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THE IMPORTANCE OF TAXONOMIC CLASSIFICATION OF 'PASHACO' AND 'HUAYRURO' IN THE FABACEAE FAMILY FOR TIMBER PRODUCTION IN LORETO, PERU

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Resumo

A importância da classificação taxonômica de "pashaco" e "huayruro" da família Fabaceae para a produção madeireira em Loreto, Peru. No Peru, os inventários florestais tradicionalmente agrupam diferentes espécies madeireiras sob o mesmo nome comercial. Os nomes "pashaco" e "huayruro" na Amazônia exemplificam essa prática, representando o agrupamento e comercialização de diversas espécies de Fabaceae, família de significativa importância florestal e comercial em Loreto. Este estudo teve como objetivo identificar taxonomicamente os indivíduos "pashaco" e "huayruro" de uma empresa madeireira registrados em seu censo florestal e diferenciar as espécies de cada grupo através da caracterização dendrológica. O censo da empresa identificou 429 indivíduos "pashaco" como *Albizia niopioides* e 150 indivíduos "huayruro" como *Ormosia amazonica*. A identificação botânica de amostras de 80 indivíduos de cada grupo revelou que os indivíduos classificados como *A. niopioides* compreendiam nove espécies: *Schizolobium parahyba var. amazonicum*, *Dimorphandra cuprea*, *Pseudopiptadenia suaveolens*, *Hydrochorea pedicellaris*, *Robrichia schomburgkii*, *Parkia nitida*, *Parkia igneiflora*, *Parkia decussata* e *Parkia multijuga*, sendo esta última a mais comum. Da mesma forma, a classificação "huayruro" ou *Ormosia amazonica* incluiu *Andira macrothyrsa*, *Batesia floribunda*, *Ormosia coccinea*, *Ormosia amazonica*, *Vataireopsis surinamensis*, *Vatairea erythrocarpa*, *Hymenolobium excelsum*, *Hymenolobium nitidum* e *Hymenolobium velutinum*, sendo este último o mais abundante. Este estudo ressalta a necessidade de melhor identificação de espécies em inventários florestais. As características dendrológicas dos caules e folhas podem auxiliar na diferenciação e identificação dessas espécies nos censos florestais, promovendo práticas de manejo sustentável, reduzindo o agrupamento de espécies e minimizando os impactos econômicos na cadeia produtiva da floresta madeireira.
Palavras-chave: Censo florestal, dendrologia, identificação taxonômica, nomes vernáculos, manejo sustentável.

Abstract

In Peru, forest inventories traditionally group different timber species under the same commercial name. The names "pashaco" and "huayruro" in the Amazon exemplify this practice, representing the grouping and commercialization of various Fabaceae species, a family of significant forest and commercial importance in Loreto. This study aimed to taxonomically identify the "pashaco" and "huayruro" individuals a timber company recorded in its forest census and to differentiate each group's species through dendrological characterization. The company's census identified 429 "pashaco" individuals as *Albizia niopioides* and 150 "huayruro" individuals as *Ormosia amazonica*. Botanical identification of samples from 80 individuals in each group revealed that the individuals classified as *A. niopioides* comprised nine species: *Schizolobium parahyba var. amazonicum*, *Dimorphandra cuprea*, *Pseudopiptadenia suaveolens*, *Hydrochorea pedicellaris*, *Robrichia schomburgkii*, *Parkia nitida*, *Parkia igneiflora*, *Parkia decussata*, and *Parkia multijuga*, with the last being the most common. Similarly, the "huayruro" or *Ormosia amazonica* classification included *Andira macrothyrsa*, *Batesia floribunda*, *Ormosia coccinea*, *Ormosia amazonica*, *Vataireopsis surinamensis*, *Vatairea erythrocarpa*, *Hymenolobium excelsum*, *Hymenolobium nitidum*, and *Hymenolobium velutinum*, with the latter being the most abundant. This study underscores the need for improved species identification in forest inventories. Dendrological characteristics of stems and leaves can aid in differentiating and identifying these species in forest censuses, fostering sustainable management practices by reducing species grouping and minimizing economic impacts in the timber forest production chain.
Keywords: Forest census, dendrology, taxonomic identification, vernacular names, sustainable management.

INTRODUCTION

Understanding the vast diversity of tree species in the tropics remains a significant challenge for researchers and various institutional actors focused on the management, conservation, and sustainable use of these forests. Among these areas are production forests intended for forestry use, representing a potential economic alternative for the sustainable development of the Amazon regions in Peru (Proyecto USAID Pro-

Bosques, 2019). However, forest resources are not optimally and sustainably utilized due to a lack of knowledge about the correct identity of the many forest species in these forests (Lacerda and Nimmo, 2010).

The first link in the timber forest production chain, and a fundamental piece for understanding the richness and floristic composition of production forests, is the forest census. Its purpose is to record all trees of different forest species with timber potential for subsequent use. However, the information obtained in forest censuses is not based on the scientific identity of the timber species but rather on common and/or commercial names (Araújo and Silva, 2000; Cardoso and Silva, 2004). Therefore, species identification in forest censuses lacks scientific, morphological, ecological, and even evolutionary validity. Common and/or commercial names for different timber species in the Amazon represent taxonomic complexes in which different taxa are grouped because they exhibit certain dendrological similarities in the eyes of the materos, who are responsible for tree identification in forest censuses (Procópio and Secco, 2008).

Moreover, the scientific names declared by timber companies in their forest census reports come from official lists provided by the highest entity of the Peruvian national forest service. These scientific names are only probable names for the commercial name established by the woodsmen in forest censuses. Consequently, the incorrect attribution of scientific names to commercial names generates negative impacts on sustainable forest management, biodiversity loss, and changes in species distribution due to poor management in timber exploitation (Cardoso and Silva, 2004). The inaccurate identification of these species also fosters illegal trade, causing serious economic harm and directly affecting the growth and maintenance of the timber forest industry, reflected in consumer dissatisfaction with wood-derived products and their exports.

Most institutions involved in forest crime issues have focused considerable effort on the anatomical identification of timber forest species, both macroscopically and microscopically, a valuable initiative to curb illicit timber trafficking (Lacerda *et al*., 2010). However, anatomical identification serves its purpose based on material from a felled, and transformed tree: the wood. Therefore, considering the extensive diversity of tree species in production forests, harvested without knowing their correct identity, complicates the work of anatomists, doubling the effort in describing and identifying samples whose species lack prior research, botanical support, and reference material deposited in xylotecas. Consequently, this hinders the joint efforts of institutions in their attempt to stop illicit timber trafficking, due to the lack of knowledge of the identity of timber forest species in forest censuses.

Fabaceae is one of the families with the greatest diversity of species with timber potential, some of which are commercially known as “pashaco” and “huayruro” in the Peruvian national market. Both commercial names group timber species of significant commercial flow in the Peruvian Amazon. However, Fabaceae is one of the most problematic families in terms of species identification at the taxonomic level, reflecting the same challenge but with greater complexity at the level of forest censuses (Azani *et al*., 2017).

Considering these problems and the crucial importance of botanical identification in forest censuses, this study aimed to collect botanical samples from individuals censused with the names “pashaco” and “huayruro” in a production forest in the Loreto region, Peru; and to identify them at the species level to find out, which are commercialized under both denominations. Likewise, a second objective was to carefully record the dendrological characteristics of the stem and leaves, in order to verify if differentiation is possible among species with the same commercial name through the construction of dichotomous keys based on these characteristics, this information being essential for the design and creation of future photographic guides or illustrated manuals that can serve as a tools to improve the identification skills of woodsmen and forestry regents in censuses. Finally, a new approach is proposed for future research in dendrological characterization and identification of timber forest species belonging to those most diverse families, generally grouped under the same commercial denomination.

MATERIAL AND METHODS

Study area

This study was conducted in the Industrial Maderera Zapote (IMAZA) forestry concession area, located in the Nauta district, 83 km southwest of Iquitos city, in the Loreto department, Peru (4°25’08” S; 73°38’44” W). This forestry concession is the only one with terrestrial access via roadways, making it the primary wood supplier to the city of Iquitos, unlike other concessions accessible only by waterways (Fig. 1). The concession spans 47,626 hectares and is characterized by its low hill forests (Bcb) and predominantly clay soils, with high floristic diversity and tree density (MINAM, 2015). The climate is tropical, with an average annual temperature and precipitation of 27°C and 2700 mm, respectively (Paredes, 2012).

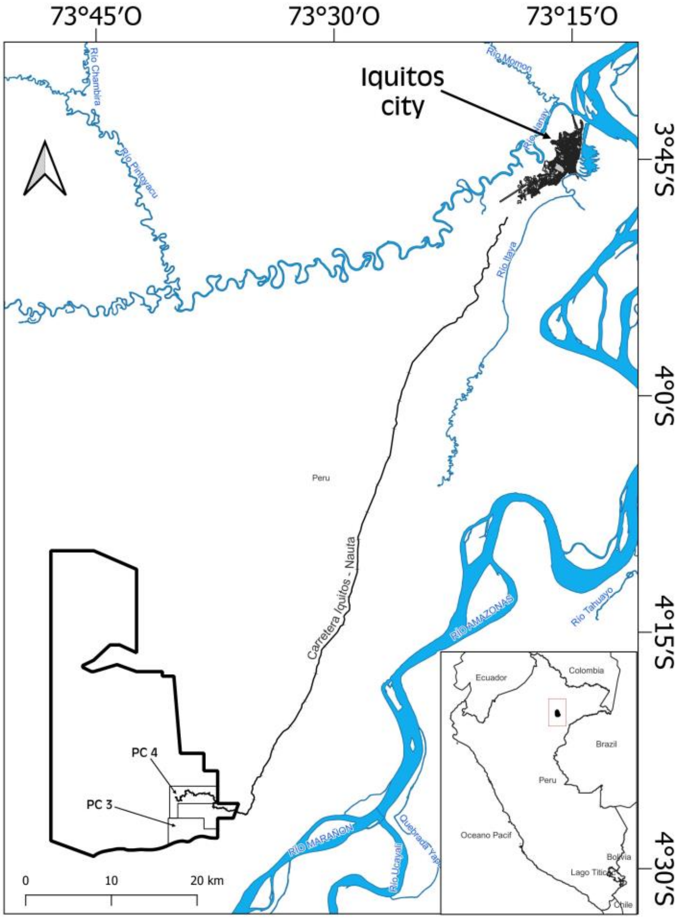

Figure. 1. Cutting plots (PC3 – PC4), within the forestry concession area of the Industrial Maderera Zapote company (IMAZA), in the Loreto region, Perú.

Figura 1. Parcelas de corte (PC3 – PC4), dentro da área de concessão florestal da empresa Industrial Madeireira Zapote (IMAZA), na região de Loreto, Peru.

Study species

To understand the diversity of species commercially known as "pashaco" and "huayruro," dendrological identification sheets, official species lists for forest procurement, scientific literature on the taxonomic identification of commercial species, and guides for the anatomical identification of timber species were reviewed (OSINFOR, 2014, 2015, 2017, 2018, 2019; SERFOR, 2019a, 2020, 2023). Additionally, species lists declared in the final report of the forest census conducted by the managing company were examined.

Database and identification of trees

Based on the species list recorded in the latest forest census conducted by the company in two procurement units (PC3 = 1250.27 ha; PC4 = 1293.32 ha) in 2016, only trees identified with the commercial names "pashaco" and "huayruro" were selected (Fig. 1). This record list consists of a robust database detailing the total number of individuals per species to be harvested; each tree is identified by its commercial or vernacular name, (DBH) diameter at breast height, commercial height, stem quality (i.e., straight, twisted), phytosanitary condition (signs of pathogen attacks or rot), unique tree serial code, and geographical coordinates (X, Y).

Sampling and data collection

Considering the high density of trees in both groups of commercial species and their accessibility, 80 individuals called "pashaco" and 80 individuals called "huayruro" were selected, located near the main access roads of the concession to facilitate transportation and logistics for the research team. In the field, the 160 individuals were found and re-georeferenced for updating in the database. Each tree was assigned a new code, different from that in the forest census, to facilitate botanical collection and subsequent dendrological characterization. The collected botanical material, such as leaf samples, flowers, and fruits (the latter two when possible), were preserved following herbarization methods and the new coding assigned in this study. The preserved samples were sent to the CITEforestal Maynas herbarium in Iquitos, Peru, where they were dried and deposited. Taxonomic review and identification of the samples were carried out by botanical experts through species description and comparison with samples from other local and virtual herbaria.

Dendrological characterization of the identified species

To provide a more complete and detailed dendrological description of the identified species from both groups, 1 to 3 individuals per species were selected. This study focused more on characteristics related to the stem, such as stem base (i.e., cylindrical, digitate, tabular); stem type (i.e., straight, twisted); bark or rhytidome type (i.e., striated, cracked, scaly, evident shedding, smooth, lenticellate); lenticel distribution (i.e., dispersed, forming horizontal lines); external and internal bark coloration, and exudate coloration (i.e., cream, reddish, not evident). Additionally, leaf morphological characters, such as compound leaf type (i.e., pinnate, bipinnate); phyllotaxy of leaves, leaflets, and foliolules (i.e., opposite, alternate); leaf arrangement on branches (i.e., clustered, evenly distributed); glands (i.e., present, absent); gland position on the leaf (i.e., petiole, rachis, both rachis and petiole); indumentum on leaflets or foliolules (i.e., pubescence, waxes); shape of foliolules (i.e., rhomboid, sigmoid; in the case of “pashaco”); position of the main vein (i.e., central, lateral; in the case of “pashaco”); size of leaflets (i.e., tiny, small, large); shape of leaflets and foliolules (i.e., elongated, rounded).

Preparation of dichotomous keys

To determine significant dendrological differences and facilitate differentiation between the forest species comprising both groups, all morphological characteristics of stems and leaves recorded in the field were subjected to a dichotomous model. This model will allow the determination of different species by comparing two exclusive characters. Based on the construction of these dichotomous keys, the most important characteristics were selected to discriminate or differentiate between species of each group, aiming to improve the skills of fieldworkers in identifying and differentiating these species in forest censuses.

RESULTS

Survey of Species Known as “Pashaco” and “Huayruro”

According to the bibliographic information gathered on species named with both common names, 31 species belonging to 13 genera were found under the name “pashaco” (Table 1). On the other hand, 21 species identified as “huayruro” were found, distributed across 7 genera (Table 2). Additionally, taxonomic synonyms for each scientific name were recorded (Tables 1 and 2) (OSINFOR, 2019, 2018, 2017, 2015, 2014; SERFOR, 2023, 2020, 2019b.

Table 1. Species known commercialily as “pashaco” in the Peruvian Amazon, and its taxonomic synonyms. (OSINFOR, 2019, 2018, 2017, 2015, 2014; SERFOR, 2023, 2020, 2019a)

Tabela 1. Espécies conhecidas comercialmente como “pashaco” na Amazônia peruana e seus sinônimos taxonômicos. (OSINFOR, 2019, 2018, 2017, 2015, 2014; SERFOR, 2023, 2020, 2019a)

Trade name: PASHACO	
Scientific names attributed to the commercial name	**Taxonomic synonyms**
Abarema acreana (J.F.Macbr.) L.Rico	*Hydrochorea acreana* (J.F.Macbr.) Barneby & J.W.Grimes
Abarema auriculata (Benth.) Barneby & J.W.Grimes	*Jupunba auriculata* (Benth.) M.V.B.Soares, M.P.Morim & Iganci
Albizia niopioides (Benth.) Burkart	Albizia niopoides (Spruce ex Benth.) Burkart
Albizia submidiata (Splitg.) Barneby & J.W.Grimes	-
Hydrochorea pedicellaris (DC.) M.V.B. Soares; Iganci & M. P. Morim	*Balizia pedicellaris* (DC.) Barneby & J.W.Grimes
Dimorphandra macrostachya Benth.	-
Enterolobium barnebianum Mesquita & M.F.Silva	-
Enterolobium cyclocarpum (Jacq.) Griseb.	-
Enterolobium schomburgkii (Benth.) Benth.	-
Macrolobium acaciifolium (Benth.) Benth.	-
Macrolobium angustifolium (Benth.) R.S.Cowan	-

Macrolobium discolor (Benth.)	-
Macrolobium gracile Spruce ex Benth.	-
Macrolobium limbatum Spruce ex Benth.	-
Macrolobium microcalyx Ducke	-
Macrosamanea spruceana (Benth.) Killip ex Record	-
Marmaroxylon basijugum (Ducke) L.Rico	*Zygia basijuga* (Ducke) Barneby & J.W.Grimes
Parkia igneiflora Ducke	-
Parkia multijuga Benth.	-
Parkia nitida Miq.	-
Parkia panurensis Benth.	*Parkia pectinata* (Humb. & Bonpl. Ex Willd.) Benth.
Parkia pendula (Willd.) Benth.	-
Parkia ulei (Harms) Kuhlm.	-
Parkia velutina Benoist	-
Piptadenia pteroclada Benth.	-
Schizolobium amazonicum Huber ex Ducke	*Schizolobium parahyba* (Vell.) S.F.Blake
Senegalia loretensis (J.F.Macbr.) Seigler & Ebinger	-
Senegalia tenuifolia (L.) Britton & Rose	-
Stryphnodendron microstachyum Poepp.	-
Stryphnodendron polystachyum (Miq.) Kleinhoonte	-
Stryphnodendron pulcherrimum (Willd.) Hochr.	-

Table 2. Species known commercialily as "huayruro" in the Peruvian Amazon, and its taxonomic synonyms. (OSINFOR, 2019, 2018, 2017, 2015, 2014; SERFOR, 2023, 2020, 2019a)
Tabela 2. Espécies conhecidas comercialmente como "huayruro" na Amazônia peruana e seus sinônimos taxonômicos. (OSINFOR, 2019, 2018, 2017, 2015, 2014; SERFOR, 2023, 2020, 2019a)

Trade name: HUAYRURO	
Scientific names attributed to the commercial name	**Taxonomic synonyms**
Andira macrothyrsa Ducke	-
Andira multistipula Ducke	-
Batesia floribunda Spruce	-
Dussia tessmannii Harms	-
Hymenolobium excelsum Ducke	-
Hymenolobium nitidum Benth.	-
Hymenolobium pulcherrimum Ducke	-
Ormosia amazonica Ducke	-
Ormosia arborea (Vell.) Harms	-
Ormosia bopiensis Pierce	-
Ormosia coarctata Jacks.	-
Ormosia coccinea (Aubl.) Jacks.	-
Ormosia discolor Spruce	-
Ormosia macrocalyx Ducke	-
Ormosia nobilis Tul.	-
Ormosia paraensis Ducke	-
Ormosia peruviana Rudd	-
Ormosia schunkei Rudd	-
Vatairea erythrocarpa (Ducke) Ducke	-
Vatairea guianensis Aubl.	-
Vataireopsis speciosa Ducke	-

Comparison between Forestry Survey Identification and Taxonomic Identification in this Study

The forest census conducted by the timber company recorded 429 individuals of "pashaco" and 150 individuals of "huayruro," for which the company attributed the scientific names *Albizia niopioides* and *Ormosia amazonica*, respectively, as declared in their final report according to the official list of timber forest species. The taxonomic study of the samples collected in this study revealed the occurrence of 9 species for the "pashaco" group and 9 species for the "huayruro" group. Among the individuals grouped as A. niopioides "pashaco," the following were identified: 26 individuals of *Parkia multijuga* Benth.; 10 *Pseudopiptadenia suaveolens* (Miq.) J.W. Grimes; 6 *Dimorphandra cuprea* Sprague & Sandwith; 7 *Parkia nitida* Miq.; 4 *Hydrochorea pedicellaris* (DC.) M.V.B. Soares; Iganci & M. P. Morim; 3 *Parkia igneiflora* Ducke; 2 *Robrichia schomburgkii* (Benth.) A.R.M. Luz & É. R. Souza; 4 *Schizolobium parahyba* var. *amazonicum* (Huber ex Ducke) Barneby; 2 *Parkia decussata* (Ducke), and 16 standing dead individuals. Among the individuals grouped as *O. amazonica* "huayruro," 16 individuals of *Hymenolobium velutinum* Ducke; 10 *Ormosia amazonica* Ducke; 8 *Hymenolobium nitidum* Benth.; 6 *Vataireopsis surinamensis* H.C. Lima; 4 *Hymenolobium excelsum* Ducke; 6 *Ormosia coccinea* (Aubl.) Jacks.; 5 *Batesia floribunda* Spruce ex Benth.; 4 *Andira macrothyrsa* Ducke, 7 *Vatairea erythrocarpa* (Ducke) Ducke, and 14 standing dead individuals were identified. Additionally, the number of common and/or commercial names each of these species has was recorded (Table 3).

Table 3. Number of commercial names of the species popularly known as "pashaco" and "huayruro", found in this study.
Tabela 3. Número de nomes comerciais das espécies popularmente conhecidas como "pashaco" e "huayruro", encontrados neste estudo.

Scientific names	Tradenames determined in the forest census	Nº tradenames
Hydrochorea pedicellaris (DC.) Barneby & J.W.Grimes	Pashaco	3
Dimorphandra cuprea Sprague & Sandwith	Pashaco	1
Robrichia schomburgkii (Benth.) A.R.M. Luz & É. R. Souza	Pashaco	1
Parkia decussata Ducke	Pashaco	1
Parkia igneiflora Ducke	Pashaco	2
Parkia multijuga Benth.	Pashaco	4
Parkia nitida Miq.	Pashaco	8
Pseudopiptadenia suaveolens (Miq.) J.W.Grimes	Pashaco	1
Schizolobium amazonicum Huber ex Ducke	Pashaco	5
Andira macrothyrsa Ducke	Huayruro	2
Batesia floribunda Spruce	Huayruro	2
Hymenolobium excelsum Ducke	Huayruro	3
Hymenolobium nitidum Benth.	Huayruro	2
Hymenolobium velutinum Ducke	Huayruro	1
Ormosia amazonica Ducke	Huayruro	3
Ormosia coccinea (Aubl.) Jacks.	Huayruro	7
Vatairea erythrocarpa (Ducke) Ducke	Huayruro	2
Vataireopsis surinamensis H.C.Lima	Huayruro	1

Dendrological Characterization of "Pashaco" and "Huayruro" Species and Dichotomous Keys

Stem characteristics were important in differentiating both groups. However, the base of the stem, whether digitate or tabular, was the main characteristic that allowed differentiation of the species in the field, followed by the shedding of the outer bark, the presence of lenticels, and the type of exudates. Leaf characteristics such as the presence/absence of glands, types of glands, phyllotaxy, and size of foliolules also substantially contributed to the separation of the identified specimens.

Key to Dendrological Characters of Species Commercialized as “Pashaco” in Iquitos

1 Digitate stem base.
- 2 Rhytidome with evident shedding (depressions), outer bark orange in color, bipinnate leaves with cup-shaped gland between the base of the petiole and the first pair of pinnae..***Hydrochorea pedicellaris***
- 2’ Rhytidome without evident shedding, lenticellate bark, bipinnate leaves with flattened gland between the base of the petiole and the first pair of pinnae..***Parkia multijuga***

1’ Tabular stem base.
- 3 Rhytidome with evident shedding.
  - 4 Large, conspicuous lenticels forming horizontal lines around the stem, very small sigmoid (S-shaped) leaflets, with cup-shaped gland between the base of the petiole and the first pair of pinnae.…………..***Robrichia schomburgkii***
  - 4’ Small, inconspicuous lenticels, not forming horizontal lines around the stem.
    - 5 Yellow exudate present, inner bark yellow, small and oblong leaflets, without wax and underside not white…...................***Parkia igneiflora***
    - 5’ No exudate, inner bark white, leaves without glands on the petiole and rachis......................................***Schizolobium parahyba var. amazonicum***
- 3’ Rhytidome without evident shedding.
  - 6 Circular lines or well-defined annular marks....................***Parkia multijuga***
  - 6’ Without broadly circular lines or well-defined annular marks.
    - 7 Striated rhytidome, very small sigmoid leaflets, with flattened gland between the base of the petiole and the first pair of pinnae ....***Pseudopiptadenia suaveolens***
    - 7’. Lenticellate rhytidome.
      - 8 Large and spaced lenticels, with cream to yellow inner bark, and leaves without glands on the petiole and rachis ....***Dimorphandra cuprea***
      - 8’ Small and closely spaced lenticels.
        - 9 Yellow exudate.............................***Parkia decussata***
        - 9’ Reddish exudate (in some cases slightly pinkish and milky), small and oblong leaflets, with the underside covered in wax, giving a white appearance........................***Parkia nitida***

Key to Dendrological Characters of Species Commercialized as “Huayruro” in Iquitos

1 Digitate stem base.
- 2 Rhytidome with evident shedding (scaly), leaves with medium-sized leaflets, underside lighter than the upper side (medium orange when dry)................***Andira macrothyrsa***
- 2’ Rhytidome without evident shedding, leaves clustered and not clustered.
  - 3 Leaves well clustered at the tip of the branches…………....***Vataireopsis surinamensis***
  - 3’ Leaves not clustered at the tip of the branches.
    - 4 Leaves with flattened rachis and glands between the leaflets ………..***Batesia floribunda***
    - 4’ Leaves with non-flattened rachis and without glands, large, round leaflets with hairs or pubescence on the underside…….................***Ormosia amazonica***

1’ Tabular or tabulate stem base.
- 5 Rhytidome with evident shedding (cracked or scaly).
  - 6 Leaves clustered at the tip of the branches.
    - 7 Pubescent, small and thin leaflets............***Hymenolobium excelsum***
    - 7’ Pubescent, slightly larger and rounded leaflets than the previous ....***Hymenolobium velutinum***
  - 6’ Leaves not clustered at the tip of the branches, intersecondary veins, glabrous upper and lower sides, with shedding of rhytidome either scaly or cracked ....***Hymnolobium nitidum***
- 5’ Rhytidome without evident shedding
  - 8 Lenticels forming horizontal lines, leaves with entire-edged leaflets ....***Ormosia coccinea***
  - 8’ Lenticels not forming horizontal lines, leaves with serrated-edged leaflets ....***Vatairea erythrocarpa***

DISCUSSION

This study demonstrates that various timber species from different genera of the Fabaceae family in the Peruvian Amazon are grouped under a single common or commercial name as a traditional practice in forest censuses. The diversity of species found in this floristic study, in contrast to the species reported by the timber company in its forest census, reveals significant gaps in information regarding local taxonomy. This directly impacts management and utilization plans for these species groups, significantly affecting the timber production chain in the Loreto region.

Previous studies have shown similar issues with the grouping of timber species in forest censuses throughout the Amazon basin. This is common in families that are both species-rich and economically significant (Procópio and Secco, 2008; Reis *et al*., 2013; Sousa *et al*., 2007). However, other researchers have managed to differentiate species named with a single commercial name using dendrological characteristics of the stem and leaf morphology, highlighting the importance of botanical identification in forest censuses (Procópio and Secco, 2008).

Botanical identification for floristic studies requires personnel experienced in plant identification, capable of processing samples collected in the field. However, forest censuses for production purposes are based on the empirical knowledge of local woodsmen regarding the various tree species in a specific area. This leads to the grouping of several taxa belonging to one or more families under the same commercial names, as these species share certain dendrological similarities, making differentiation difficult.

While the costs required for field timber exploration limit the hiring of botanical identification specialists, materials, and supplies for sample collection, concessionaires and officials of various forestry companies could train woodsmen in tree identification using various illustrative guides and manuals for dendrological identification of timber species (OSINFOR, 2019, 2018, 2017, 2015; SERFOR, 2020). Although there is extensive literature represented in guides and manuals for identifying these species, none have presented a differential approach for a specific group of species that, due to their phylogenetic proximity, share similar dendrological characteristics, the same commercial name, and are procured for the same uses of their wood. Therefore, the lack of botanical information under these approaches generates ignorance and confusion, hindering the vision of the wide variety of species in the most diverse families; at the same time favoring the grouping of trees that appear morphologically similar to the woodsmen, and consequently are determined by them under a single common name.

Field manuals and botanical identification guides should pay more attention to those groups of species that are commercially known under a single common name, as these groupings create "commercial species complexes," which hinder management and sustainable use. According to the technical document of the forest species management plan carried out by the timber company, based on its census report, 429 individuals of “pashaco” and 150 individuals of “huayruro” were identified, to which the scientific names *Albizia niopioides* and *Ormosia amazonica* were attributed, respectively. However, the results obtained in this study, through botanical collections and taxonomic identification, indicated the occurrence of *H. pedicellaris*; *R. schomburgkii*; *D. cuprea*; *P. igneiflora*; *P. multijuga*; *P. nitida*; *P. decussata*; *P. suaveolens* and *S. parahyba* var. *amazonicum*, which had been declared as *A. niopioides*, with no individuals belonging to this species found. Similarly, the species *A. macrothyrsa*; *B. floribunda*; *H. excelsum*; *H. nitidum*; *H. velutinum*; *O. amazonica*; *O. coccinea*; *V. erythrocarpa* and *V. surinamensis*, were declared as *O. amazonica*, with only 10 individuals recorded for the latter.

Therefore, establishing conservation plans through the selection of seed trees of the species *A. niopioides* “pashaco” and *O. amazonica* “huayruro” in forest censuses is entirely erroneous because both scientific names group other species with different phenological cycles, growth strategies, and other ecological aspects that are important for their adaptation in permanent production forests. Moreover, it is important to consider that the species identified in both groups do not present the same anatomical and organoleptic characteristics, which define the suitability of the wood for its workability in the industry, potential uses, and according to these, their market costs (other results obtained within the framework of the same project that have not yet been published).

Differentiating species using dichotomous keys has been an important tool in taxonomic identification, as it facilitates the recognition of a species according to key morphological characteristics, while discarding others in the process. Many identification manuals and guides lack a comparative approach for those groups of timber species that share the same commercial denomination and often belong to complex and taxonomically challenging families; they are generally based on the most well-known and easily recognizable species, whose commercial denomination does not present conflicts with other species. Likewise, dendrological characterization for these species is based on general descriptions of the tree, paying more attention to leaf characteristics.

While leaf morphological knowledge is of utmost importance for taxonomic identification, woodsmen and personnel responsible for identification in forest censuses have little or no access to leaf material, basing their identification mainly on stem characteristics such as bark type, color of exudates, odors, flavors, and personal experiences; making it more complex to differentiate trees that share the same commercial denomination. According to the dendrological description carried out in this study, and submitted to the dichotomous system, it was possible to identify each of the species belonging to the “pashaco” and “huayruro” groups, using dendrological characteristics of the stem. For both groups of species, the type of stem base was the first characteristic for the differentiation of subgroups; followed by the evident or non-evident shedding of the rhytidome, as well as the arrangement, density, and size of lenticels. Therefore, the dichotomous key constructed in this study, based on stem characteristics, represents an important tool for the identification of "pashaco" and "huayruro" species in forest censuses in the Loreto region.

It is important to highlight that the nine species identified with the name "pashaco," and the nine species identified as "huayruro," represent only a small geographical part of the Loreto region, with environmental conditions different from other geographical areas of the same, and much more different from other regions of Peru, whose floristic composition is different. According to the bibliographic review of the timber forest species that share the names "pashaco" and "huayruro" in Peru; the number of species found by this study represents 26% and 43%, respectively. However, considering the official list of timber forest species provided by the Peruvian forestry service, the species *Dimorphandra cuprea*, *Pseudpiptadenia suaveolens*, and *Parkia decussata*, found in this study, as well as the species *Andira macrothyrsa*, *Vataireopsis surinamensis*, and *Hymenolobium velutinum*, from the "huayruro" group, have not yet been considered in this list (SERFOR, 2023). The official list of timber forest species is established based on the results of joint research, monitoring, and inspection actions by competent organizations, updating the diversity of species from time to time (Fig. 1); and since the last update was published this year, the species found in this study have not yet been included.

The results indicate that through the construction of dichotomous keys based on dendrological characteristics of the stem, a resource heavily used by woodsmen in forest censuses, and in conjunction with leaf characteristics, it is possible to differentiate and identify species that share the same commercial name. This change in perspective regarding the description of species established in manuals and identification guides could improve the skills of woodsmen in recognizing the various species in their timber exploration activities. Nonetheless, the identification of timber species in forest censuses will continue to be a challenge for scientific research, public sector forestry organizations and entities, non-governmental organizations, professionals, and specialists in botanical identification.

CONCLUSIONS

- The identification of timber species denominated "pashaco" and "huayruro" in forest censuses cannot be considered reliable because several taxa share the same commercial name. Therefore, the scientific names that forestry companies designate the species identified by both commercial names are erroneous and have no scientific validity, leading to poor management practices and use of permanent production forest in the peruvian Amazon.
- Although the collection of botanical samples and the knowledge of experts in taxonomic identification are fundamental in the assignment of names, forestry companies do not consider them in their censuses, because they take up more time in the field and economic investment.
- The identification of these species carried out by woodsmen is based solely on the observation of the characteristics of the stem, which, considered as a basis for the construction of dichotomous keys, are very important in the differentiation of species of each group. Therefore, taking into account the validity and operation of these keys, it is possible to design and create photographic guides or illustrated manuals based on the essential information obtained from the dichotomous keys.
- This new approach will allow for the creation of new simpler identification material that can assist in the differentiation and identification of usable trees that have the same commercial name and forms groups or commercial complexes, and at the same time, improve management plans and sustainable use of the same, according to their correct taxonomic identity, especially in those families that are most diverse and of great economic importance.
- Finally, the incorporation of this new perspective into the guidelines and policies of various academic, governmental, and non-governmental institutions will reduce the grouping of species, minimizing economic damages at different levels of the timber forest production chain, and positively affecting the economic growth of the forestry sector in Amazonian regions.

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