower of *R. melanocarpa*. K. Legume fruit with unicolor seeds of *R. minima*. L. Legume fruit with bicolor seeds of *R. phaseoloides*. (Photos: A–E by L.M.P.A. Bezerra and F–L by T.C. Monteiro).

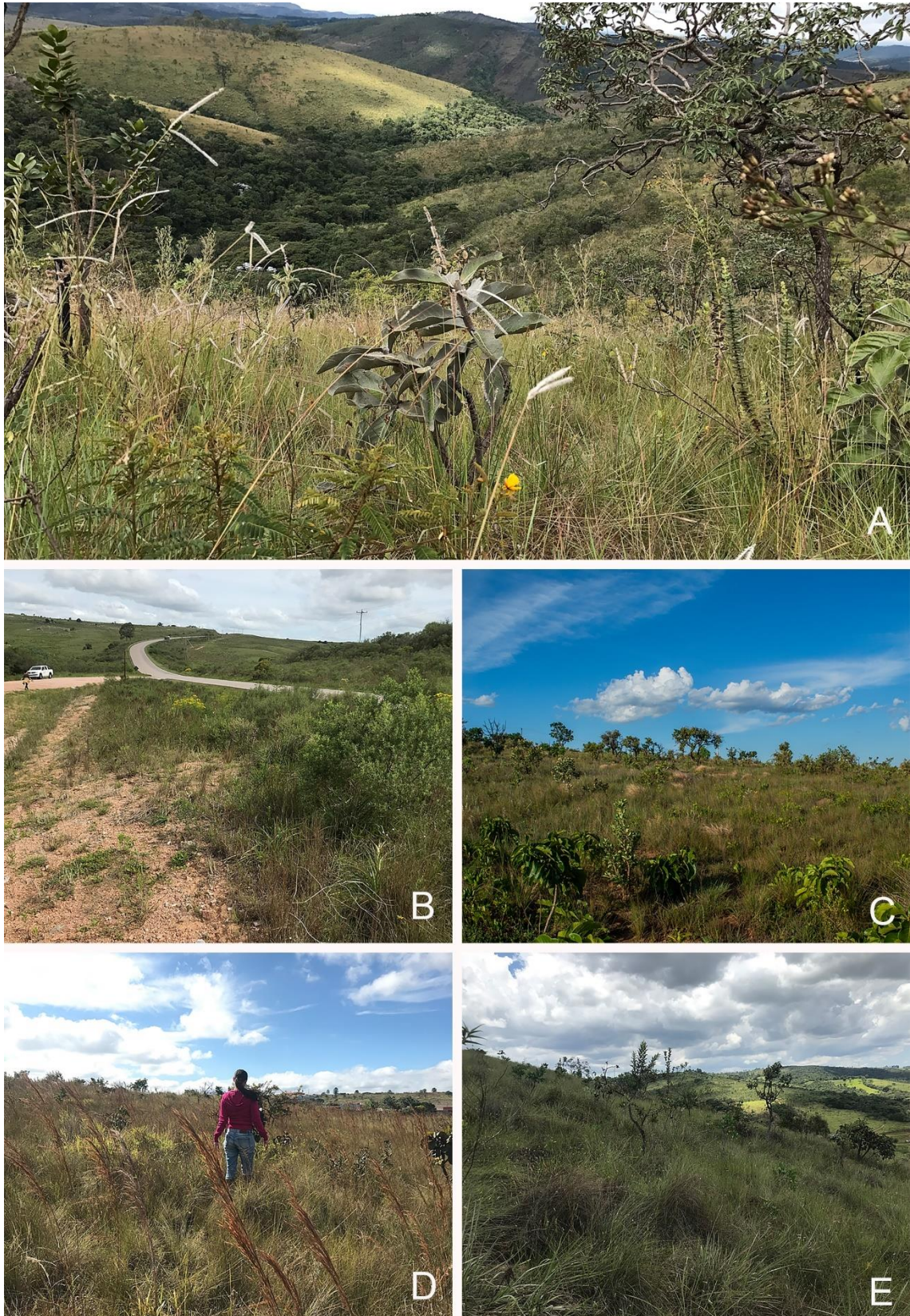


FIGURE 2. Habitat of *Rhynchosia* species in Brazil. A, E. Grasslands and bushy woodland in Cachoeira do Campo, Minas Gerais state, Brazil. B. Sandy soil field in Rio Grande do Sul state, Brazil. C, D. Grasslands and bushy woodland in Botucatu, São Paulo state, Brazil. (Photos: A, B, E by L.M.P.A. Bezerra and D, E by T.C. Monteiro).

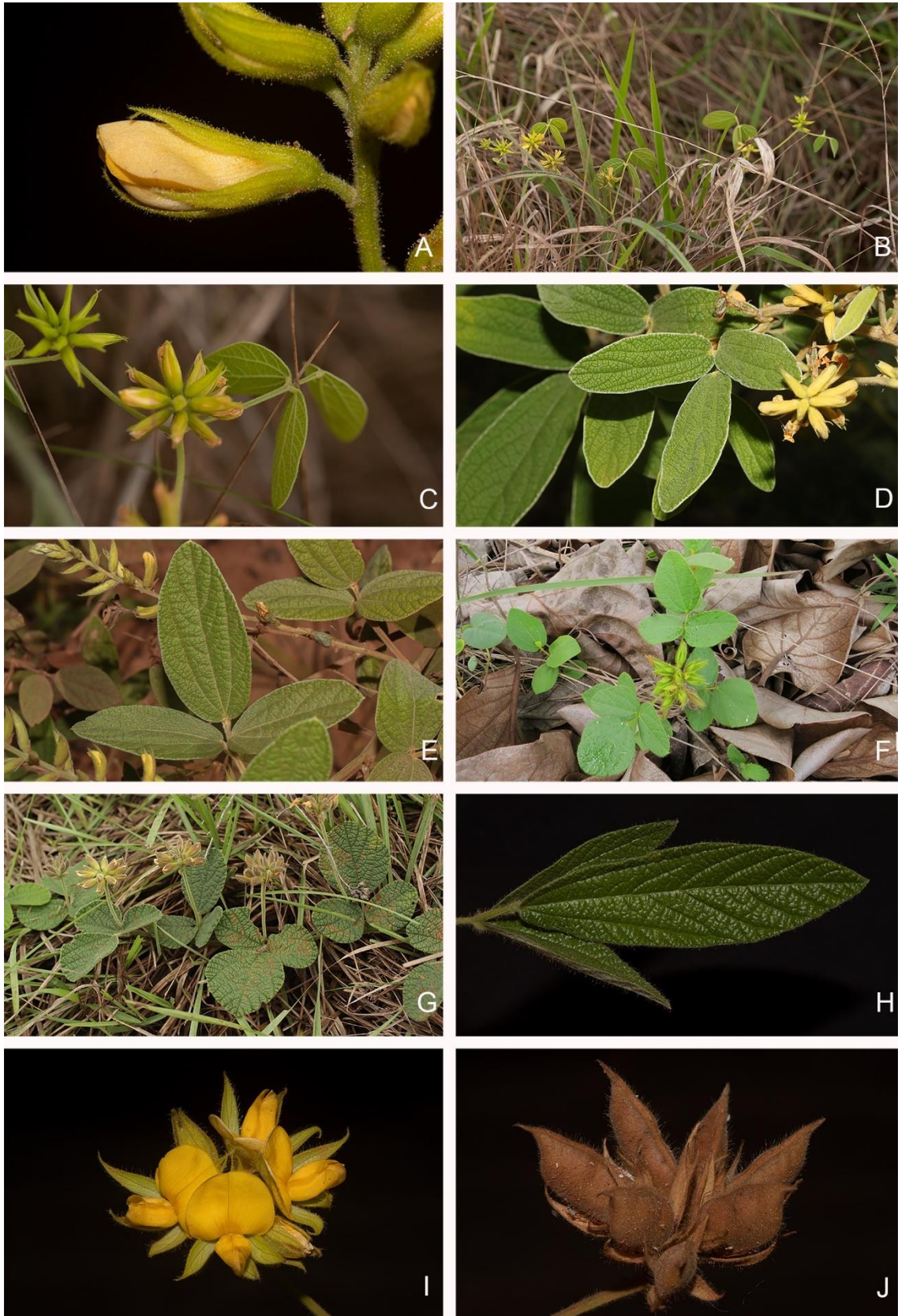


FIGURE 3. *Rhynchosia* species from South America. A–C. *R. arenicola*. D, E. *R. balansae*. F. *R. clausenii*. G–J. *R. corylifolia*. (Photos: A–C, G–J by T.C. Monteiro; D, E by R. Ripley and F. by C. Martins).

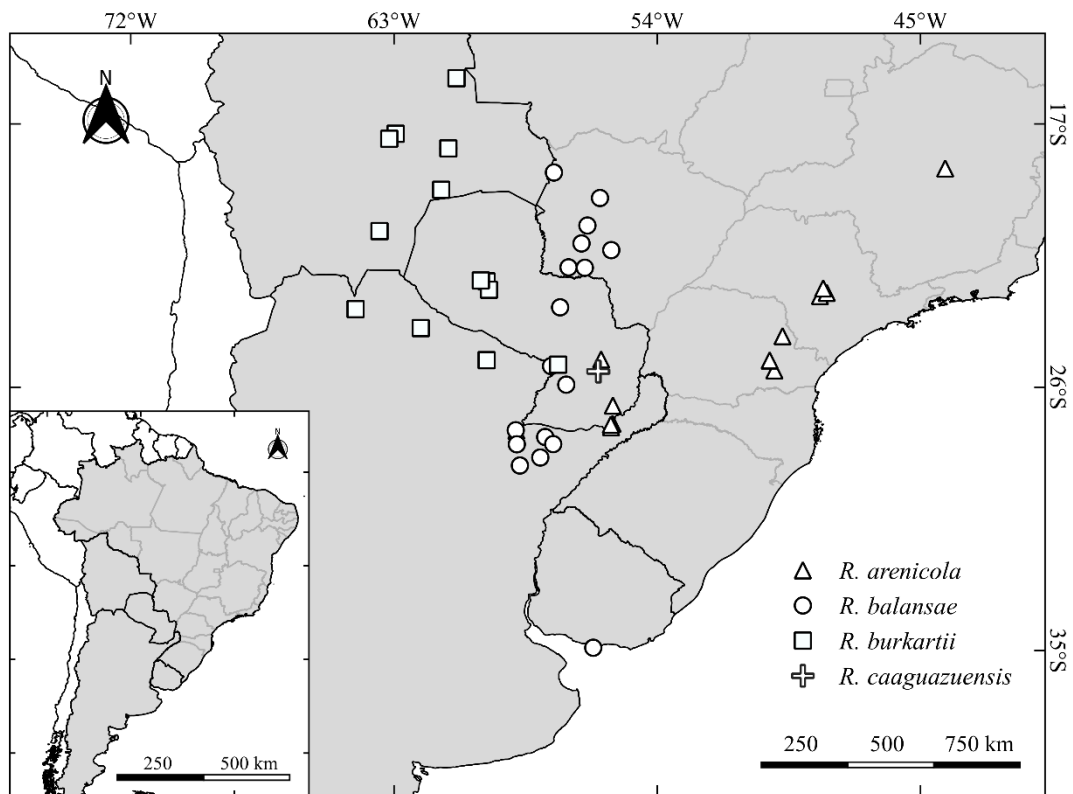


FIGURE 4. Geographical distribution of *Rhynchosia arenicola*, *R. balansae*, *R. burkartii* and *R. caaguazuensis* in South America.

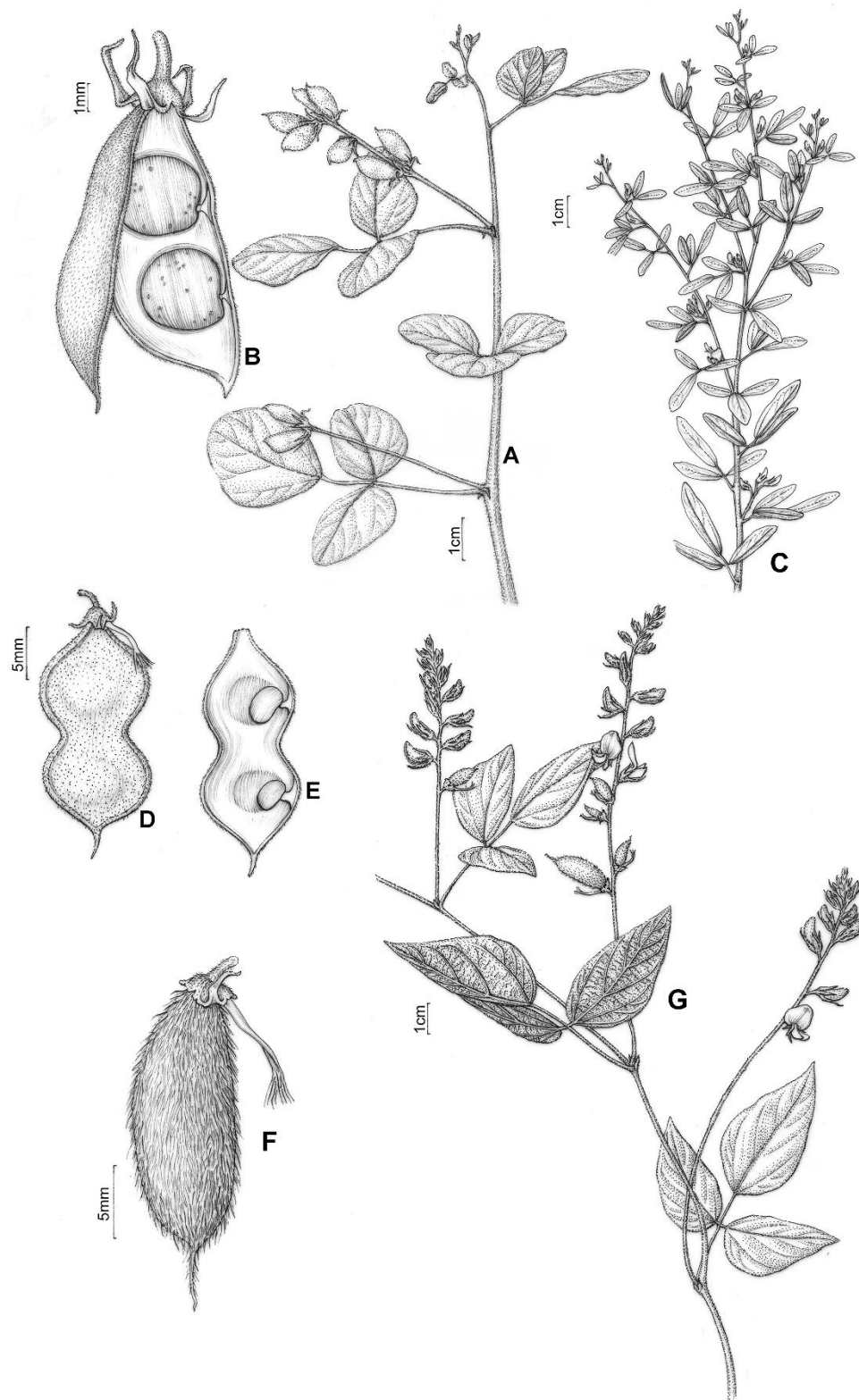


FIGURE 5. Detailed structures of *Rhynchosia* species. A–B. Portion of the stem and detailed fruit of *R. burkartii*. C. Stem of *R. caaguazuensis* showing the leaflets shape and inflorescences. D–E. Fruit of *R. erythrinoides*. G, F. Portion of the stem and detailed fruit of *R. mantaroensis* var. *cuprinervia*. (Illustrated by Klei Souza).

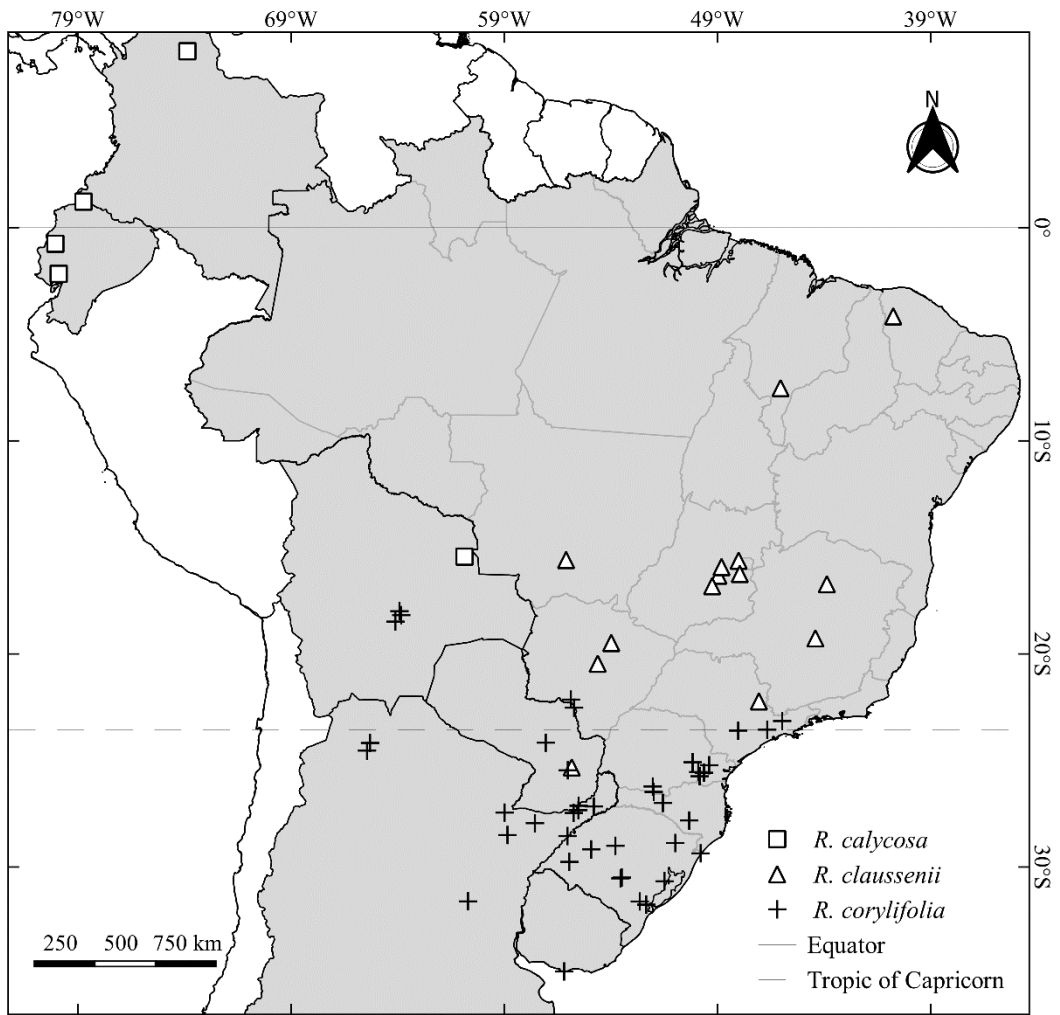


FIGURE 6. Geographical distribution of *Rhynchosia calycosa*, *R. clausenii* and *R. corylifolia* in South America.

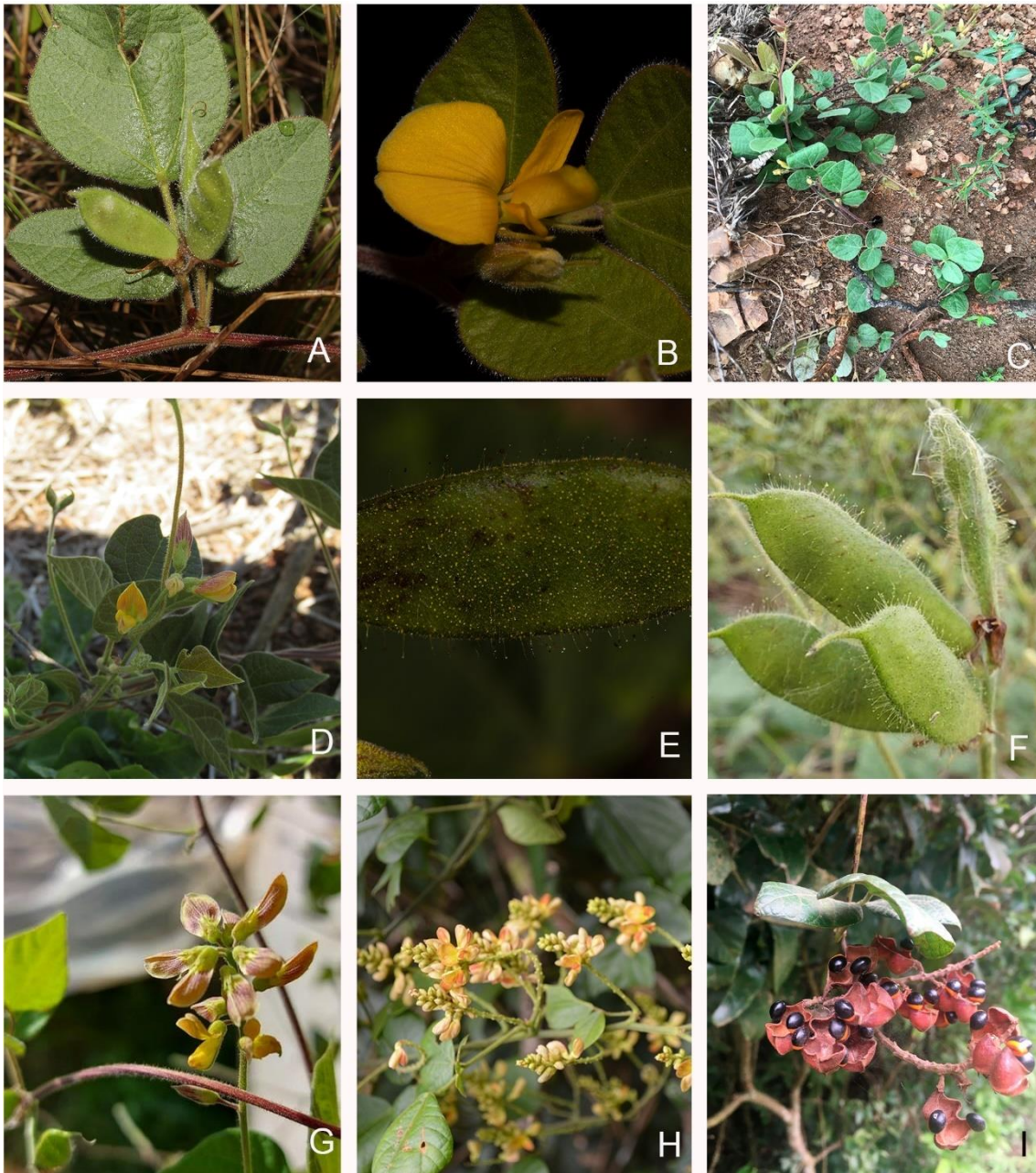


FIGURE 7. *Rhynchosia* species from South America. A–C. *R. diversifolia*. D–G. *R. edulis*. H–I. *R. erythrinoides*. (Photos: A, B, E by T.C. Monteiro; C by L.M.P.A. Bezerra; D, F, G by D. S. Gissi and H, I by N. R. Marcial).



FIGURE 8. Geographical distribution of *Rhynchosia diversifolia*, *R. edulis* and *R. erythrinoides* in South America.

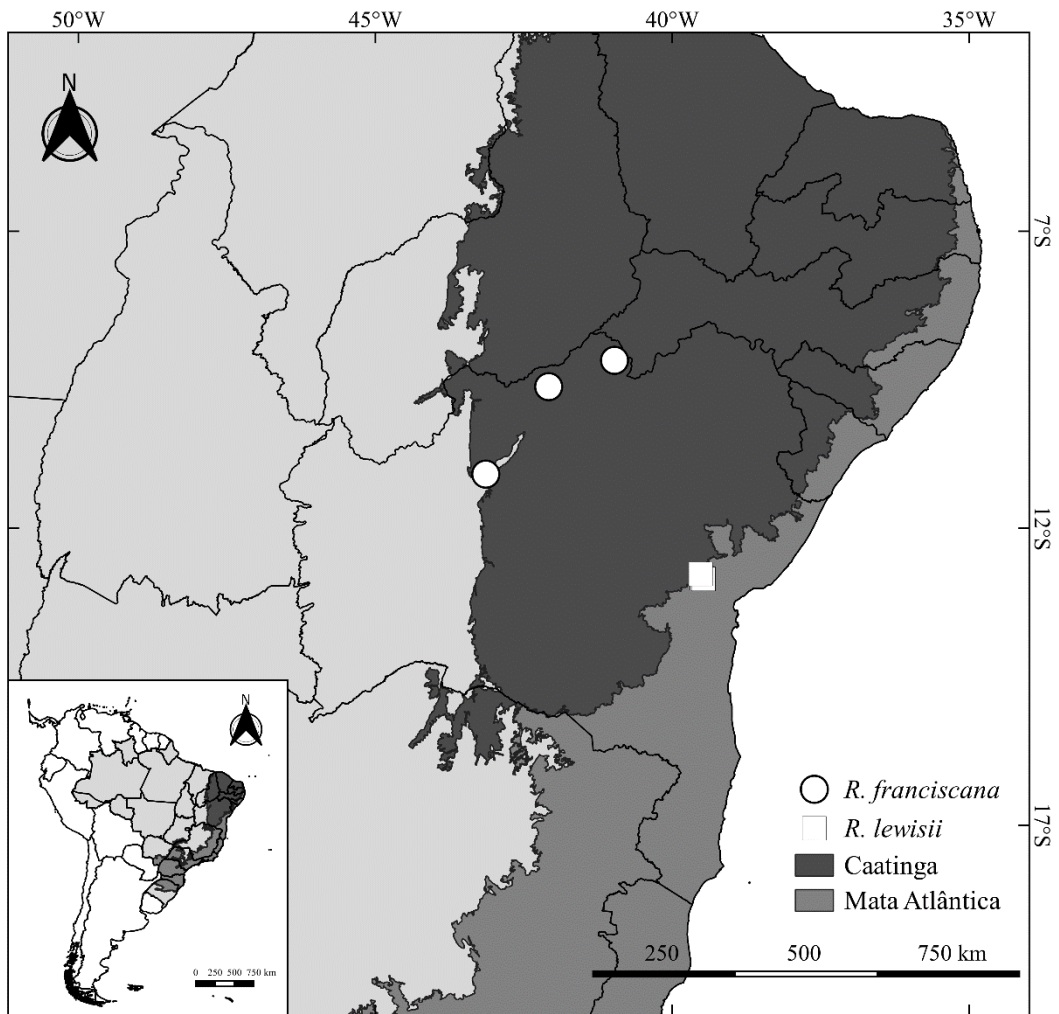


FIGURE 9. Geographical distribution of *Rhynchosia franciscana* and *R. lewisii*, both species endemic to Bahia state, Brazil.

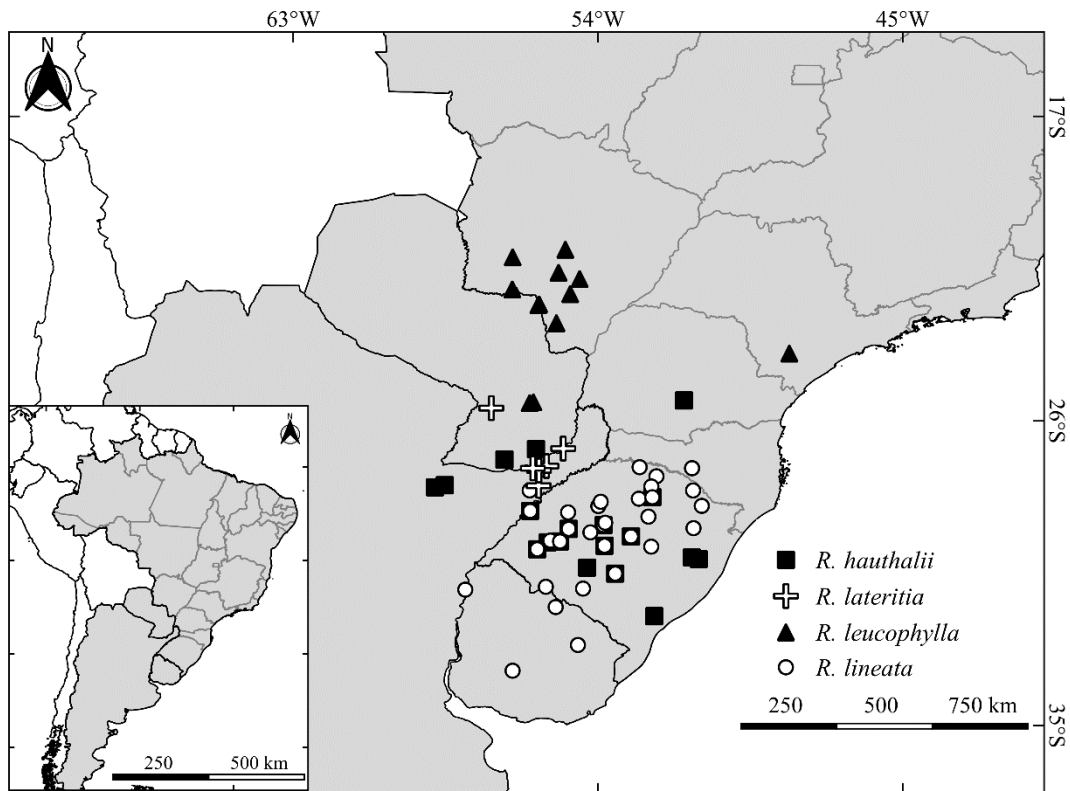


FIGURE 10. Geographical distribution of *Rhynchosia hauthalii*, *R. lateritia*, *R. leucophylla* and *R. lineata* in South America.

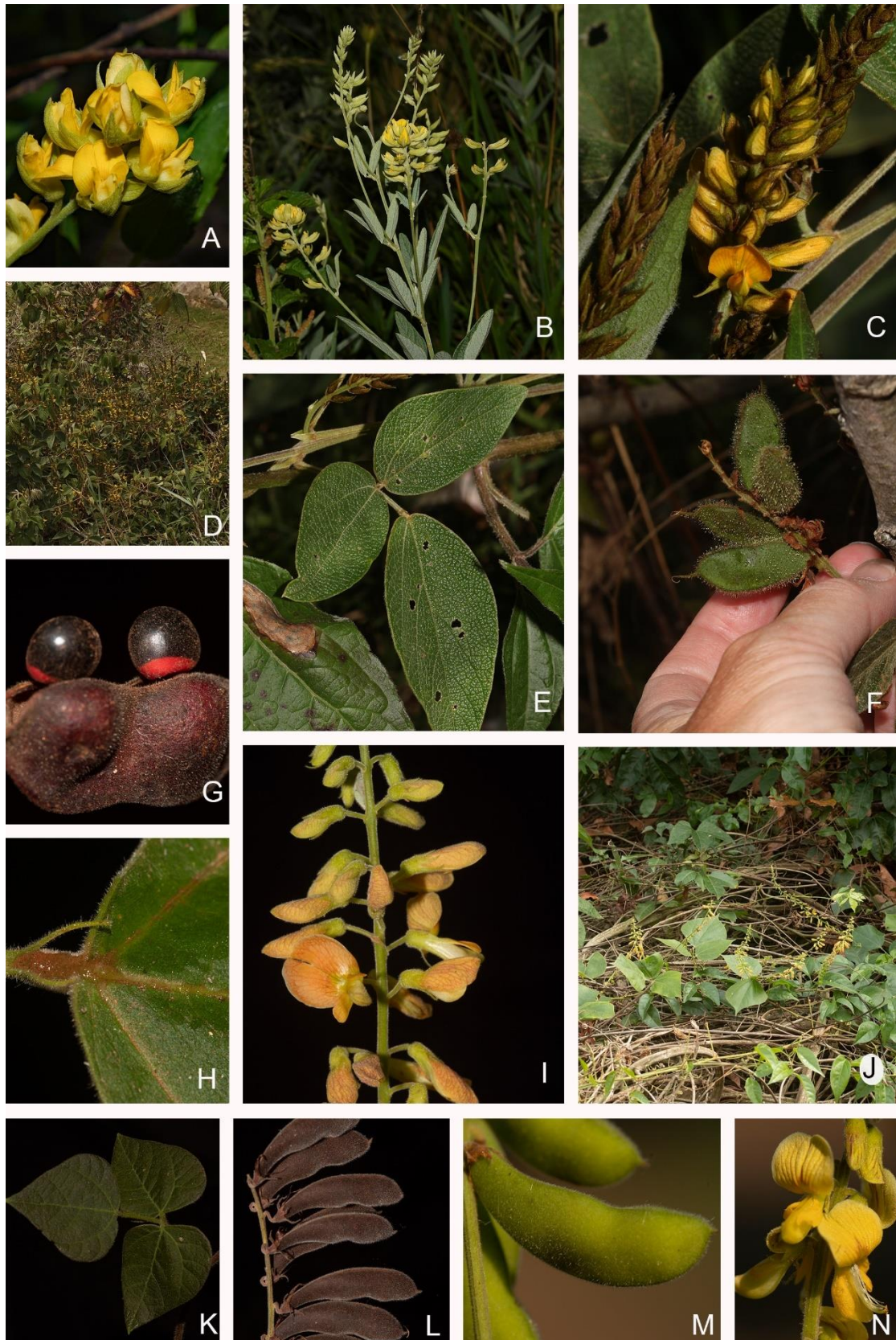


FIGURE 11. Photographs of *Rhynchosia* species. A, B. *R. lineata*. C–F. *R. mantaroensis* var. *cuprinervia*. G–J. *R. melanocarpa*. K–N. *R. minima*. (Photos: A, B by A. Mailhos; C–F by R. Ripley and G–N by T. C. Monteiro).

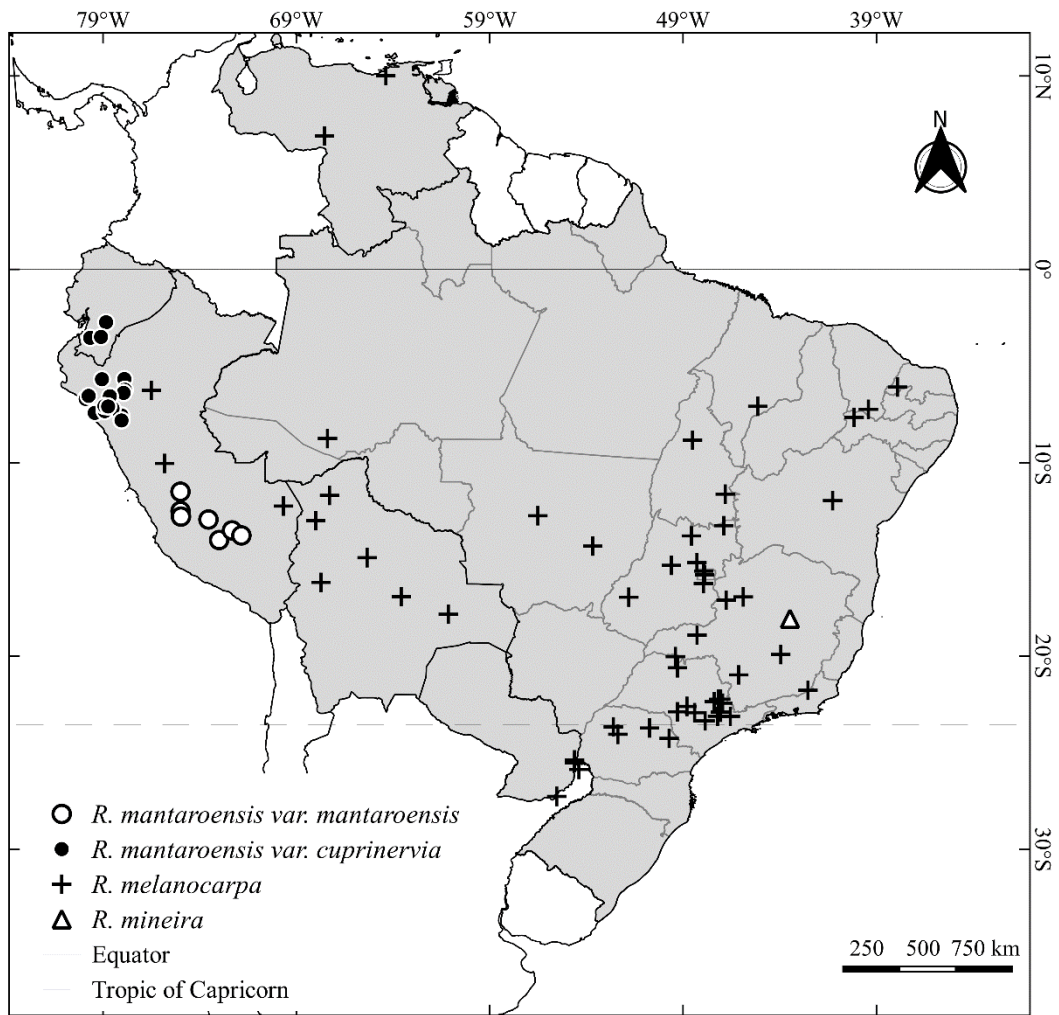


FIGURE 12. Geographical distribution of *Rhynchosia mantaroensis* var. *mantaroensis*, *R. mantaroensis* var. *cuprinervia*, *R. melanocarpa* and *R. mineira* in South America.

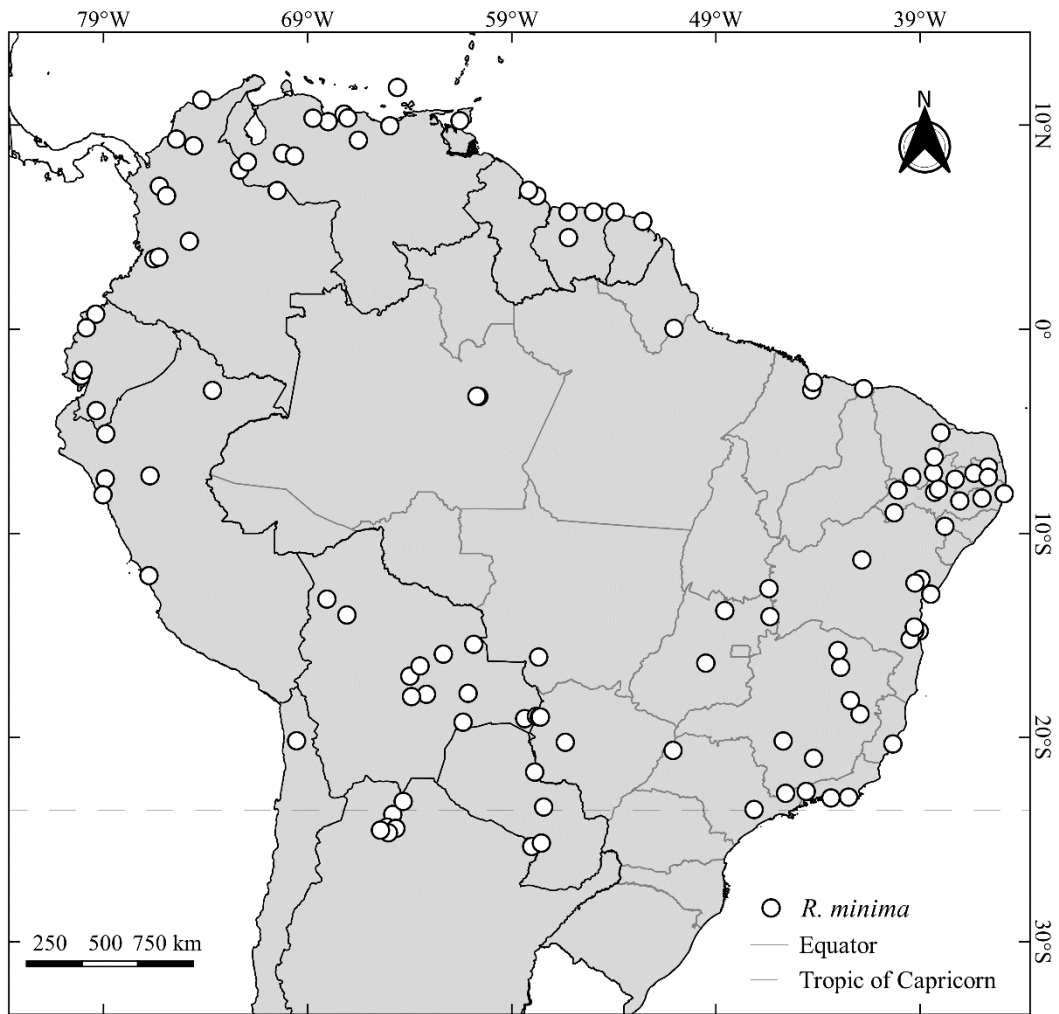


FIGURE 13. Geographical distribution of *Rhynchosia minima* in South America.

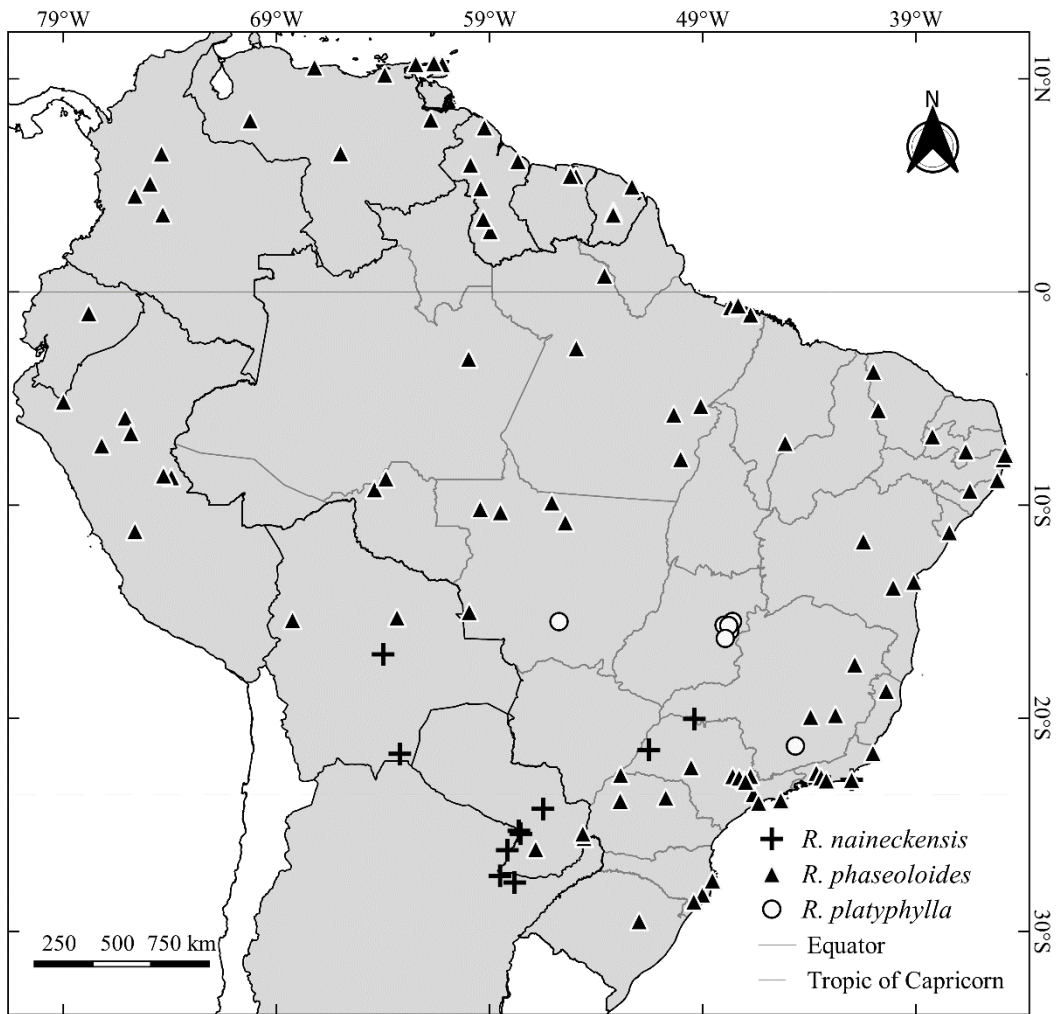


FIGURE 14. Geographical distribution of *Rhynchosia naineckensis*, *R. phaseoloides* and *R. platyphylla* in South America.



FIGURE 15. Photographs of *Rhynchosia* species. A–C. *R. phaseoloides*. D. *R. platyphylla*. E–H. *R. reticulata*. I–J. *R. schomburgkii*. K–L. *R. senna*. (Photos: A, E–H, L by L. M. P. A. Bezerra; B, C, K by T. C. Monteiro; D by C. Martins and I–J by A. P. Fortuna-Perez).

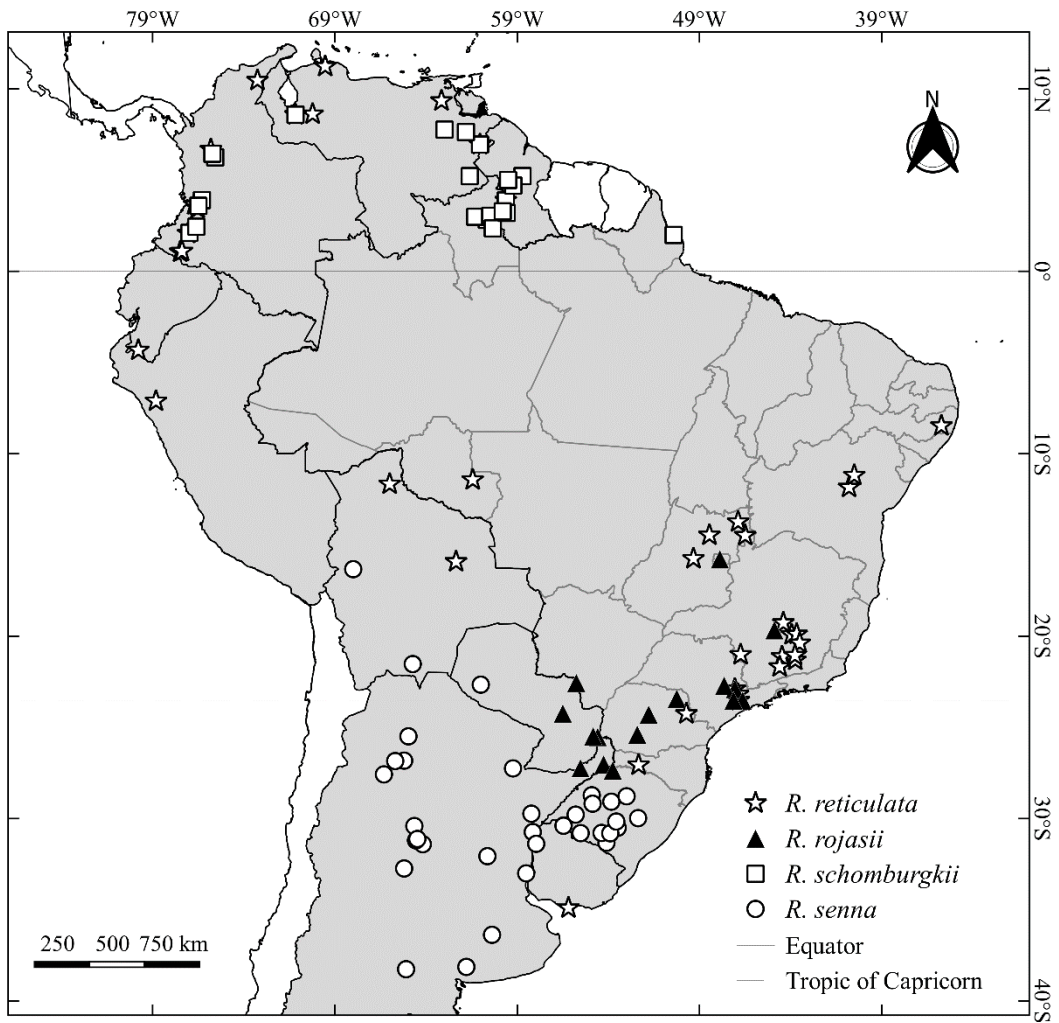


FIGURE 16. Geographical distribution of *Rhynchosia reticulata*, *R. rojasii*, *R. schomburgkii* and *R. senna* in South America.

Chapter II: Phylogeny of the remarkable genus *Rhynchosia* Lour. (Leguminosae, Papilionoideae, Phaseoleae)

Abstract

Rhynchosia is the largest and most diverse genus of the ten traditionally circumscribed in the subtribe Cajaninae, a very important and representative subtribe of Phaseoleae. This genus comprises ca. 230 species, being Africa and American continent its two main centers of diversity. Although plants in *Rhynchosia* exhibit different habits, a diverse leaf and flower morphology, inflorescences racemose, paniculate, corymbiform or fasciculate and legume fruit with two seeds; its circumscription has always been hampered by the uniformity of some taxa, as well as the similarity with others representatives of Cajaninae. Recent molecular studies support the monophyly of the subtribe and show a poly and/or paraphyletic *Rhynchosia*. However, as it included a low sampling of *Rhynchosia* and Cajaninae taxa as a whole, these results have not been clarified. Here we present a phylogeny of the genus with a denser taxon sampling of *Rhynchosia* and the largest sampling of Cajaninae members performed so far, covering all its geographical distribution. In order to do this, Bayesian and Maximum Likelihood phylogenetic analysis assembled with plastid regions (*rpl32-trnL* and *trnQ-5' rps16* intergenic spacers) and ITS were performed. Our results corroborate the previous studies, supporting a monophyletic Cajaninae and a polyphyletic *Rhynchosia*, which emerged as six different lineages, one of them represented just by the type species of the genus with other Asian species. This study elucidates the evolutionary history of *Rhynchosia* and clarify the infrageneric relationships as well as the generic relationships among Cajaninae taxa. In view of the results presented, a new classification proposal that reflects the natural relationship between the groups is being carried out in order to better circumscribe the taxa of *Rhynchosia* and the entire subtribe.

Introduction

Cajaninae is the most representative subtribe of Phaseoleae (Leguminosae, Papilionoideae) and also stands out for including members of great economic importance since its included significant cultivated crop as *Cajanus cajan* (L.) Huth (Jaca 2017). It was traditionally circumscribed in 10 genera: *Adenodolichos* Harms, *Bolusafra* Kuntze, *Cajanus* DC., *Carrissoa* Baker f., *Chrysoscias* E. Mey., *Dunbaria* Wight & Arn., *Paracalyx* S.I. Ali, *Flemingia* Roxb. ex W.T. Aiton, *Eriosema* (DC.) Desv., and *Rhynchosia* Lour. (Schrire 2005), but the genus *Chrysoscias* was recently synonymized in *Rhynchosia* (Manyelo 2014).

Rhynchosia is the biggest genus of Cajaninae, comprising ca. 230 species. This genus together with *Eriosema* are the only of the subtribe that exhibits a pantropical distribution, with Africa and the American continent being the main distribution centers, the others genera are exclusive to the Old World (Schrire 2005; Gear 1970; Cândido 2020). According to molecular and morphological data, these genera are closely allied (Bruneau et al. 1995; Gear 1978; Kajita et al. 2001; Egan et al. 2016; LPWG 2017; Candido et al. 2020).

Morphologically, *Rhynchosia* is characterized by having herbaceous to subshrub habit, with growth forms that vary from twining to erect; leaves unifoliolate to trifoliolate with a diverse morphology; inflorescence that can surpass or not the length of the leaf, be racemose, paniculate, corymbiform or fasciculate, axillary to terminal, with yellow flowers; calyx 5-lobed, the lobes can exceed the corolla in length or not; and legume fruit with two seeds (Fig. 1; Gear 1978; Bezerra et al. 2019). The circumscription of *Rhynchosia* has always been hampered by the uniformity of some taxa, as well as the similarity with others representatives of Cajaninae, one of the most uniform subtribes of Phaseoleae. In view of this resemblance, a number of taxonomic studies indicate that, as *Chrysoscias*, the genera *Bolusafra* and *Carrissoa* should also be recognized as synonym of *Rhynchosia* (Fig. 1; Lackey 1981; Schrire 2005).

Molecular studies recognized Cajaninae as monophyletic (Egan et al. 2016, LPWG 2017, Cândido et al. 2020). The recent phylogeny conducted by Candido et al. (2020) were the most complete molecular study that includes representatives of Cajaninae performed so far. In this study *Rhynchosia* emerged as paraphyletic, but as the work focused on the *Eriosema* phylogeny, it was used a big sample of this genus but a smaller sample of the other Cajaninae members. So far, no phylogenetic studies addressing the whole genus *Rhynchosia* have been carried out, so its precise circumscription as well as the relationships between the Cajaninae representatives remains poorly understood.

In this work, we present the most comprehensive molecular phylogeny of the vast genus *Rhynchosia* with a denser taxon sampling of all representatives of Cajaninae, except for the monospecific genus *Carrissoa*. In view of this, this study aims (1) to test the paraphyletic status of *Rhynchosia* as well as clarify the infrageneric relationships; (2) to clarify the generic relationships among Cajaninae genera; and (3) to support a future new classification proposal for the Cajaninae subtribe.

Material and Methods

Taxon Sampling

In this study were included nine of the ten genera traditionally recognized in the Cajaninae subtribe. Efforts to sequence the monospecific genus *Carrissoa* were unsuccessful, since none of our attempts at sequencing it has succeeded. The Cajaninae members sampled cover the entire geographic and ecological range of the subtribe and were represented by the following accessions: *Adenodolichos* (4), *Bolusafr*a (4), *Cajanus* (10), *Chryso*scias (3), *Dunbaria* (5), *Eriosema* (99), *Flemingia* (8), *Paracalyx* (7) and *Rhynchosia* (136). We also included one species of the genera *Centrosema* (DC.) Benth., *Camptosema* Hook. & Arn., and *Galactia* P. Browne, all members of the Phaseoleae tribe, for rooting purposes.

DNA extraction, amplification and sequencing

Total DNA was obtained from fresh leaves collected in the field and stored in silica gel and from herborized material obtained from specimens of national and foreign herbaria. For plant extraction we used the NucleoSpin plant II kit (Macherey-Nagel, Düren, Germany) according to the manufacturer's protocol with a modified protocol in the beginning of the procedure, adding 4 µL RNase A stock solution and for herbarium materials we left on the heater for about three hours. To fragment the material about 1 cm² of dried leaf of each sample was grounded with pestle in a mortar using liquid nitrogen or in a Geno/Grinder® 2010 machine (SPEX® SamplePrep LLC; for 2 minutes on speed 2).

In our analysis we used the chloroplasts regions *rpl32* and *trnQ* that were amplified using the primers *trnL(UAG)/rpL32-F* and *trnQ(UUG)/rpS16x1* respectively (Shaw et al. 2007); and ITS region (including ITS1 and ITS2 spacer regions and the 5.8S ribosomal subunit) of nuclear ribosomal DNA (nrDNA), primer pairs 17SE and 26SE (Sun et al. 1994). The amplification conditions followed the protocol described by Cândido et al. (2020) and was

checked by agarose gel electrophoresis using 0.8% agarose gels. Its product was purified using the NucleoSpin gel and PCR clean-up kit (Macherey-Nagel, Düren, Germany). DNA sequencing reactions were carried out using purified PCR products as templates for sequencing with the primers used in the amplifications in an automatic sequencer ABI 3730xl (Macrogen Inc., Seoul, South Korea).

Alignment and phylogenetic analysis

The software Geneious version 8.1.9 (<http://www.geneious.com>, Kearse et al. 2012) was used to edit and align forward and reverse sequences. In order to verify the sequence and exclude the possibility of contaminant DNA a BLAST search (<http://blast.ncbi.nlm.nih.gov/>) was performed for all sequences. Regions of DNA were aligned using MAFFT v7.369b (Kato & Standley 2013) under default setting and the alignments were manually revised in AliView v. 1.26 (Larsson 2014). We excluded large indels and gaps using trimAL (Capella-Gutiérrez et al., 2009) with option `-gt=0.65` from all analyses. We used Maximum likelihood (ML) and Bayesian inference (BI) to build a phylogeny as these outperform other methods in terms of tree reconstruction accuracy (Ogden and Rosenberg 2006). For the ML method, we used IQ-TREE v. 1.6.12 (Nguyen *et al.* 2015). ModelFinder (Kalyaanamoorthy *et al.* 2017) selected SYM + G as a best-fit model according to the Bayesian information criterion. We obtained branch support using 1000 Ultra-Fast Bootstraps (Hoang et al., 2018). We used BEAST2 version 2.6.6 (Bouckaert et al. 2019) to infer a temporally calibrated phylogeny under the BI framework. For each dataset (nuclear and chloroplast), we run two independent analyses of 100 million generations each, sampling every 10,000 generations with the uncorrelated lognormal relaxed molecular clock model and the Yule tree prior. We used Tracer version 1.7.2 (Rambaut et al., 2018) to ensure effective sample sizes were higher than 200 for each parameter. We then combined the two sets of posterior trees with LogCombiner with a burnin of 25% in each set. We generated a Maximum clade Credibility Tree with node heights as mean heights using TreeAnnotator version 2.6.6.

Results and discussion

Our analysis comprises 281 accessions, being 274 of *rpl32* and 245 of *trnQ*. All of them were produced by our research team and will be deposited in GenBank [Table 1 (some sequences were donated by the collaborators of this work and the vouchers will be included for publication)]. The analysis assembled with ITS region were not well resolved when ran with

individual datasets. Analyses for combined datasets (ITS, *rpl32* and *trnQ*) are being carried out and will be included for publication.

The subtribe Cajaninae (BS 99%, PP 1.00) and the genera *Adenodolichos* (BS 100%; PP 1.00), *Dunbaria* (BS 100%, PP 1.00), *Eriosema* (BS 100%; PP 1.00), *Flemingia* (BS 95%, PP 1.00) and *Cajanus* (BS 82%, PP 1.00) emerged as monophyletic (Fig. 2). Nevertheless, it also showed a polyphyletic *Rhynchosia* with respect to the genera *Paracalyx*, *Bolusafrax* and *Chrysoscias*.

Our analysis revealed that *Rhynchosia* emerged as six different lineages here called CLADE I, CLADE II, CLADE III, CLADE IV, CLADE V and CLADE VI (Fig. 2). The first one includes the hole big and well supported *Eriosema* (BS 100%, PP 1.00) together with three African species of *Rhynchosia*: *R. versicolor* Baker, from Madagascar, *R. thorncroftii* Burt Davy and *R. clivorum* S. Moore (Fig. 2), both from South Africa.

The second lineage, here represented by CLADE II (Fig. 2), includes representatives of New and Old World *Rhynchosia* species with *Paracalyx* nested (BS 100%, PP 1.00). This lineage revealed a well-supported clade (BS 98%, PP 1.00; Fig. 2; clade A) represented mostly by species currently placed by Grear (1978) in *R.* sect. *Arcyphyllum* (Elliott) Torr. & A. Gray. This section was based on the generic name *Arcyphyllum* and includes exclusively Neotropical species, not being represented in the Old World. It is characterized by having a foliaceous or campanulate calyx which is not marcescent and many times equals or exceeds the corolla in length (Fig. 1B), but in few species the lobes are narrower and just the ventral one exceeds the laterals (Grear 1978).

The CLADE II also revealed that Neotropical species currently placed by Grear (1978) in *R.* sect. *Copisma* (E. Mey.) Endl. emerged in two different lineages (Fig. 2; groups B, D). This section is characterized by the calyx with small and subulate lobes that does not exceed the corolla in length and by the mostly twining stems and trifoliolate leaves (Fig. 1A; Grear 1978). As the species in this section are not morphologically consistent, Grear (1978) established five informal series in order to better circumscribe them.

The first lineage (BS 92%; Fig. 2, clade B) emerged as sister of *R.* sect. *Arcyphyllum* clade (BS 76%; Fig. 2, clade A) and is represented mostly by species that matches the informal series two of Grear (1978). Species in this series present the stems twining, pods deeply to shallowly constricted and seeds bicolored and tending to remain attached to placenta by funicle after dehiscence (Grear 1978).

The second lineage of Neotropical *R. sect. Copisma* species is an unsupported group (Fig. 2; group D) that includes species from different series raised by Grear (1978). However, it also revealed that species placed in series one (*R. hauthalii* (Kuntze) Grear, *R. edulis* Griseb., *R. mantaroensis* J.F. Macbr. and *R. parvifolia* DC.) are closely related (BS 100%; Fig. 2, group D). This series is characterized mainly by having stems prostrate or twining, pods oblong-elliptic or oblong-obovate or seeds black, brown, grey or mottled (Grear 1978).

We can also observe two lineages predominantly of Old World *Rhynchosia* species revealed in the CLADE II (Fig. 2; clades C, E). The first one although it is a lineage with strong support (BS 99%, PP 1.00; Fig. 2, clade C), the species in this clade exhibit a wide distribution across the Africa continent (and also in the Neotropical region in the case of *R. latifolia* Nutt. ex Torr. & A. Gray) and a great morphological variation. Thus, in these respects this is not a coherent clade.

Paracalyx, one of the genera of the Cajaninae subtribe, comprises six species that were originally described as *Cylista* Aiton. This genus emerged embedded with mostly Old World *Rhynchosia* representatives in a strong clade (BS 78%, PP 0.99; Fig. 2, clade E). Species of *Paracalyx* occurs in Africa and Asia continent and morphologically resembles *Rhynchosia*, since it can be twining herbs or erect shrubs, with leaves pinnately 3-foliolate and leaflets with yellowish gland-dots beneath; flowers in axillary racemes; pod compressed also 1–2-seeded (Thulin 1993). However, the latter differs by the calyx lobes, which are greatly expanded and papery after flowering (Fig. 1 G; Moteetee 2006).

The CLADE III revealed that the species originally placed in the genus *Chrysoscias* emerged together with some African *Rhynchosia* and with the monotypic genus *Bolusafr* Kuntze also embedded (BS 100%; PP 1.00; Fig. 2). Some authors already treated *Chrysoscias* as a synonym of *Rhynchosia* (Grear 1978; Germishuizen 2000), but it was also treated as an independent genus (Schrire 2005) or as a section of *Rhynchosia* (Bentham 1862; Baker 1923; Moteetee 2012; Jaca 2018).

In the phylogenetic study carried out by Manyelo (2014) the species of the traditional *Chrysoscias* emerged nested with other African *Rhynchosia* species, and the analysis presented here corroborates this result and that of Cândido et al. (2020). Thus, *Chrysoscias* became to be recognized not in the generic rank, but as a section of *Rhynchosia* (*R. sect. Chrysoscias* Benth. ex. Harv. & Sond.). A recent work carried out by Jaca et al. (2018) clarify the taxonomy of the species placed in the *R. sect. Chrysoscias*, which was circumscribed in 4 species: *Rhynchosia*

angustifolia (Jacq.) DC., *R. chrysoascias* Benth. ex Harv., *R. leucoscias* Benth. ex Harv. and *R. microscias* Benth. ex Harv..

The species placed in *R. sect. Chrysoascias* are restricted to the Core Cape Subregion of the Greater Cape Region of South Africa and are characterized mainly by the golden glands and bulbous-based hairs distributed throughout the plant's body (Jaca et al. 2018). It also stands out by the twining stems, leaflets pinnately trifoliolate with slight to strongly revolute margins, flowers yellow, solitary or in axillary umbels and by the pods compressed to slightly turgid, mucronate and somewhat dehiscent (Jaca et al. 2018).

As the species of the section *Chrysoascias*, the monotypic genus *Bolusafra* is also restricted to Cape Province of South Africa (Moteetee & van Wyk 2006). This genus is characterized mainly by its twining growth habit and viscidulous branches (Moteetee & van Wyk 2006). It resembles *Rhynchosia* since they both have similar growth habit (twining), pinnately trifoliolate leaves with conspicuous veins generally covered with glands beneath and yellow flowers (Moteetee & van Wyk 2006; Jaca 2018). However, they are distinguished by prominent seed arils, turgid and 5–7-seeded fruits in *Bolusafra* vs. seed arils almost absent and 2-seeded fruits in *Rhynchosia* (Schrire 2005; Jaca 2018). Due to the great similarity between these genera, some authors cited *Bolusafra* as “viscid *Rhynchosia*-like vine” (Fig. 1 H–I; Lackey 1981; Moteetee 2006).

In this clade (Fig. 2, CLADE III) it is possible to observe that the group that includes the species of the *R. sect. Chrysoascias* is closely related to a group formed by *R. capensis* Schinz, *R. emarginata* Germish., *R. arida* C.H.Stirt. and by the species currently placed in *R. sect. Polytropia* (*Rhynchosia ferulaefolia* (C.Presl) Benth. ex Harv. and *R. smithiana* Moteetee & Boatwr.). The *R. sect. Polytropia* (Presl) Harv. can be distinguished by the spreading, non-twining and decumbent stems, multi-flowered inflorescences with terminally congested flowers and includes representatives with pedately bipinnate, simply pinnate and pinnately trifoliolate leaves (Moteetee et al. 2014).

The relationship between the representatives of the species included in the section *Chrysoascias*, *Polytropia* and in the genus *Bolusafra* was also revealed in previous studies (Manyelo 2014; Cândido et al. 2020), but with a lower taxa sampling. Beyond some morphological similarities shared by the species of CLADE III, all of them are restricted to Cape Province of South Africa.

The CLADE IV (Fig. 2) comprises species of *Rhynchosia* that occur predominantly in Africa, except for *R. hirta* (Andrews) Meikle & Verdc. (Fig. 1C), which also occur in India and Sri Lanka, and *R. acuminatissima*, which is restricted to countries in Asia and Oceania. The species included in this phylogenetically well resolved clade (BS 100%, PP 1.00; Fig. 2) also exhibit a very varied morphology and therefore were placed in different sections for the African species of *Rhynchosia*.

Our analyses revealed a big clade that we called here CLADE V (BS 92%; Fig. 2). This morphologically heterogeneous group includes a large number of *Rhynchosia* species, all of them exclusive to the Old World [except for *R. minima* (L.) DC. that has a cosmopolitan distribution] distributed mainly in the African continent but also with some representatives in Asia.

In the CLADE VI *Rhynchosia volubilis* Lour., the type species of the genus and here represented by 3 accessions, emerged as a separate clade together with *R. dielsii* Harms (BS 100%, PP 1.00; Fig. 2) and sister to *Dunbaria* (BS 82%, PP 0.98; Fig. 2). *Rhynchosia volubilis* and *R. dielsii* species are restricted to Asia and share the climbing habit, ovate-deltoid to rhomboid leaflets, inflorescences which exceeds the leaf in length and oblong legume slightly constricted between seeds (Fig. 1D).

Dunbaria is a genus that comprises about 20 species with a predominantly Asian distribution, as well as the species mentioned above. It is characterized by the climbing herbs to subshrub habit, leaves pinnately trifoliolate, flowers yellow in axillary pendunculate or almost sessile pseudoracemes and flat-compressed legume fruit slightly depressed between the seeds (Van Der Maesen 1998). These characteristics, as well as the fact that they are commonly found in seasonally dry tropical forests, thickets, scrubs and grasslands; are shared with *Rhynchosia*. However, the mainly difference between them is that of *Dunbaria* representatives present fruits 3–10 seeded (vs. fruits 1–2 seeded in *Rhynchosia*; Grear 1978; Van Der Maesen 1998).

A recent work carried out by Kates et al. (2022) presented the most extensive phylogenomic work in order to reconstruct the evolutionary history of the representatives of the nitrogen-31 fixing clade (NFC). In this work, a large sample of Cajaninae subtribe representatives was used, which included 74 accessions of *Eriosema*, 54 of *Rhynchosia*, 14 of *Cajanus*, seven of *Dunbaria*, ten of *Flemingia* and six of *Adenodolichos*. As the phylogenetic tree presented by Kates et al. (2022) includes genomic data from more than 12 thousand

herbarium species, it is assumed that an accurate check of the identity of the sampled species has not been carried out. Even so, the results referring to representatives of the Cajaninae subtribe are quite similar to our results presented here.

In the phylogenetic tree of Kates et al. (2022) the genera *Eriosema*, *Femingia* and *Adenodolichos* were resolved as monophyletic. A species of *Dunbaria* emerged separately from the others, together with *Erythrina* L., and *R. aurea* (Willd.) DC. emerged embedded within *Cajanus*, but we believe that may have resulted from misidentified materials. Furthermore, the study of Kates et al. (2022) corroborates our results on the close relationship of *Eriosema* with *R. clivorum* and also supports the Asian species *R. volubilis* *R. dielsii* together with *R. acuminatifolia* Makino, that we did not sample, as a separate clade and sister of *Dunbaria*.

Additionally, Kates et al. (2022) analysis endorsed our results by showing that the species of *R. sect. Arcyphyllum* are closely related, as well as some Neotropical species currently placed in the *R. sect. Copisma*, specially that characterized by presenting bicolored seeds (currently placed in the informal series two of Grear [1978]).

Our study represents the most complete and comprehensive phylogeny of *Rhynchosia* as well as the subtribe Cajaninae as a whole. Our results confirmed the polyphyly of *Rhynchosia* in relation to *Paracalyx*, *Bolusafra* and *Chrysoscias*; and also *R. volubilis*, type species of the genus, emerged as a separate clade together with *R. dielsii*. Furthermore, it elucidated the infrageneric relationships in *Rhynchosia sensu lato* as well as the generic relationships between the subtribe genera.

Final considerations

This study is part of a large project developed by a network of researchers called Cajaninae Phylogeny Working Group. The results presented here, as well as other analyzes that are being carried out, will support a large-scale work that aims a new classification proposal for the Cajaninae subtribe. In the further studies we will also include divergence time analysis to determine the timing of diversification within the subtribe and to explain the biogeographic history.

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Figures and table

Table 1.

Taxa studied with voucher information, locations, and markers.

Taxa	Voucher	Continent	Country	rpl32	trnQ
<i>Adendolichos baumii</i>	M.G. Bingham 14158	African	Zambia		x
<i>Adenodolichos baumii</i>	JP Laveridge 403	African	South Africa	x	x
<i>Adenodolichos punctatus</i>	J Pawek 9896	African	Malawi	x	x
<i>Adenodolichos rhomboideus</i>	EA Robinson 3794	African		x	x
<i>Bolusafra bituminosa</i>	Adolf Hafström	African	South Africa	x	x
<i>Bolusafra bituminosa</i>	Adolf Hafström	African	South Africa	x	x
<i>Bolusafra bituminosa</i>	Adolf Hafström & Gösta Lindeberg	African	South Africa	x	x
<i>Bolusafra bitumosa</i>				x	
<i>Cajanus cajan</i>	OO Miller & JR Johnston 139	American	Venezuela	x	x
<i>Cajanus cajanifolius</i>	L.J.G. van der Maesen 2739	Asian	India	x	x
<i>Cajanus cinereus</i>	Martin J.S. Sands 4590	Oceania	Australia	x	x
<i>Cajanus flavus</i>	CGT Kotschy 266	African	Ethiopia		x
<i>Cajanus marmoratus</i>	J.R. Moconochie 1730	Oceania	Australia	x	x
<i>Cajanus reticulatus</i> var. <i>grandiflora</i>	Verdcourt, Huxley & White 4870	Oceania	Papua New Guinea	x	x
<i>Cajanus rugosus</i>	L.J.G. van der Maesen 4033	Asian	India	x	x
<i>Cajanus scarabaeoides</i>	H Faulkner 3202	African	Tanzania	x	x
<i>Cajanus scarabaeoides</i>	A.N. Egan 13-0733	Asian	Thailand	x	x
<i>Cajanus trinervia</i>	L.J.G. van der Maesen 4159	Asian	Sri Lanka	x	x
<i>Camptosema grandiflorum</i>	L.B. Santos e F.L.S. Ferreira 199	American	Brazil	x	x
<i>Centrosema virgianum</i>	A. Amaral Jr. et al 306	American	Brazil	x	x
<i>Chrysoscias calycina</i>	S.L. Williams 841	African	South Africa	x	x
<i>Chrysoscias grandiflora</i>	H.T. Scharf 1433	African	South Africa	x	x
<i>Chrysoscias parviflora</i>	E. Esterhwysen 13330	African	South Africa		x
<i>Dumbaria vilosa</i>	J. Klackenberg 1123	African	Laos	x	x
<i>Dunbaria bella</i>	Chantaronothai et al 854	Asian	Thailand	x	x
<i>Dunbaria fusca</i>	A.N. Egan 13-0808	Asian	Thailand	x	x
<i>Dunbaria glandulosa</i>	Kai Larsen & Supee S.	Asian	Thailand	x	x

<i>Dunbaria villosa</i>	B.R. Yinger et al. 2634	Asian	South Korea	x	x
<i>Eriosema acuminatum</i>	K Grieve 967	African	South Africa	x	x
<i>Eriosema affine</i>	L.J. Brass 17426	African	Republic of Malawi	x	x
<i>Eriosema afzelii</i>	N Diarra 1391	African		x	x
<i>Eriosema albo-griseum</i>	Anzancot de Menezes 1100	African	Angola	x	x
<i>Eriosema andohii</i>	R Demange 2670	African	Mali	x	x
<i>Eriosema angolense</i>	M. Reekmans 6308	African	Burundi	x	x
<i>Eriosema angustifolium</i>	K Grieve 990	African	South Africa	x	x
<i>Eriosema arachnoideum</i>	S Bidgood & I Darbyshire 5279	African	Tanzania	x	x
<i>Eriosema bauchiense</i>	H. M. Richards 20643	African	Democratic Republic of the Congo	x	x
<i>Eriosema benthamianum</i>	ES Candido 1101	American	Brazil	x	x
<i>Eriosema brevipes</i>	AP Fortuna-Perez 2101	American	Brazil	x	x
<i>Eriosema buchananii</i>	H.G. Troupin 7480	African	Ruanda	x	x
<i>Eriosema campestre</i> var. <i>campestre</i>	ES Candido 1098	American	Brazil	x	x
<i>Eriosema campestre</i> var. <i>delicatula</i>	W Vargas 6	American	Brazil	x	x
<i>Eriosema campestre</i> var. <i>macrophyllum</i>	AP Fortuna-Perez 1436	American	Brazil	x	x
<i>Eriosema campestre</i> var. <i>pubescens</i>	A flores & RS Rodrigues 711	American	Brazil	x	x
<i>Eriosema chrysadenium</i>	F. J. Breteler, 11638	African	Tanzania	x	x
<i>Eriosema congestum</i>	MJ Silva 7396	American	Brazil	x	x
<i>Eriosema cordatum</i>	K Grieve 987	African	South Africa	x	x
<i>Eriosema cordifolium</i>	I. Friis & K. Vollescen 433	African	Southern Sudan	x	x
<i>Eriosema crinitum</i> var. <i>crinitum</i>	ES Cândido et al. 1075	American	Brazil	x	x
<i>Eriosema defoliatum</i>	ES Cândido 1109	American	Brazil	x	x
<i>Eriosema diffusum</i>	J. Bustamante, 202	American	Costa Rica	x	x
<i>Eriosema distinctum</i>	K Grieve 1039	African	South Africa	x	x
<i>Eriosema dregei</i>	A. Albott 9272	African	South Africa	x	x
<i>Eriosema elegans</i>	MJ Silva 7228	American	Brazil	x	x

<i>Eriosema ellipticifolium</i>	C.H. Stirton 1441	African	South Africa	x	x
<i>Eriosema ellipticum</i>	A. R. Torre 265	African	Mozambique	x	x
<i>Eriosema englerianum</i>	R. D. Bayliss 10499	African	Zimbabwe	x	x
<i>Eriosema erectum</i>	H. M. Richards 15782	African	Democratic Republic of the Congo	x	x
<i>Eriosema flemingioides</i>	A. Fournier 145	African	Ivory Coast	x	x
<i>Eriosema flexuosum</i>	E. Milne-Redhead & P. Taylor 8920	African	Democratic Republic of the Congo	x	x
<i>Eriosema floribundum</i>	ES Cândido et al. 1090	American	Brazil	x	x
<i>Eriosema glabrum</i>	ES Cândido et al. 1067	American	Brazil	x	x
<i>Eriosema glaziovii</i>	AP Fortuna-Perez et al. 1457	American	Brazil	x	x
<i>Eriosema glomeratum</i>	Ossian Flock 356	African	Tanzania	x	x
<i>Eriosema grandiflorum</i>	Howard Scott Gentry 1837	American	Mexico	x	x
<i>Eriosema gunniae</i>	C.H. Stirton & Gernishuizen 6938	African	South Africa	x	x
<i>Eriosema harmsianum</i>	K. Dinter 5750	African	South Africa	x	x
<i>Eriosema hatschbachii</i>	AP Fortuna-Perez et al. 1401	American	Brazil	x	x
<i>Eriosema heterophyllum</i>	ES Cândido et al. 1068	American	Brazil	x	x
<i>Eriosema humile</i>	D.J. Goyder 6273	African	Angola	x	x
<i>Eriosema irwinii</i>	ES Cândido 1106	American	Brazil	x	x
<i>Eriosema juronianum</i>	Ivar Ambijorn 372	African	Ethiopia	x	x
<i>Eriosema kraussianum</i>	K Grieve 942	African	South Africa	x	x
<i>Eriosema latifolium</i>	C.H. Stirton 5599	African	South Africa	x	
<i>Eriosema laurentii</i>	Kare Arnstein Lye s/n	African	Uganda	x	x
<i>Eriosema laxiflorum</i>	M Silva 4407	American	Brazil	x	x
<i>Eriosema lebrunii</i>	M. Reekmans 8784	African	Burundi	x	x
<i>Eriosema longiflorum</i>	M Silva 4025	American	Brazil	x	x
<i>Eriosema longifolium</i>	AP Fortuna-Perez et al. 1442	American	Brazil	x	x
<i>Eriosema macrostipulatum</i>	MJ Silva 4696	American	Brazil	x	x
<i>Eriosema macrostipulum</i> var. <i>macrostipulum</i>	M. Reekmans 4134	African	Burundi	x	

<i>Eriosema mirabilis</i>	R.G.N. Young 1107	African	Angola	x	x
<i>Eriosema molle</i>	H Ern <i>et al.</i> 119	African	Togo	x	x
<i>Eriosema montanum</i>	A. Stolz 222	African	Mozambique	x	x
<i>Eriosema monticola</i>	JM Lock 84/94	African	Togo	x	x
<i>Eriosema multiflorum</i>	M Hahn 386	American	Mexico	x	x
<i>Eriosema naviculare</i>	C.H. Stirton 9839	African	South Africa	x	x
<i>Eriosema nutans</i>	B.D. Schrire 2422	African	South Africa	x	x
<i>Eriosema oblongum</i>	R.F. Rand 590	African	South Africa	x	x
<i>Eriosema palmeri</i> var. <i>palmeri</i>	HS Gentry 2536	American	Mexico	x	x
<i>Eriosema parviflorum</i>	JG Adam 20593	African	Liberia	x	x
<i>Eriosema pauciflorum</i>	Adolf Hafstrom & J. P. H. Acock 579	African	South Africa	x	x
<i>Eriosema pentaphyllum</i>	H.M. Richards 8193	African	Zambia	x	x
<i>Eriosema platycarpon</i>	Troels Myndel Pedersen 4372	American	Paraguay	x	x
<i>Eriosema populifolium</i>	C. H. Stirton 1200	African	South Africa	x	x
<i>Eriosema preptum</i>	Hendrik J. Venter & A. Venter 10237	African	South Africa	x	x
<i>Eriosema prorepens</i>	R Romero <i>et al.</i> 4653	American	Brazil	x	x
<i>Eriosema prunelloides</i>	D.B. Fanshame 8910	African	Zambia	x	x
<i>Eriosema pycnanthum</i> var. <i>pycnanthum</i>	SG Rezende & MS Medens 2088	American	Brazil	x	x
<i>Eriosema pycnanthum</i> var. <i>veadeirensense</i>	HS Irwin <i>et al.</i> 12885	American	Brazil	x	x
<i>Eriosema robustum</i>	J. B. Gillett 14595	African	Ethiopia	x	x
<i>Eriosema rossii</i>	K Grieve 946	African	South Africa	x	
<i>Eriosema rufum</i> var. <i>rufum</i>	W Vargas 12	American	Brazil	x	x
<i>Eriosema shirensense</i> var. <i>adamii</i>	Adam 14687	African	Guinea	x	x
<i>Eriosema simplicifolium</i> var. <i>micranthum</i>	RS Rodrigues <i>et al.</i> 1386	American	Brazil	x	x
<i>Eriosema simplicifolium</i> var. <i>simplicifolium</i>	ES Candido 1099	American	Brazil	x	x
<i>Eriosema simplicifolium</i> var. <i>simplicifolium</i>	ES Candido 1099	American	Brazil	x	x
<i>Eriosema sparsiflorum</i>	A. Borgdan 3680	African	Tanzania	x	x
<i>Eriosema speciosum</i>	B. Fritzsche 101	African	Angola	x	x

<i>Eriosema spicatum</i>	JM Lock 84/49	African	Togo	x	x
<i>Eriosema squarrosum</i>	Adolf Hafstrom & J. P. H. Acock 616	African	South Africa	x	x
<i>Eriosema squarrosum</i>	Ecklon & Zeyher	African	South Africa	x	x
<i>Eriosema stenophyllum</i>	LP Queiroz 15074	American	Brazil	x	x
<i>Eriosema tacuarembense</i>	AP Fortuna-Perez et al. 1443	American	Brazil	x	x
<i>Eriosema tozziae</i>	LS Kinoshita et al. 02/158	American	Brazil	x	x
<i>Eriosema triformum</i>	X. M. van der Burgt, Pierre Haba & Alphonse Traoré 1240	African	Guinea	x	x
<i>Eriosema tuberosum</i>	Schimper 1202	African	Ethiopia	x	x
<i>Eriosema vanderystii</i>	S.M. Chisumpa SMC3	African	Zambia	x	x
<i>Eriosema velutinum</i>	A. A. Bullock 2844	African	Democratic Republic of the Congo	x	x
<i>Eriosema verdickii</i>	J Louve 2699	African	Nigeria	x	x
<i>Eriosema cordatum</i>				x	x
<i>Eriosema distinctum</i>				x	
<i>Eriosema dregei</i>				x	x
<i>Eriosema kraussianum</i>				x	x
<i>Eriosema populifolium</i>				x	x
<i>Eriosema psoraliodes</i>				x	x
<i>Eriosema rossii</i>				x	x
<i>Eriosema umtamvunense</i>				x	x
<i>Flemingia congesta</i>	P. Remanandan 4698	Asian	India	x	x
<i>Flemingia ferruginea</i>	Kai Larsen 9152	Asian	India	x	x
<i>Flemingia grahamiana</i>	WJ Hanekom 2315	African	South Africa	x	x
<i>Flemingia involucrata</i>	B.R. Maslin 5115	Oceania	Australia	x	
<i>Flemingia lineata</i>	H.F. Mooney 3166	Asian	India		x
<i>Flemingia macrophylla</i>	P Mezeli 258	African	Cameroon	x	x
<i>Flemingia pauciflora</i>	J.R. Clarkson & V.J. Nelder 7998	Oceania	Australia	x	x
<i>Flemingia sericea</i>	J. Cowie & K.G. Brennam 9083	Oceania	Australia	x	x

<i>Galactia striata</i>	W. Vargas & E.S. Cândido 72	American	Brazil	x	x
<i>Paracalyx balfourii</i>	A.G. Miller et al. 8654	Asian	Yemen	x	
<i>Paracalyx microphyllus</i>	M. Thulin et al. 10558	African	Somalia	x	x
<i>Paracalyx nogalensis</i>	M. Thulin & A.M. Warfa 5425	African	Somalia	x	x
<i>Paracalyx scariosa</i>	L.J.G. van der Maesen 1973	Asian	India	x	x
<i>Paracalyx scariosa</i>	N. Kameswara Rao 12	Asian	India	x	x
<i>Paracalyx schweinfurthii</i>	Omentin Cronk 3	Oceania	Australia	x	x
<i>Paracalyx somalorum</i>	I. Friis 9993	African	Ethiopia	x	x
<i>Rhynchosia candida</i>				x	
<i>Rhynchosia acuminatissima</i>	W. Takeuchi 9284	African	Papua New Guinea	x	x
<i>Rhynchosia adenodes</i>	R.D.A. Bayliss 6409	African	South Africa	x	x
<i>Rhynchosia albae-paulii</i>	Berhaut 7495	African	Senegal	x	x
<i>Rhynchosia ambacensis</i>	J Raynal 12914	African	Cameroon	x	x
<i>Rhynchosia androyensis</i>	L Alorge 2295	African	Madagascar	x	x
<i>Rhynchosia aureovillosa</i> var. <i>humbertii</i>	H.G. Troupin 5686	African	Ruanda	x	x
<i>Rhynchosia avensis</i>	D Kerr 4642	Asian	Thailand		x
<i>Rhynchosia balansae</i>	G. Hatschbach et al. 74908	American	Brazil	x	x
<i>Rhynchosia balansae</i> var. <i>balansae</i>	A.L.B. Sartori et al 709	American	Brazil	x	x
<i>Rhynchosia baukea</i>	M Peltier 1102	African	Madagascar	x	x
<i>Rhynchosia breviracemosa</i>	Azancot de Menezes 732	African	Angola	x	x
<i>Rhynchosia brunea</i>	RAA Oldeman 803	African	Gana	x	x
<i>Rhynchosia buchananii</i>	K. Kaunda & R.B. Kwatha 632	African	Republic of Malawi	x	x
<i>Rhynchosia buettneri</i>	Peyre de Fabrègues 3473	African	Costa do Marfim	x	x
<i>Rhynchosia caaguazuensis</i>	E. Hassler 11067	American	Paraguay	x	x
<i>Rhynchosia capensis</i>	N.S. Pillans 10165	African	South Africa	x	
<i>Rhynchosia chapelierii</i>	P Ranirison 699	African	Madagascar	x	x
<i>Rhynchosia chrysoscias</i>	Schuh, Cassis, Weirauch PBI_SA03_H191	African	South Africa	x	x
<i>Rhynchosia claussenii</i>	CR Martins 252	American	Brazil	x	x

<i>Rhynchosia clausenii</i>	EP Heringer	American	Brazil	x	x
<i>Rhynchosia cliffordii</i>	JB Gillett 4864	African	Somalia	x	x
<i>Rhynchosia clivorum</i>	WJ Hanekom s/n	African	South Africa	x	x
<i>Rhynchosia corylifolia</i>	Fortuna-Perez, A.P. 1531	American	Brazil	x	x
<i>Rhynchosia craibiana</i>	DE Boufford <i>et al.</i> 3114	Asian	China	x	x
<i>Rhynchosia cytisoides</i>	R.k. Godfrey 84172	American	Florida	x	x
<i>Rhynchosia debilis</i>	J.M. Robertson 50	African	Gana	x	
<i>Rhynchosia dielsii</i>	K. Yao 9152	Asian	Japan	x	x
<i>Rhynchosia difformis</i>	S. McDaniel 29983	American	Mississippi	x	x
<i>Rhynchosia discolor</i>	J.J. Castillo & J.M. Vargas 2741	American	Guatemala	x	x
<i>Rhynchosia diversifolia</i>	Bonifacio, M. <i>et al.</i> 1803	American	Uruguay	x	x
<i>Rhynchosia edulis</i>	França, F. <i>et al.</i> 2164	American	Brazil	x	x
<i>Rhynchosia elisae</i>	O Tellez 12583	American	Mexico	x	x
<i>Rhynchosia ferulifolia</i>	H. Bolus 3775	African	South Africa	x	
<i>Rhynchosia ferulifolia</i>	F.M. Leighton 1889	African	South Africa	x	x
<i>Rhynchosia fleckii</i>	R. Seydel 1806	African	Namibia	x	x
<i>Rhynchosia hauthali</i>	T.M. Pedersen 2982	American	Argentina	x	x
<i>Rhynchosia hauthalii</i>	TM Pedersen 2982	American	Argentina	x	x
<i>Rhynchosia himalensis</i>	R.R. Stewart 21264	Asian	India	x	x
<i>Rhynchosia hirsuta</i>	R.D.A. Bayliss 8297	African	South Africa	x	x
<i>Rhynchosia hirta</i>	E.J. Tawakali & A.C. Chikuni 1672	African	Republic of Malawi	x	x
<i>Rhynchosia hockii</i>	H.G. Troupin 3664	African	Ruanda	x	x
<i>Rhynchosia lateritia</i>	E.L. Ekman 1679	American	Argentina	x	x
<i>Rhynchosia lateritia</i>	H.A. Keller, J. Pirelli, L. Ritter 4566	American	Argentina	x	x
<i>Rhynchosia latifolia</i>	D. Atha 12874	American	Texas	x	x
<i>Rhynchosia leucophylla</i>	W Vargas 10	American	Brazil	x	x
<i>Rhynchosia lewisii</i>	Guedes, M.L. <i>et al</i> 20795	American	Brazil	x	x
<i>Rhynchosia longeracemosa</i>	J.J. Castillo & A. Castillo 2718	American	Guatemala	x	x

<i>Rhynchosia luteola</i> var. <i>luteola</i>	E.J. Tawakali & J.L. Balaka 1513	African	Republic of Malawi	x	x
<i>Rhynchosia macrocarpa</i>	P. Tenorio L. et al. 10290	American	Mexico	x	x
<i>Rhynchosia madagascariensis</i>	M Bardot-Vaucoulon 743	African	Madagascar	x	x
<i>Rhynchosia malacophylla</i>	R. Spellenberg 7535	Asian	Yemen	x	x
<i>Rhynchosia mantaroensis</i>	A. Sagástegui et al. 15255	American	Peru	x	x
<i>Rhynchosia melanocarpa</i>	AP Fortuna-Perez	American	Brazil	x	x
<i>Rhynchosia micrantha</i>	M.E. Archbold 1069	African	Tanzania	x	x
<i>Rhynchosia naineckensis</i>	M. Nee 50484	American	Bolivia	x	x
<i>Rhynchosia nipensis</i>	J.P. Carabia 3719	American	Cuba	x	x
<i>Rhynchosia nyasica</i>	R.D.A. Bayliss 10129	African	Zimbabwe	x	x
<i>Rhynchosia nyikensis</i>	W. Nachamba, I.H. Patel & E.J. Tawakali 78	African	Republic of Malawi	x	x
<i>Rhynchosia pallida</i> var. <i>boliviana</i>	M. Nee 36388	American	Bolivia	x	x
<i>Rhynchosia parvifolia</i>	W.C. Brumbach 9455	American	Florida	x	x
<i>Rhynchosia phaseoloides</i>	RB Pinto 500	American	Brazil	x	x
<i>Rhynchosia platyphylla</i>	J Raveratti et al. 640	American	Brazil	x	x
<i>Rhynchosia precatorea</i>	A. Reyes-Garcia et al. 6211	American	Mexico	x	
<i>Rhynchosia pringlei</i>	H.D. Ripley & R.C. Barneby 14, 675	American	Mexico	x	x
<i>Rhynchosia prostrata</i>	C.A. Purpus 3205	American	Mexico	x	x
<i>Rhynchosia puberula</i>	R.D.A. Bayliss 4114	African	South Africa	x	x
<i>Rhynchosia pycnostachya</i>	H Ern 2562	African	Togo	x	x
<i>Rhynchosia pyramidalis</i>	S. Palma 346	American	Honduras	x	x
<i>Rhynchosia quercetorum</i>	W.A. Haber 3674	American	Costa Rica	x	x
<i>Rhynchosia reniformis</i>	SW Leonard & AE Radford 1547	American	United States	x	x
<i>Rhynchosia resinosa</i>	CCH Jongkind 8035	African	Guinea	x	x
<i>Rhynchosia reticulata</i>	Queiroz, L.P. et al. 1314	American	Brazil	x	x
<i>Rhynchosia reticulata</i> var. <i>kuntzei</i>	F França 3175	American	Brazil	x	x
<i>Rhynchosia rojasii</i>	EM Zardini & M Vera 45368	American	Paraguay	x	x
<i>Rhynchosia schomburgkii</i>	J. Ollerton et al 201	American	Guyana	x	x

<i>Rhynchosia senna</i>	K.C. Rice 1428	American	Arizona	x	x
<i>Rhynchosia stenodon</i>	H.J. Venter & A. Venter 10216	African	South Africa	x	x
<i>Rhynchosia sublobata</i>	S Bidgood <i>et al.</i> 6418	African	Tanzania	x	x
<i>Rhynchosia swartzii</i>	D.S. & H.B. Correll & J. Popenoe 48124	American	Florida	x	x
<i>Rhynchosia tarphanta</i>	T.S. Cochrane, M.A. Wetter & M. Rosales C. 11, 782	American	Mexico	x	x
<i>Rhynchosia tomentosa</i>	R. Dale Thomas & A. Dunn 157, 685	American	Louisiana	x	x
<i>Rhynchosia totta</i>	CH Stirton 14089	African	South Africa	x	x
<i>Rhynchosia totta</i> var. <i>venulosa</i>	OH Volk 6268	African	Namibia	x	x
<i>Rhynchosia verdcourtii</i>	R Abdallah & K Vollesen 96/220	African	Tanzania	x	x
<i>Rhynchosia versicolor</i>	Y Veyret 1329	African	Madagascar	x	x
<i>Rhynchosia versicolor</i> subsp. <i>versicolor</i>	D.J. & B.P. Du Puy M322	African	Madagascar	x	x
<i>Rhynchosia viscosa</i>	J Bosser 21902	African	Madagascar	x	x
<i>Rhynchosia volubilis</i>	F Konta 35508	Asian	Japan	x	x
<i>Rhynchosia volubilis</i>	G. Murata 13831	Asian	Japan	x	x
<i>Rhynchosia volubilis</i>	Y.N. Xiong & K. Yao 122	Asian	Japan	x	x
<i>Rhynchosia albissima</i>				x	x
<i>Rhynchosia arida</i>				x	
<i>Rhynchosia atropurpurea</i>				x	
<i>Rhynchosia calvescens</i>				x	x
<i>Rhynchosia capensis</i>				x	x
<i>Rhynchosia caribaea</i>				x	x
<i>Rhynchosia chrysoscias</i>				x	
<i>Rhynchosia ciliata</i>				x	
<i>Rhynchosia clivorum</i>				x	x
<i>Rhynchosia coddii</i>				x	
<i>Rhynchosia cooperi</i>				x	x
<i>Rhynchosia crassifolia</i>				x	x
<i>Rhynchosia densiflora</i> subsp. <i>chrysadenia</i>				x	

<i>Rhynchosia emarginata</i>	X	
<i>Rhynchosia emarginata</i>		X
<i>Rhynchosia ferulifolia</i>	X	X
<i>Rhynchosia fleckii confusa</i>	X	X
<i>Rhynchosia galpinii</i>	X	X
<i>Rhynchosia grandifolia</i>	X	
<i>Rhynchosia harveyi</i>	X	X
<i>Rhynchosia harveyi</i>		
<i>Rhynchosia hirsuta</i>	X	X
<i>Rhynchosia hirta</i>	X	
<i>Rhynchosia holosericea</i>	X	
<i>Rhynchosia komatiensis</i>	X	
<i>Rhynchosia leucoscias</i>	X	
<i>Rhynchosia minima</i>	X	X
<i>Rhynchosia nervosa</i>	X	X
<i>Rhynchosia ngwenyii</i>	X	
<i>Rhynchosia nitens</i>	X	
<i>Rhynchosia ovata</i>	X	
<i>Rhynchosia pedunculata</i>	X	
<i>Rhynchosia pentheri</i>	X	X
<i>Rhynchosia pinnata</i>	X	
<i>Rhynchosia reptabunda</i>	X	
<i>Rhynchosia resinosa</i>	X	
<i>Rhynchosia smithiana</i>	X	X
<i>Rhynchosia sordida</i>	X	X
<i>Rhynchosia spectabilis</i>	X	X
<i>Rhynchosia sublobata</i>	X	X
<i>Rhynchosia thorncroftii</i>	X	X

<i>Rhynchosia totta</i>	X	X
<i>Rhynchosia totta var rigidula</i>	X	
<i>Rhynchosia totta var venulosa</i>	X	
<i>Rhynchosia vendae</i>	X	
<i>Rhynchosia villosa</i>	X	

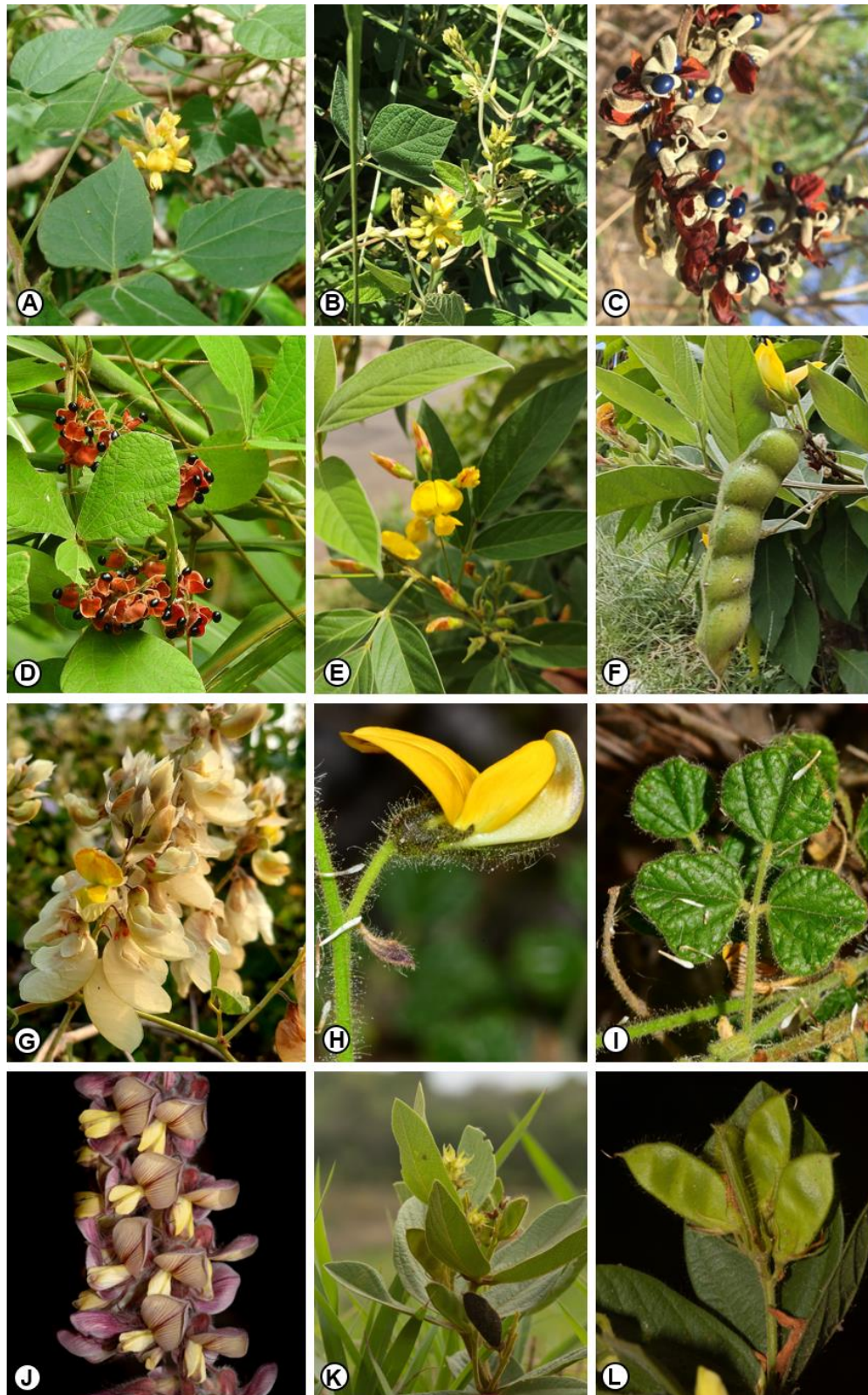


Figure 1. Morphological diversity in the Cajaninae subtribe. A. *Rhynchosia edulis*. B. *R. reticulata*. C. *R. hirta*. D. *R. volubilis*. E–F. *Cajanus cajan*. G. *Paracalyx scariosus*. H–I. *Bolusafra bituminosa*. J. *Eriosema defoliatum*. K–L. *E. campestre*. (A by D.S. Gissi; B by L.M.P.A. Bezerra; C by Len deBeer; D by Kinmatsu Lin; E–F by E.S. Cândido; G by Pravin Kawale; H–I by Joey Santore; J–L by T.C. Monteiro).



Figure 2. A scheme of the phylogenetic tree for *Rhynchosia* and others representatives of Cajaninae subtribe from maximum likelihood analysis of plast DNA dataset (*rpl32-trnL* and *trnQ-5'rps16*). Numbers above branches are bootstrap support (BS) values and numbers below branches are Bayesian posterior probabilities (PP).



Figure 2. Continued.

Chapter III: A new species of *Rhynchosia* (Leguminosae, Papilionoideae) from Bahia State, Brazil

Abstract

During a taxonomic study of *Rhynchosia* in Brazil and intensive field work, a new species from Bahia, *R. lewisii*, was discovered. The new species is herein described, illustrated and its morphological affinities with related species are presented. Additionally, the conservation status of the new species is discussed, and a key to the taxa of *Rhynchosia* that occur in the Bahia is provided.

Keywords: Cajaninae, Fabaceae, Phaseoleae, Taxonomy

Introduction

Rhynchosia Loureiro (1790: 460), a genus with approximately 230 species (Lewis et al. 2005) and pantropical distribution, with main centers of diversity in Africa and America (Gear 1978), belongs to tribe Phaseoleae Candolle (1825: 381), subtribe Cajaninae Benth (1837: 49) in the Leguminosae. Of the ten genera in subtribe Cajaninae, only *Rhynchosia* and *Eriosema* (Candolle 1825: 388) Desvaux (1826: 421), occur in Brazil. These two genera can be easily confused because of their morphological similarities, since both present uni or trifoliolate leaves, legume fruit with two seeds and stipules (Cândido 2018; Bezerra et al. in press). According to Gear (1978) these genera differ by the location of the funicular attachment of the seed in relation to the hilum, which can be apical, subcentral and terminal in *Rhynchosia* and terminal in *Eriosema*. However, Cândido (2018) presented other characters that contributed to the delimitation of these groups such features related to the habit, the inflorescence, and the fruit.

The most complete taxonomic study for *Rhynchosia* in America was published by Gear (1978), who proposed two sections, *R. sect. Copisma* (Meyer 1835: 132) Endlicher (1840: 1300) and *R. sect. Arcyphyllum* (Elliott 1818: 371) Torrey & Gray (1838: 284) to arrange the 51 species from the New World. In Brazil, there are 20 species of *Rhynchosia*, of which *Rhynchosia platyphylla* Benth (1862: 201) and *R. franciscana* Queiroz & Cardoso (2018: 975) are endemic to the country (Bezerra et al. in press; Queiroz & Cardoso 2018). Most species of *Rhynchosia* are widely distributed throughout Brazil, occurring in environments such as Cerrado, Campos Rupestres (rocky fields), Caatinga and Mata Atlântica. Some species of the

genus are used for ornamentation, feeding, handcrafts, due to the presence of bicolor seeds in some species, and as narcotics (Schultes 1976, Gear 1978, Bezerra et al. in press).

During taxonomic studies of *Rhynchosia* in Brazil and intensive fieldwork, a new species was discovered, which is herein described and illustrated. Also, an updated identification key for the *Rhynchosia* species in Bahia State, conservation status, and information about geographical distribution are provided.

Materials and Methods

The study was based on a review of relevant literature (Gear 1978; Cristaldo 2008; Queiroz 2009; Hirt & Flores 2012; Bezerra et al. in press), fieldwork, and morphological analyses of herbarium specimens of *Rhynchosia* from ALCB, BHCB, BOTU, CEPEC, CVRD, ESA, FLOR, HUEFS, IPA, MBML, NY, OUPR, P, PEUFR, R, RB, SP, UB, UEC, VIC and VIES (acronyms according to Thiers, continuously updated).

We follow the morphological species concept, in which species are “the smallest groups that are consistently and persistently distinct and dis-tinguishable by ordinary means” (Singh 2012). The morphological analysis was realized using the classical methodology and a stereomicroscope (Zeiss) with a light camera coupled. The relevant measurements were made with a caliper. The terminology of the description was based on Gear (1978) for vegetative and flower characteristics and Kirkbride et al. (2003) for fruit.

The distribution map was generated using ArcGIS 10.5 software (ESRI 2016; Redlands, California), from geographic coordinates extracted from locality data. Preliminary conservation status is based on IUCN red list categories and criteria v.13 (IUCN 2017).

Taxonomy

Rhynchosia lewisii Bezerra & Fort.-Perez, spec. nov. (Figs. 1; 2; 3).

Diagnosis: Morphologically similar to *Rhynchosia phaseoloides* (Swartz 1788: 105) Candolle (1825: 385) and differing from it mainly by the persistent stipules (vs. caducous in *R. phaseoloides*), pedicel 3–5 mm long (vs. 0.5–1 mm long in *R. phaseoloides*); fruit without constriction between seeds and with apparent veins (vs. constricted between seeds and without apparent veins in *R. phaseoloides*) and bicolored yellow to orange and black seeds (vs. bicolored red and black seeds in *R. phaseoloides*).

TYPE:—Brazil. Bahia: Santa Teresinha, caminho para a Torre, 12°46'S 39°31'W, 16 August 2013, fl. fr., M. L. Guedes et al. 20795 (holotype: ALCB!; isotype: UB!).

Vines herbaceous, stems branched, pubescent, white to light yellow, with non-glandular and bulbous-based trichomes. Stipules 4–7 × 0.5–1 mm, free, persistent, lanceolate to triangular, externally pubescent with yellow punctiform glands and bulbous-based trichomes. *Leaves* trifoliolate, petiole 1.9–3.2 cm long; leaf rachis 0.9–1.4 cm long; stipels absent; leaflets 1.9–10.3 × 0.9–4.4 cm, rhomboid, lanceolate to ovate, apex acute to attenuate, base cuneate to rounded, margins entire, pilose, with yellow punctiform glands in the abaxial surface. *Inflorescences* axillary, paniculate, 8–17.5 cm long, more than 30 flowers, exceeding the length of the subtending leaf, branches pubescent; bracts lanceolate, deciduous, 3–6 mm long; bracteoles absent; pedicel 3–5 mm long. *Flowers* 4–7 mm long excluding the pedicel; calyx 3–4 mm long, densely pubescent with yellow punctiform glands and bulbous-based trichomes, lobes lanceolate to triangular, not exceeding the corolla in length; petals yellow to yellowish-green with vinaceous macules, pilose; standard petal ca. 6 × 6 mm, orbicular, apex rounded, externally pubescent, with yellow punctiform glands and bulbous-based trichomes, claw ca. 2.2 mm long, auricle ca. 0.5 mm long; wing petals 5–5.5 × 1.8–2 mm, obovate, claw ca. 2 mm long, auricle 1 mm long; keel petals 4.5–5 × 2–2.25 mm, falcate, claw ca. 2 mm long; androecium diadelphous, stamens ca. 7 mm long, staminal sheath ca. 5 mm long, free portion of the filaments ca. 2 mm long; ovary ca. 3 mm long, hairy, style ca. 5 mm, stigma minute. *Fruit* 1–2.1 × 1–1.1 cm, legume, oblong, base cuneate, apex obtuse with style remnant, ca. 1 mm long, margins entire, valves coriaceous, greenish, with apparent veins, flat-compressed, pilose with yellow punctiform glands. *Seeds* 5–6 × 4–5 cm, oblong to obovate, two per mature fruit but in some cases a seed can be aborted, bicolored yellow to orange and black.

Additional Specimens Examined (Paratypes):—BRAZIL. Bahia: Santa Teresinha, Serra da Jibóia, Mata Estacional Semidecidual, 12°50'39" S 39°28'59" W, 25.X.2010, fl., M. L. Guedes et al. 17793 (ALCB, VIES); idem, ca. de 4 km da Pedra Branca, Mata Higrófila, 12°51'10" S 39°28'32" W, 27.IX.2000, fl., L. P. Queiroz et al. 6386 (HUEFS); idem, trilha em área florestada passando as torres de transmissão, 12°51'12" S 39°28'33" W, 08.X.2018, fl., L.C. Marinho 1428 (HUEFS).

Distribution and habitat:—*Rhynchosia lewisii* is currently known from Santa Teresinha, Bahia, Brazil. The new species is distributed in a specific area of the state called Serra da Jiboia,

which is characterized by different types of vegetation such as caatinga, humid forest and “campos rupestres” (rocky fields) (Queiroz et al. 1996; Sobrinho & Queiroz 2005), in which *R. lewisii* occurs in a fragment of tropical forest. The new species was only found in this region, which indicates that it is probably endemic to the state of Bahia. (Fig. 4).

Phenology:—The species was collected with flowers in August, September and October and fruits in August.

Etymology:—The epithet honors Dr. Gwilym P. Lewis, a British botanist, for his dedicated studies on Leguminosae and his great contribution to the development of the legume taxonomy community. Dr. Lewis also authored *Legumes of Bahia* (Lewis 1987), a landmark for legume taxonomy in Bahia, the state where *Rhynchosia lewisii* was collected, and for Brazil as a whole.

Conservation status:—After analysis of several *Rhynchosia* specimens in herbaria, as well as intensive fieldwork, no specimens of *R. lewisii* other than the four cited above were found outside of Serra da Jibóia. This restricted geographic distribution for the species plus threats due to anthropization of Serra da Jibóia (Sobrinho & Queiroz 2005), lead us to consider the species as Endangered (EN) based on Red List criteria B2a and B2b (iii) (IUCN 2017).

Taxonomic comments: According to the classification of Grear (1978), *Rhynchosia lewisii* belongs to *Rhynchosia* sect. *Copisma*, because it presents short and subulate calyx lobes, the two lateral lobes subequal to the tube in length or usually not more than twice its length, oblong pods, suborbicular and bicolored seeds, even though seeds are yellow to orange and black and not red and black. Also, the species could be included at the informal series 1 of Grear (1978). This series is characterized mainly by persistent stipules, oblong pods and twining stems. *Rhynchosia lewisii* is morphologically similar to *R. phaseoloides*, *R. melanocarpa* Grear (1978:43) and *R. naineckensis* Fortunato (1982: 497). The features that distinguish these species are presented in the table 1.

Key to the species of *Rhynchosia* occurring in Bahia State, Brazil

1. Corolla's length 35–39 mm long *R. franciscana*
– Corolla up to 15 mm long 2
2. Punctiform glands in both surfaces of the leaflet *R. minima*
– Punctiform glands just in abaxial surface of the leaflet 3
3. Racemose inflorescence; Calyx lobes exceeding the length of the corolla *R. reticulata*
– Paniculate inflorescence; Calyx lobes not exceeding the length of the corolla 4
4. Stipels present 5
– Stipels absent 6
5. Bulbous-base trichomes present in leaves, flowers and fruits; fruit not constricted between seeds *R. edulis*
– Bulbous-base trichomes absent; fruit constricted between seeds *R. melanocarpa*
6. Stipules persistent; pedicels 3–5 mm long; fruit not constricted between seeds; bicolored seeds yellow–orange and black *R. lewisii*
– Stipules deciduous; pedicels 0.5–1 mm long; fruit with constriction between seeds both by margins and valves; bicolored seeds red and black *R. phaseoloides*

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Figures and Table

TABLE 1. Some morphological features distinguishing *R. lewisii*, *R. phaseoloides*, *R. melanocarpa* and *R. nainceckensis*.

Species	Stipule	Stipels	Pedicle length (mm)	Inflorescence length (cm)	Fruit color	Fruit margin	Seeds color
<i>R. lewisii</i>	Persistent	Absent	3–5 mm	8–17.5 cm	Greenish	Not constricted	Yellow—orange /black
<i>R. phaseoloides</i>	Deciduous	Absent	0.5–1 mm	9–17.5 cm	Greenish	Constricted	Red / black
<i>R. melanocarpa</i>	Deciduous	Present	1–3 mm	8–15.5 cm	Darkish	Constricted	Red / black
<i>R. nainceckensis</i>	Persistent	Absent	1–1.5 mm	2.7–3.5 cm	Darkish	Constricted	Red / black

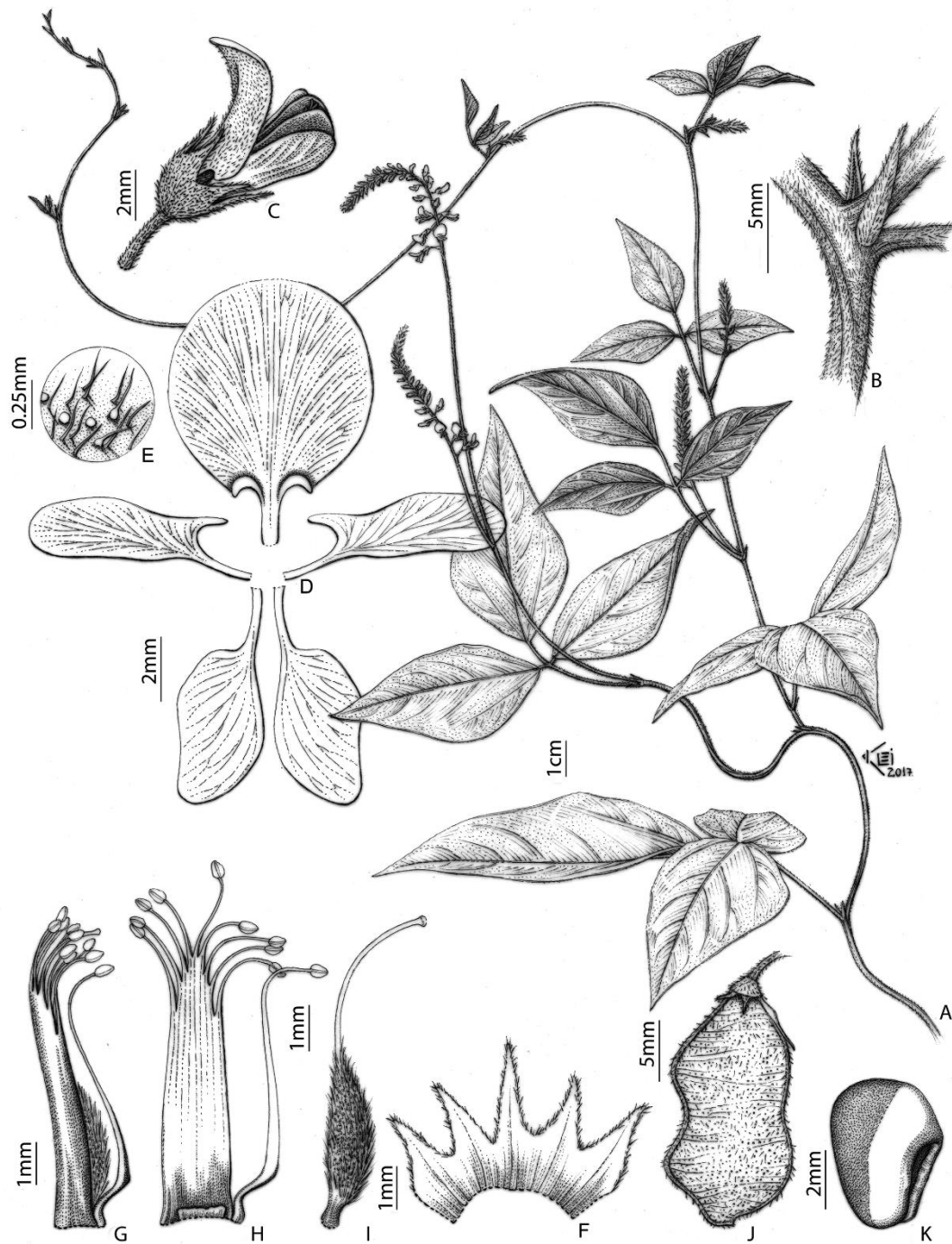


FIGURE 1. *Rhynchosia lewisii*. A. Habit. B. Detail of the branch showing a pair of persistent stipules at petiole attachment. C. Flower (lateral view). D. Petals: standard petal in upper central position, a pair of lateral wing petals and below a pair of keel petals. E. Details of punctiform glands and non-glandular trichomes on the standard petal. F. Open calyx (inner view). G and H. Diadelphous androecium showing the staminal sheath and adaxial free stamen in lateral view. I. Gynoecium in lateral view. J. Fruit. K. Seed (*M. L. Guedes et al. 20795*). Illustrated by Klei Souza.

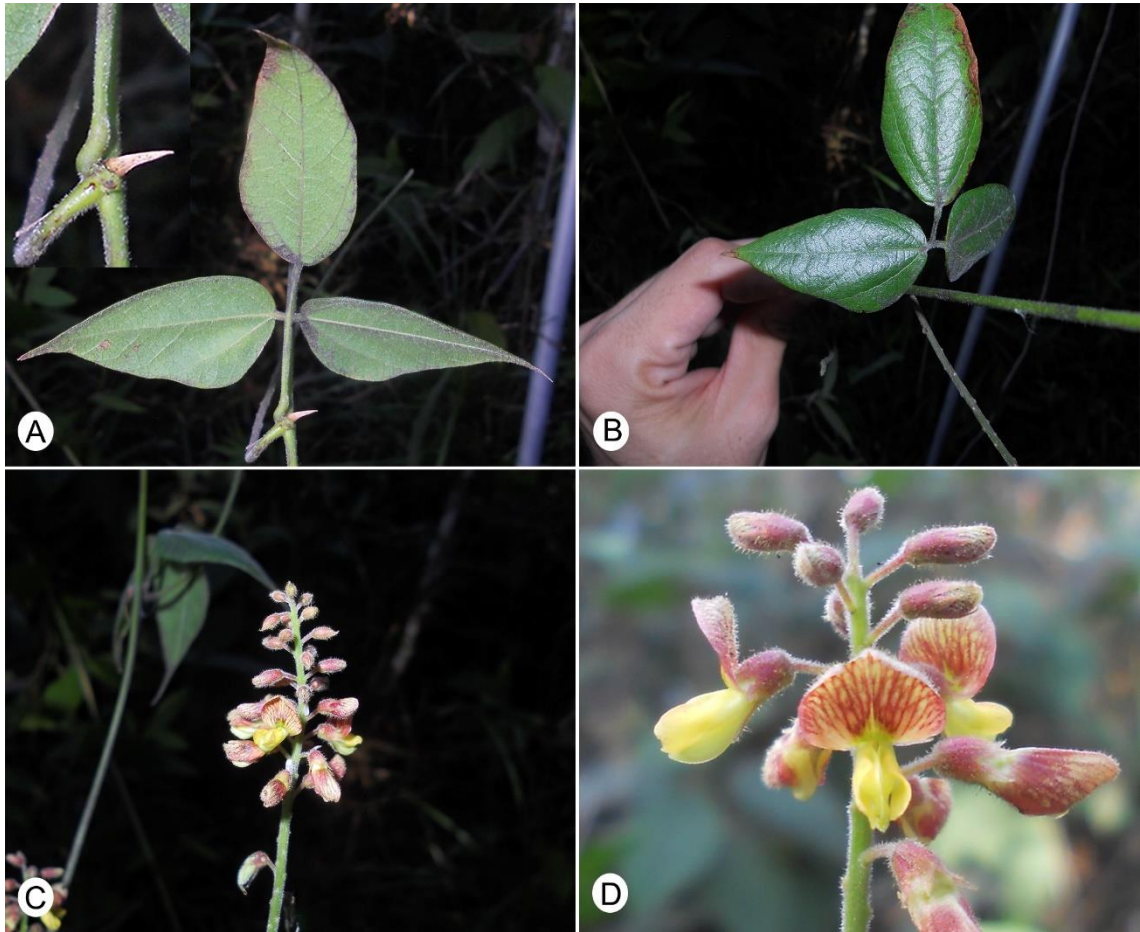


FIGURE 2. *Rhynchosia lewisii*. A. Leaf with persistent stipule at the base of the petiole (Detail of stipule in upper left corner). B. Lanceolate leaflet. C. Inflorescence apex. D. Detail of the flowers. Photos by L.C. Marinho.

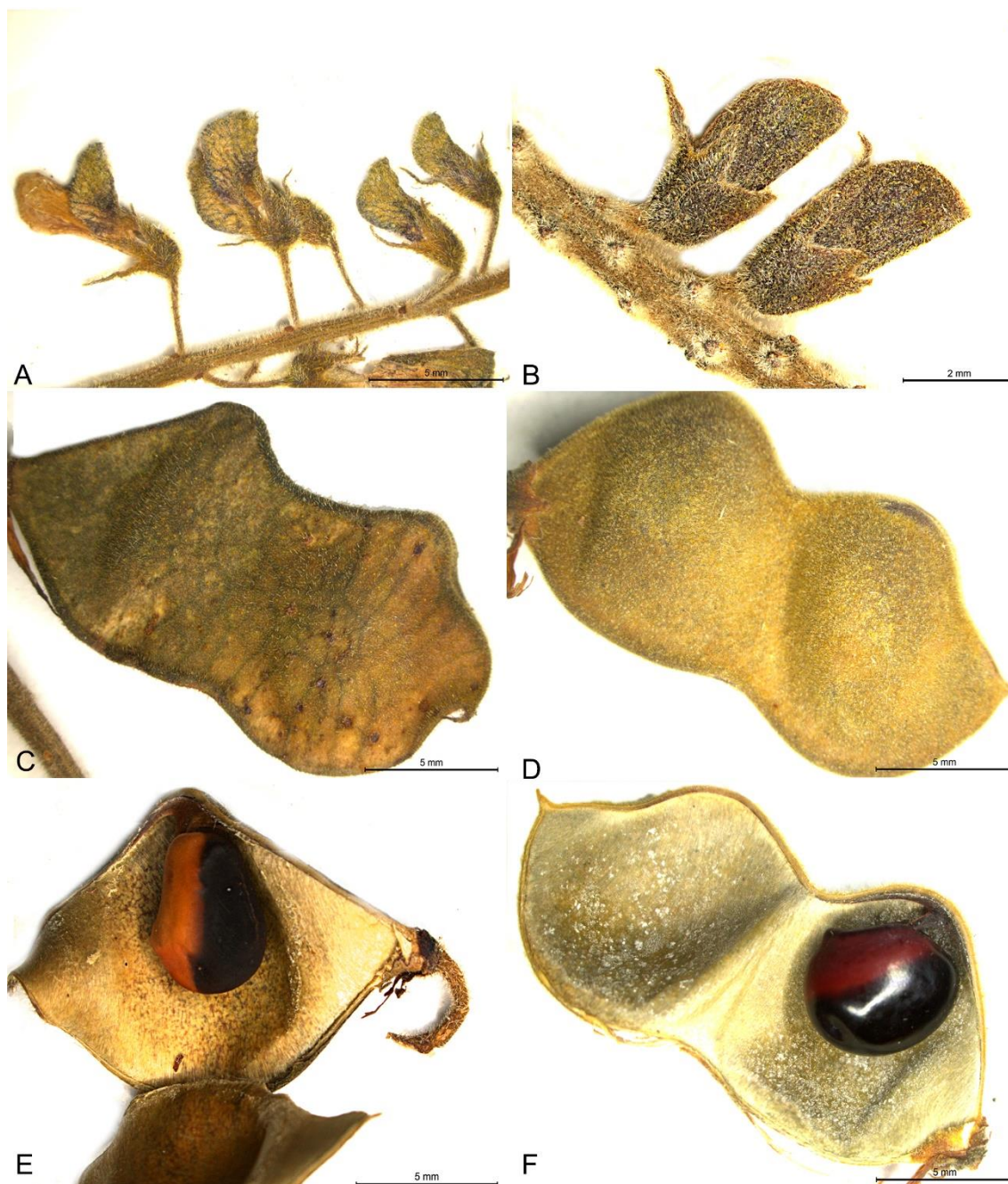


FIGURE 3. Comparative morphological features of *Rhynchosia lewisii* and *R. phaseoloides*. A. Detail of mature inflorescence showing the pedicelled flowers in *R. lewisii*. B. Detail of mature inflorescence showing the flowers sessile to subsessile in *R. phaseoloides*. C. A greenish flat-compressed fruit with marked veins (lateral view) in *R. lewisii*. D. A greenish inflated fruit without marked veins (lateral view) in *R. phaseoloides*. E. Opened fruit with a bicolored yellow to orange and black seed in *R. lewisii*. F. Opened fruit with a bicolored red and black seed in *R. phaseoloides*.

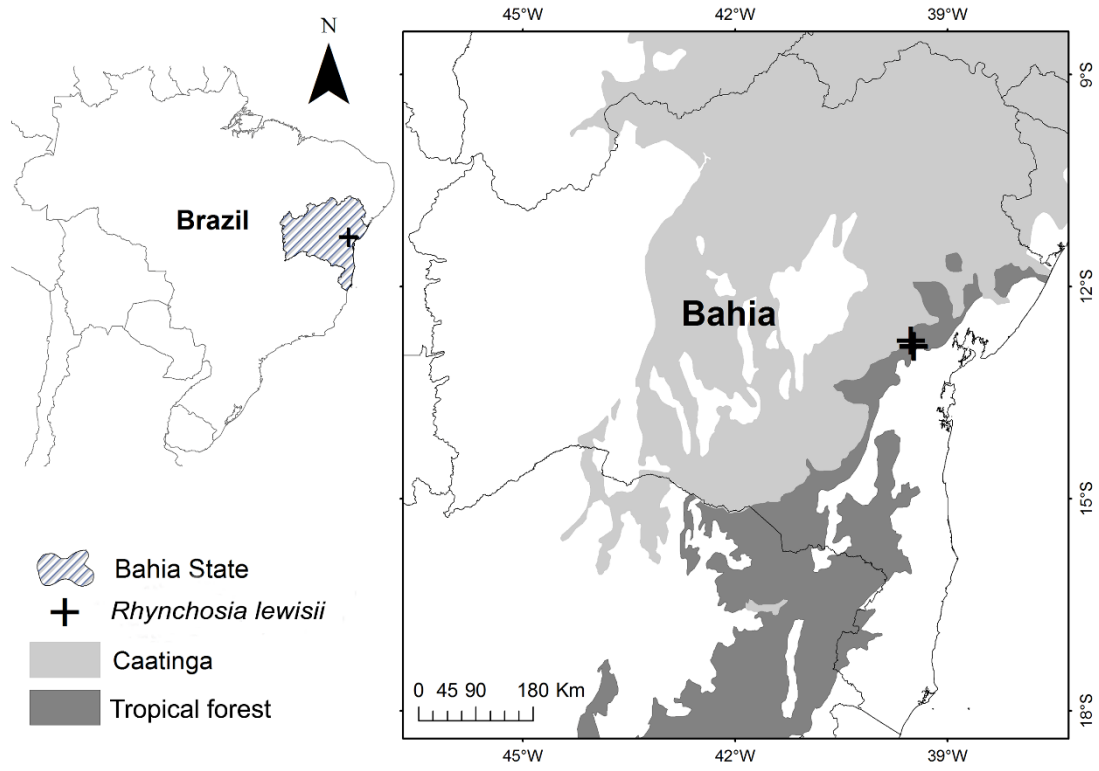


FIGURE 4. Distribution map of *Rhynchosia lewisii*.

Chapter IV: *Rhynchosia mineira* (Leguminosae: Papilionoideae), a new and critically endangered species from Minas Gerais, Brazil

Summary. *Rhynchosia mineira* is described as a new species from the state of Minas Gerais, Brazil. The taxon is morphologically similar to *R. arenicola* Hassl. but differs mainly in having ovate stipules, a prostrate habit, a densely pubescent stem and ovate to rhomboid leaflets. A description, illustration, distribution map, conservation status, and key to the species of *Rhynchosia* in the state of Minas Gerais are provided.

Key Words. Cajaninae, Phaseoleae, taxonomy.

Introduction

Rhynchosia Lour. has a pantropical distribution and comprises about 230 species with two main centers of diversity in Africa and the Americas. To date, 20 species have been recorded in Brazil, occurring mainly in Cerrado, Caatinga, Mata Atlântica and “campos rupestres” (rocky fields) vegetation (Bezerra et al. 2019; Queiroz & Cardoso 2018). The genus is a member of tribe Phaseoleae, which is noteworthy for including species of great economic importance as human food and animal fodder, as well as species that are used for ornamentation and in the manufacture of handicrafts using their bicolored seeds (for example, see Grear 1978). The tribe is one of the largest within the legume family, including 89 genera and about 1,567 species (Schrire 2005).

Of the seven subtribes of Phaseoleae, Cajaninae is the most speciose, comprising about 500 species in 10 genera, of which only *Rhynchosia* and *Eriosema* occur in Brazil (Schrire 2005). From a phylogenetic perspective, *Rhynchosia* is closely related to *Eriosema* (Bruneau et al. 1995; Doyle & Doyle 1993; Egan et al. 2016, Legume Phylogeny Working Group 2017); however, little is known about the interspecific relationships in *Rhynchosia* or about the precise characteristics that distinguish them from *Eriosema*. *Rhynchosia* can be characterized by the presence of unifoliolate or trifoliolate leaves with persistent or caducous stipules, racemose, paniculate, corymbiform or fascicular inflorescences, yellow flowers, calyces with five lobes and a two-seeded fruit (Grear 1978; Bezerra et al. 2019).

The most recent taxonomic treatment of the genus was published by Grear (1978) who treated only the 51 American species. Taxonomic studies of the genus in Brazil are scarce and

are included in regional floras, such as those of Lewis (1987), Lewis & Owen (1989), Cristaldo (2008), Queiroz (2009), Rogalski (2009), Flores & Hirt (2012), Oliveira (2016) and Bezerra et al. (2019).

During field trips to gather data for a systematic study of *Rhynchosia* in Brazil, a new species was found, which is described and illustrated here. An identification key to the species that occur in the state of Minas Gerais is provided.

Materials and Methods

The *Rhynchosia* collections of the following herbaria were analysed: BHCB, BOTU, FLOR, IPA, NY, P, PEUFR, RB, SP, UB, and UEC. In addition, a review of the most relevant literature was carried out and field trips focusing on *Rhynchosia* were undertaken, including a trip to Minas Gerais, where the type of this new species was collected. The distribution map was generated using ArcGIS 10.5 software (ESRI 2016), from geographic coordinates extracted from locality data.

Taxonomic Treatment

Rhynchosia mineira L.M.P.Bezerra & Fort.-Perez sp. nov.

Type: Brazil, Minas Gerais, Couto de Magalhães de Minas, BR-367 towards São Gonçalo do Rio Preto, 18°3'17.2"S, 43°26'00.2"W, alt. 995 m, 17 July 2017, (fl., fr.), T. C. Monteiro, A. P. Fortuna-Perez, W. Vargas, P. H. Murashima & K. R. Mendes 79 (holotype BOTU!; isotypes: K!, NY!).

Prostrate *subshrub*, stems few-branched, pubescent with yellow hairs, and non-glandular trichomes and punctiform glands. *Stipules* persistent, free, ovate, apex acute, 5 – 10 × 3 – 4 mm, externally pubescent and with yellow punctiform glands. *Stipels* absent. *Leaves* trifoliolate, persistent; petioles 1.5 – 2.4 cm long. Leaflets discolored, 2.6 – 3.8 × 1.5 – 3.1 cm, pubescent, with glands on the abaxial surface, rhomboid to ovate, apex cuneate, base rounded to truncate, margins entire. *Corymbiform inflorescences* 1.7 – 2.5 cm long, not exceeding the length of the leaf, crowded, 7 – 11-flowered. *Bracts* ovate, persistent, 3 – 7 mm long; *pedicel* 1 – 2 mm long. *Flowers* 7 – 8 mm long, yellow; *calyx* 5-lobed, 9 – 10 mm long, pubescent and with yellow punctiform glands, lobes lanceolate, equal to, or exceeding corolla in length;

standard $6 - 7 \times 3 - 4$ mm, obovate, apex rounded, externally glabrous, with punctiform glands, claw 1 – 1.5 mm long, auricle c. 0.5 mm long; wing petals $5 - 6.5 \times 1 - 1.5$ mm, obovate, claw c. 1.5 mm long, auricle c. 1 mm long; keel petals $6.5 - 7 \times 2 - 2.5$ mm, falcate, claw c. 2 mm long; stamens c. 7 mm long; ovary c. 2 mm long, hairy; style c. 4 mm long, stigma minute. *Fruit* $1.5 - 2.1 \times 0.5 - 0.6$ cm, oblong to elliptical, flat-compressed, greenish, pubescent and with yellow punctiform glands; only immature seeds seen. Figs 1 & 2.

RECOGNITION. *Rhynchosia mineira* resembles *R. arenicola* Hassl. as both possess a corymbiform inflorescence that does not exceed the length of the leaf, and calyx lobes that equal or exceed the length of the corolla. They are easily differentiated by their stipules, which are ovate, 5 – 10 mm long in *R. mineira* (vs lanceolate, c. 2 mm long in *R. arenicola*); the habit, which is prostrate in *R. mineira* (vs erect in *R. arenicola*); the densely pubescent stem (vs stem glabrescent in *R. arenicola*); and in the leaflets being ovate to rhomboid (vs elliptical in *R. arenicola*). In the state of Minas Gerais, besides *R. mineira*, there is just one species of *Rhynchosia*, *R. claussenii* Benth., in which the inflorescence does not exceed the length of the leaf. However, the two are easily differentiated by their habit, which is prostrate in *R. mineira* (vs erect in *R. claussenii*); by the calyx lobes, which are lanceolate in *R. mineira* (vs ovate in *R. claussenii*); and by the stems, which are abundantly hirsute in *R. mineira* (vs pubescent in *R. claussenii*).

DISTRIBUTION. *Rhynchosia mineira* occurs in the municipality of Couto de Magalhães de Minas in Minas Gerais state, Brazil, and grows in “campo rupestre” (rocky fields) inside cerrado vegetation (Map 1).

SPECIMEN EXAMINED. BRAZIL: Minas Gerais, Couto de Magalhães de Minas, BR-367 towards São Gonçalo do Rio Preto, $18^{\circ}3'17.2''$ S, $43^{\circ}26'00.2''$ W, alt. 995 m, 17 July 2017, (fl., fr.), T. C. Monteiro, A. P. Fortuna-Perez, W. Vargas, P. H. Murashima & K. R. Mendes 79 (holotype BOTU!; isotypes: K!, NY!).

HABITAT. The species was collected alongside a road in the Espinhaço Range of Brazil, where it grows in “campo rupestre” (rocky fields) on sandy soil; it occurs together with grasses and other legume species, such as *Poiretia elegans* Cl.Müll. and *Stylosanthes* spp.

CONSERVATION STATUS. In accordance with the IUCN red list criteria (IUCN Standards and Petitions Subcommittee 2017), we assess the conservation status as Critically Endangered (CR) based on criteria B2a and B2b (iii). *Rhynchosia mineira* occurs in only one known location, a degraded environment where there are agricultural crops and pasture.

PHENOLOGY. Collected in flower and fruit in July.

ETYMOLOGY. The species was named *Rhynchosia mineira* because it was collected in the state of Minas Gerais, which is one of the main centers of diversity of the Leguminosae family and of the genus *Rhynchosia* in Brazil.

Key to the species of *Rhynchosia* in Minas Gerais, Brazil

1a. Leaves unifoliolate.....	<i>R. platyphylla</i>
1b. Leaves trifoliolate	2
2a. Inflorescence exceeds the length of the	3
2b. Inflorescence does not exceed the length of the	8
3a. Seeds bicoloured	4
3b. Seeds unicoloured.....	5
4a. Stipels present. Seeds bicoloured black and red, with the red confined to the hilar area	<i>R. melanocarpa</i>
4b. Stipels absent. Seeds bicoloured black and red, the areas of coloration almost equal	<i>R. phaseoloides</i>
5a. Calyx lobes equal or exceed corolla	<i>R. reticulata</i>
5b. Calyx lobes do not exceed corolla	6
6a. Inflorescence racemose.....	<i>R. minima</i>
6b. Inflorescence paniculate	7
7a. Brown to black punctiform glands on the abaxial surface of the leaflets; fruits oblong	<i>R. edulis</i>
7b. Yellow punctiform glands on the abaxial surface of the leaflets; fruits oblanceolate.....	<i>R. rojasii</i>
8a. Stems hirsute; calyx lobes ovate	<i>R. clausenii</i>
8b. Stems pubescent; calyx lobes lanceolate	<i>R. mineira</i>

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Figures

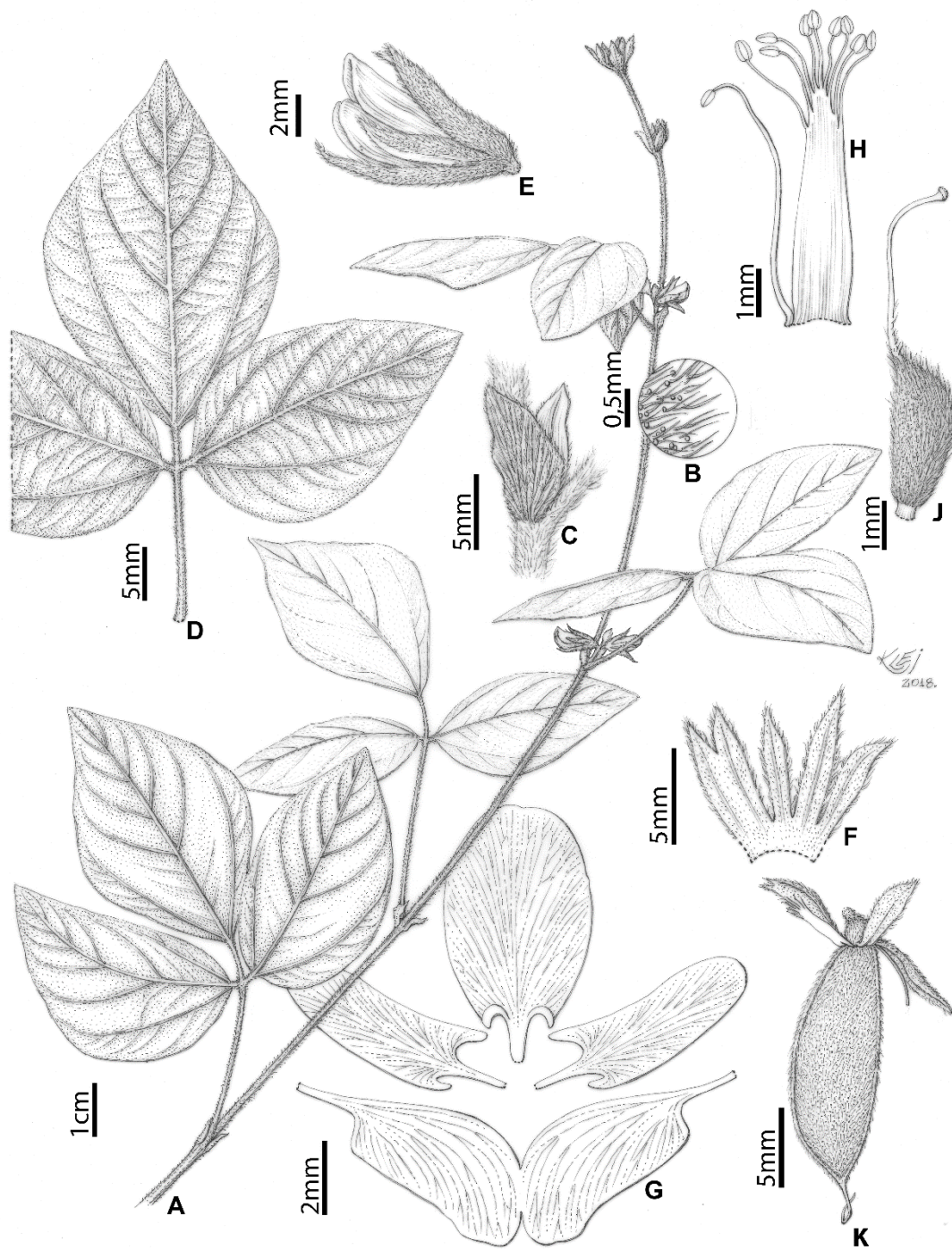
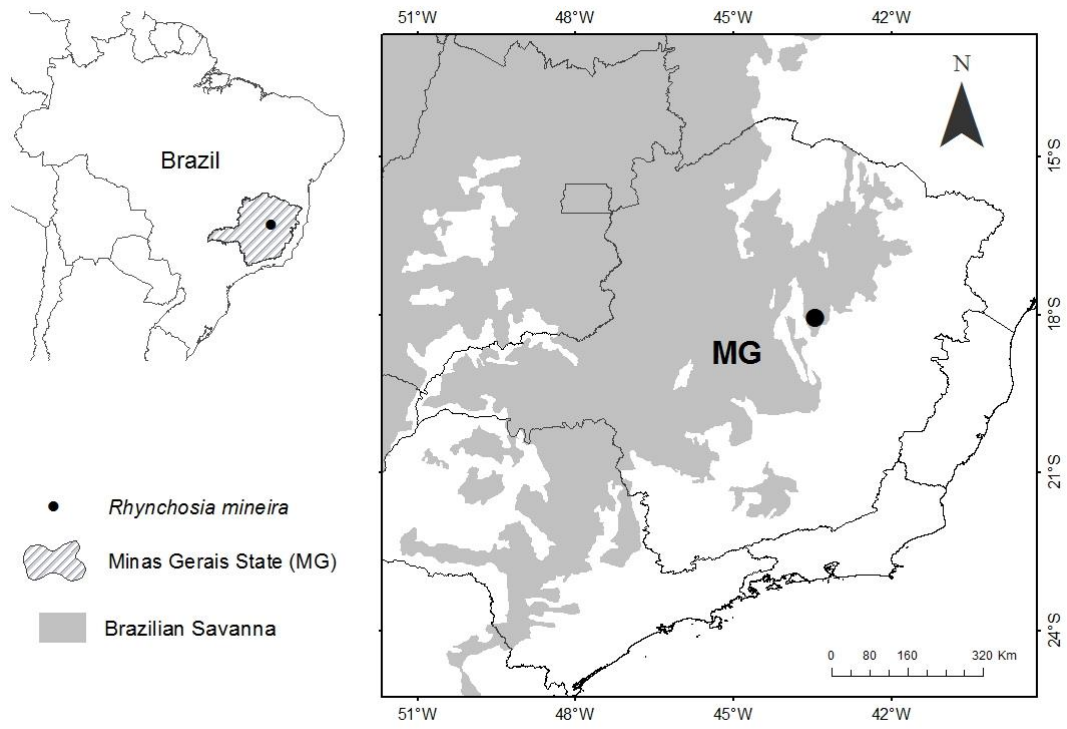


Fig. 1. *Rhynchosia mineira*. **A** habit; **B** stem with non-glandular trichomes and vesicular glands; **C** stipules; **D** trifoliate leaf; **E** flower showing calyx equal to or exceeding corolla; **F** calyx fully opened (adaxial surface); **G** standard (top), wings and keel petals; **H** staminal sheath; **J** gynoecium; **K** pod. All from Monteiro et al. 79. DRAWN BY KLEI SOUSA.



Fig. 2. *Rhynchosia mineira*. Details of stem, inflorescence and fruits. PHOTOS: ANA PAULA FORTUNA PEREZ.



Map 1. Distribution map of *Rhynchosia mineira* (modified from Olson et al. 2001).

Considerações finais

Este trabalho consiste na mais completa e recente revisão taxonômica de espécies de *Rhynchosia* ocorrentes na América do Sul. Também apresenta a primeira e abrangente filogenia molecular do gênero, utilizando uma densa amostragem de táxons de *Rhynchosia* bem como de representantes de Cajaninae, abrangendo toda a sua distribuição geográfica.

Para isto, foram feitas visitas a diferentes herbários, coletas em campo pelo Brasil, o maior centro de diversidade de *Rhynchosia* na América do Sul, e consultas bibliográficas da literatura relevante. Além disso, foi realizada uma otimização de protocolo para extração e amplificação do DNA (principalmente representantes herborizados) de táxons de *Rhynchosia*, da subtribo Cajaninae como um todo e do grupo externo.

Foram registradas 27 espécies de *Rhynchosia* para a América do Sul, sendo duas novas espécies para a ciência, e foram propostas seis novas sinonimizicações e 50 lectotipificações (30 destas de segundo passo). Os resultados filogenéticos realizados corroboraram os estudos anteriores, suportando o monofiletismo de Cajaninae e o polifiletismo de *Rhynchosia*, que emergiu em seis linhagens diferentes, uma delas representada apenas pela espécie-tipo do gênero com outra espécie asiática.

Os resultados aqui apresentados irão embasar uma nova proposta de classificação para a subtribo Cajaninae. Para isto, análises de dados combinados para os marcadores nucleares e de cloroplastos bem como análises de datação molecular estão sendo realizadas para melhor compreensão da sistemática de toda a subtribo.