



Taxonomic and ecological aspects of *Myrceugenia mesomischa* (Myrtaceae), an endemic tree from southern Brazil

Aspectos taxonômicos e ecológicos de Myrceugenia mesomischa (Myrtaceae), uma árvore endêmica da Região Sul do Brasil

Robberson Bernal Setubal¹, Martin Grings², Eduardo Pasini² & Guilherme Dubal dos Santos Seger¹

Abstract

Myrceugenia mesomischa (Burret) D. Legrand & Kausel (Myrtaceae), a tree species poorly cited in floristic and phytosociological surveys in its area of known occurrence, was recorded as one of the species with the highest importance value in a fragment of *Araucaria* forest in São Francisco de Paula municipality, Rio Grande do Sul state, Brazil. The species was abundant in the understory strata of the forest, showing the highest frequency and density of the survey. Considering the paucity of data on the species, its degree of rarity and endemism (occurring only in the states of Rio Grande do Sul and Santa Catarina, Brazil), more studies are needed to evaluate the true current state of conservation of populations of this species.

Key words: *Araucaria* forest, Atlantic Forest biome, floristic, phytosociology.

Resumo

Myrceugenia mesomischa (Burret) D. Legrand & Kausel (Myrtaceae), espécie arbórea pouco citada em levantamentos florísticos e fitossociológicos na sua área de ocorrência conhecida, foi registrada como uma das espécies de maior valor de importância em um fragmento de floresta com araucária no município de São Francisco de Paula, Rio Grande do Sul, Brasil. A espécie foi observada ocupando em abundância os estratos de sub-bosque da floresta avaliada, tendo sido a espécie de maior frequência e densidade do levantamento. Visto a escassez de dados sobre a espécie, seu grau de raridade e endemismo (ocorre apenas nos Estados do Rio Grande do Sul e Santa Catarina, Brasil), recomenda-se a realização e divulgação de mais trabalhos que possibilitem avaliar o real estado de conservação atual de populações desta espécie.

Palavras-chave: bioma Mata Atlântica, floresta com araucária, fitossociologia, florística.

Introduction

Myrceugenia mesomischa (Burret) D. Legrand & Kausel, Myrtaceae, was described by Burret (1941) as *Luma mesomischa* based on type material collected by Herter (26250) in São Francisco de Paula, Rio Grande do Sul (RS), Brazil. In the following decade, Legrand (1953) proposed a new taxonomic combination for the species, transferring it to genus *Myrceugenia*. Some years later, Legrand (1957) published a study of Neotropical *Myrceugenia* *O. Berg*, which also cited *M. mesomischa*. In these three studies, the authors made no reference to the species habit or growth form and the descriptions have been conducted

solely through analysis of original type material, which was deposited in the herbarium of Berlin and has probably been destroyed (Sobral 2003). The specific epithet refers to the median length of the petioles when compared to other species described in the same source that show longer petioles (Sobral 2003).

According to Landrum (1981), *Myrceugenia* presents two species occurring in the Fernández Islands, 12 other species in Chile and adjacent Argentina, and a majority of 25 species occurring in eastern South America. Most of these are found in the eastern border of the Brazilian coast and on the plateau (Planalto), from Rio de Janeiro to Porto Alegre. Legrand & Klein

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¹Universidade Federal do Rio Grande do Sul. Correspondence: rbsetubal@yahoo.com.br

²Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves 9500, bl. IV, prédio 43433, Campus do Vale, 91501-970, Porto Alegre, RS, Brasil.

(1970) studying *Myrceugenia* in Santa Catarina state (SC), cited 24 native species without mentioning the occurrence of *M. mesomischa*. The extensive work of Reitz *et al.* (1978, 1983) listed the occurrence of 713 and 515 species of native trees in SC and RS, respectively. In these studies, the significant contribution of Myrtaceae was evidenced by the high number of species obtained for the family, 190 in SC (26.6% of total) and 103 in RS (20%), none citing *M. mesomischa*. Furthermore, Klein (1984) also highlighted the sociological importance of Myrtaceae in the forests of Brazil.

Between 2000 and 2003, the RS Continuous Forest Inventory (SEMA/UFSM-RS 2001) reported the occurrence of 469 species of trees and shrubs with perimeter at breast height ≥ 3 cm, without citing *M. mesomischa*. Sobral (2003), in a biogeographical and taxonomic study of Myrtaceae from RS based on material examined in collection tours and herbaria, made the first citation of species occurrence after its description and new combination, describing it as a shrub up to 3 m tall. The author highlighted its restricted occurrence in the *Araucaria* forest of RS and SC and in the riparian forests of Serra do Sudeste physiographic region of RS. However, the author did not specifically comment on this record, which was until then unnoticed in other works.

Sobral *et al.* (2006) presented a new review of native tree species of RS with a list of 519 species, also not mentioning *M. mesomischa*. Soon after, Mattei (2007), in a study involving patterns of landscape ecology, species richness and diversity of the *Araucaria* forest on the Planalto Médio region (RS), cited the record of an individual tree of *M. mesomischa* in one of the 16 fragments analyzed. Sonego *et al.* (2007) presented a structural description of the tree component of an *Araucaria* forest fragment in the Floresta Nacional de São Francisco de Paula (FLONA), citing *M. mesomischa* among the five species with the highest importance value in the survey, related to the great number of individuals. More recently, Avila (2010) cited *M. mesomischa* as one of the main species for the natural regeneration of tree species of the *Araucaria* forest at FLONA. Jeske-Pieruska *et al.* (2010) also reported the occurrence of the species in a forest fragment in São José dos Ausentes (RS), a neighboring municipality of São Francisco de Paula. In spite of the importance of these works, they do not provide profound taxonomic and ecological information on *M. mesomischa*.

Other recent phytosociological and floristic surveys conducted in RS, in the Planalto Meridional region (Rosário 2001; Narvaes *et al.* 2005; Grings & Brack 2009) and Serra do Sudeste (Jurinitz & Jarenkow 2003; De Marchi & Jarenkow 2008; Soares & Ferrer 2009), did not cite the record of *M. mesomischa*.

The aim of this paper is to present new data on *M. mesomischa*, obtained from a floristic and phytosociological survey in a fragment of *Araucaria* forest in São Francisco de Paula, RS. The importance of this work is due to: (i) the addition of new taxonomic and ecological information on *M. mesomischa*, given the current lack of data available on this species, (ii) provide phytosociological data obtained for the species in the study area; (iii) the enrichment of knowledge about a species with geographic distribution restricted to southern Brazil, rarely mentioned in floristic and phytosociological surveys in its area of known occurrence, besides increasing data about its current conservation status.

Material and Methods

Study area

The study was conducted in São Francisco de Paula Municipality, located in Campos de Cima da Serra physiographic region, northeastern RS (Fortes 1959). The predominant lithology of the region is represented by acidic and basic volcanic rocks belonging to the Serra Geral Formation, constituting the Planalto Meridional (White 1908). The landscape is marked by low hills separated by wide valleys extended by successive steps of dissection that left slope ruptures and small differences in topographic levels. The climate in the region is Köppen's Cfb, considered subtropical mesothermic, although temperate climate periods also occur (Nimer 1990). The mean annual temperature is 16° C and average annual rainfall stands at around 1800 mm (São Francisco de Paula 2008). Most of the region has Bruno Cambisol soils, the main features being humic and alic properties, low to median depth, high accumulation of organic matter, sharp acidity and low fertility (São Francisco de Paula 2008).

The study area is located in the western quadrant of the municipality (29°22'33"S 50°30'38"W; altitude max. 875 m), accessed by highway RS-235. The area is part of the Guirra hydrographic micro-basin, belonging to the Santa Cruz River Basin, tributary of the Caí River. In a study of the vegetation, the RADAMBRASIL project recognized

three phytoecological formations occurring in the region: Steppe (subdivided into park-steppe and grassy-woody steppe with gallery forest), *Araucaria* forest and Atlantic Forest, with the former predominating (Teixeira *et al.* 1986). In the study area, the vegetation was represented by a mosaic composed of grassland (steppe) and *Araucaria* forest, the first occurring preferentially on the top and upper third of the hills and the second on hillside areas and watercourse margins. The municipality belongs to the Atlantic Forest Biome (IBGE 2004).

In the study area, extensive cattle ranching predominates with frequent entry of cattle inside the forest which promotes trampling and grazing of herbaceous and woody strata at some points. Moreover, the absence of valuable timber species, such as Lauraceae and centenarian individuals of *Araucaria angustifolia* (Bertol.) Kuntze are evidences of selective logging in the recent past. Despite these disturbances, a large part of the forest is currently in an advanced stage of regeneration, presenting an ample canopy and complex stratification.

Species description

The morphological description of *M. mesomischa* was based on material collected during fieldwork and also on the review of material deposited in the herbarium collections of ICN, HAS, HUCS, MBM and PACA (Thiers 2010). Terminology is according to Radford (1986), Sobral (2003) and Stearn (1973).

Vegetation survey

The qualitative and quantitative survey of the tree component present in a fragment of *Araucaria* forest (about 26 ha) was conducted in May 2010. The floristic survey was performed through a visual sampling method (Filgueiras *et al.* 1994), which consisted of walking through the fragment with the aid of maps. Concurrently, we described the different communities present in the fragment that were recognized by comparative analysis of the parameters relief, drainage, geomorphology, flora and physiognomy. The species were arranged in families according to APG III (2009).

The phytosociological survey was carried out using the plot method, with the sampling units (SUs) measuring 10 × 10 m (Müller-Dombois & Ellenberg 1974). The arrangement of the SUs was done in a

systematic preferential way in four transects distributed according to local relief toposequences, covering the following geomorphological compartments: top, slope (upper, middle and bottom) and lowland. The distance between plots was c. 40 m. Two transects had southern exposure and two had southeastern exposure, the predominant directions of the local relief. Each transect contained one SU per geomorphological compartment, that is, four SUs per compartment and 20 SUs in the total survey (total sampled area: 2,000 m²).

Two inclusion levels traditionally used in phytosociological surveys were considered, one comprising individuals with diameter at breast height (DBH) between 5 and 10 cm and other with DBH over 10 cm. This criterium aimed to evaluate structural and compositional differences between the regenerative and canopy strata, allowing the comparison of the data obtained with other similar surveys. Besides collecting phytosociological data from each specimen, standardized sampling sheets were used to collect qualitative information on environmental factors such as relief position, soil moisture and sunlight, seeking to verify possible influence on the composition and distribution of species along the geomorphological compartments, and visual quantitative evaluations of exposed soil, litter, density of shrubby strata and density of lianas (low = 0–25%; medium = 25–50%; high > 50%). For each individual were recorded: scientific name, height (meters) and circumference at breast height (CBH - cm), and then calculated the value of DBH according to the formula: CBH/π . Bifurcated individuals had all trunks with $DBH \geq 5$ cm measured and then used to calculate the basal area per individual. The phytosociological parameters calculated as descriptors of vegetation were: N_i = number of individuals of the species; N_p = number of plots where the species occurred; AF = absolute frequency (%); RF = relative frequency (%); AD = absolute density (%); RD = relative density (%); TBA = total basal area by species (m²); ADo = absolute dominance (%); RDo = relative dominance (%); IVI = Importance Value Index (%). Besides the above-mentioned parameters, the diversity index of Shannon-Wiener (H') and Evenness (J') were also calculated (Krebs 1999). Sampling sufficiency was estimated using the species-area curve (adjusted for logarithmic regression). The recognition of forest structural features was based on analysis of height distribution (intervals of one meter), DBH distribution (intervals of 5 cm) and field observations.

Results

Species description

Myrceugenia mesomischa (Burret) D. Legrand & Kausel, *Comunicaciones Botánicas del Museo de Historia Natural de Montevideo* 2, n°. 28: 10. 1953. (holotype B). Fig. 1a-h

Treelets or trees between 3–16 m. Glabrous branches, the youngest with adpressed, sparse or dense malpighiaceae trichomes. Rough cortex. Leaf blade usually lanceolate, rarely elliptical, 2.6–7.1 × 0.7–2.6 cm, slightly discolored, glabrous, the youngest covered with malpighiaceae trichomes, scattered on both sides, hyaline glands on abaxial surface; apex acute to acuminate, sometimes mucronulate; base attenuate to cuneate; central nerve grooved on the adaxial surface and prominent on the abaxial surface; secondary nerves 8 to 12 pairs, slightly evident on the adaxial surface and visible on the abaxial surface; marginal vein 0.5 mm from the edge; petiole 2–5 mm long with sparse adpressed malpighiaceae trichomes. Flowers 1–2, axillary, tetramerous; pedicels 4–7 mm with adpressed malpighiaceae trichomes; corolla white; calyx green, lobes ovate, 1–2.5 × 1.2–2 mm; two triangular bracteoles, to 1.5 mm long. Fruit elliptic to oblong, covered with whitish indument, measuring 0.88–1.49 × 0.44–0.86 cm; color changes from green to dark red and purple to black when ripe. Seeds irregularly shaped; membranous testa; variegated coloration with white, green and brown; one to five seeds per fruit measuring 0.39–0.66 × 0.24–0.47 cm.

The species occurs in Brazil, only in the states of SC and RS (Sobral 2003). *Myrceugenia mesomischa* is located in *Araucaria* forests of the Planalto Meridional (SC and RS) and riparian forests (seasonal semideciduous forest) of Serra do Sudeste physiographic region (RS).

Landrum (1981) considered *Luma mesomischa* as a possible earlier name of *Myrceugenia cucullata* D. Legrand suggesting that the description of Burret (1941) was ambiguous. However, Sobral (2003) did not regard *Myrceugenia mesomischa* as an ambiguous species, differentiating it from *M. cucullata* by the presence of the calyx lobes shortly cucullate, never with a tuft of trichomes at the apex; abaxial leaf surface irregularly discolored, grayish or paler-green, secondary nerves evident, generally on the abaxial surface; petioles 2–5 mm, leaf length/petiole length ratio 16–20:1; pedicels 2–5 mm, petiole length/pedicel length ratio 0.6–1:1. *Myrceugenia cucullata* has markedly cucullate calyx lobes, sometimes with a tuft of trichomes at

the apex; abaxial surface of the leaves uniformly discolored, grayish or whitish, secondary nerves barely evident; petioles 4–8 mm, leaf length/petiole length ratio 9–11:1; pedicels 1–2.6 mm, petiole length/pedicel length ratio 3–4:1.

Records of flowering are from January to March with a peak at late January, early February (Seeger 2010) and individuals occasionally reaching May and June. Fruiting occurs from September to November with a peak in October (Seeger 2010).

Examined material: BRAZIL. RIO GRANDE DO SUL: Amaral Ferrador, mata ciliar à beira do rio Camaquã, 6.IX.1981, fr., *M. Sobral* 720 (ICN). Barracão, Parque Estadual do Espigão Alto, III.2001, fl., *M. Sobral* & *J. Larocca* 9244 (ICN). Bom Jesus, coord.: 573723, 6851073, 29.IX.2009, fr., *M. Molz* (ICN 163725). Cambará do Sul, XI.2005, fr., *G.D.S. Seeger* 1027 (ICN). Canela, Caracol, 27.XII.1972, *P. Pellizzaro et al.* (ICN 21671). Canguçu, Projeto de Assentamento União, em beira de sanga afluente direita do rio Camaquã, 8.XI.2007, fr., *M. Grings* 1002 (ICN). Casca, perto da cidade, 28.X.1987, *J. Mattos* & *N. Silveira* 31461 (HAS). Esmeralda, 11.V.1983, fr., *J.A. Jarenkow s.n.* (ICN 85629). Nova Prata, 11 km ao norte de Rio Branco, na Estação Experimental, 30.IV.1982, fr., *J. Mattos* & *N. Mattos* 24175 (HAS). Muitos Capões, 6.II.1985, fr., *N. Silveira*, *R. Frosi* & *W. Schinoff* 2414 (HAS). São Francisco de Paula, FLONA, 15.XI.2007, fr., *G.D.S. Seeger* 520 (ICN).

Vegetation survey

The floristic survey recorded 71 native tree species distributed in 49 genera and 29 families (Tab. 1). The most species-rich families were Myrtaceae (19), Lauraceae (5), Aquifoliaceae and Euphorbiaceae (4) (Fig. 2). Families with the highest number of genera were Myrtaceae (10), Lauraceae (4) and Euphorbiaceae (3), while the genera with the highest number of species were *Myrceugenia* (5), *Ilex* and *Myrcia* (4) and *Eugenia* and *Myrsine* (3). Families with only one species (15) comprised 51.7% of all families. We recognized four major physiognomic forest communities (Tab. 2, Fig. 3a-f). Quantitative information obtained from all types of habitats registered that 50% of SUs had a median percentage of exposed soil, 85% had low litter density, 60% had low shrub-layer density and 75% had low liana density, probably influenced by the occasional presence of cattle in the understory.

The phytosociological survey resulted in 339 individuals of 43 species distributed in 21 families (60.5% of tree species recorded in the floristic survey) in 20 sampling units (SUs). Of this total, 138 individuals

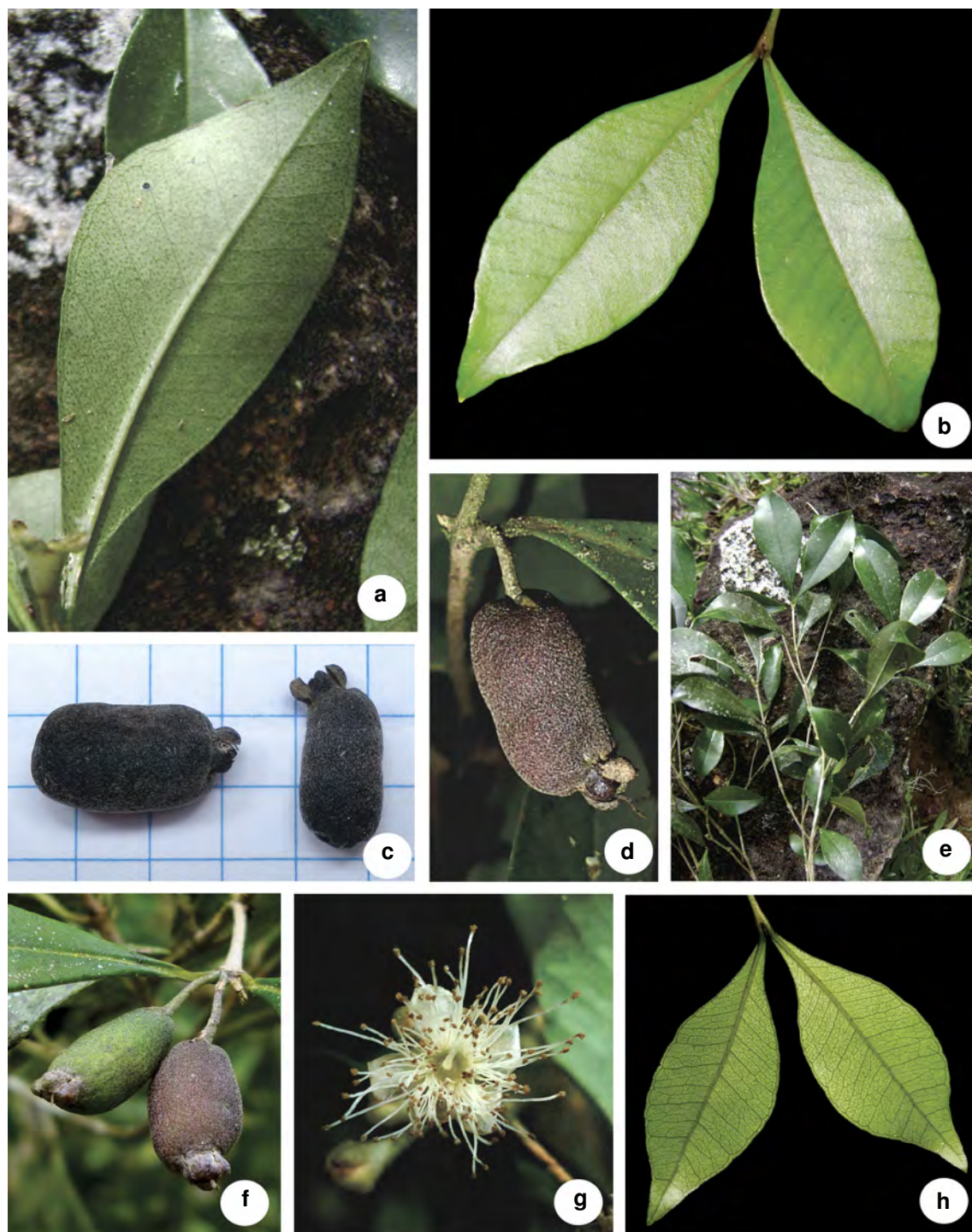


Figure 1 – *Myrceugenia mesomischa* – a. abaxial surface of the leaf blade with hyalin glands, mucronulate apex and fruit in initial phase of maturation; b. adaxial surface of leaves with grooved central nerve; c,d. ripe fruits (squares of the scale 0.5 cm); e. branches with leaves presenting dark green adaxial surfaces; f. fruits in final phase of maturation; g. flower; h. abaxial surface of leaves with conspicuous venation.

Table 1 – Floristic list of tree species found in an *Araucaria* forest fragment, São Francisco de Paula, RS, Brazil.

| Família | Espécie |
|-------------------|--|
| Anacardiaceae | <i>Lithraea brasiliensis</i> Marchand <i>Schinus lentiscifolius</i> Marchand <i>Schinus polygamus</i> (Cav.) Cabrera |
| Annonaceae | <i>Annona rugulosa</i> (Schltdl.) H. Rainer |
| Aquifoliaceae | <i>Ilex brevicuspis</i> Reissek <i>Ilex dumosa</i> Reissek <i>Ilex microdonta</i> Reissek <i>Ilex paraguariensis</i> A. St.-Hil. |
| Araucariaceae | <i>Araucaria angustifolia</i> (Bertol.) Kuntze |
| Asteraceae | <i>Dasyphyllum spinescens</i> (Less.) Cabrera <i>Dasyphyllum tomentosum</i> (Spreng.) Cabrera <i>Vernonia discolor</i> (Spreng.) Less. |
| Cardiopteridaceae | <i>Citronella gongonha</i> (Mart.) R.A. Howard |
| Cunoniaceae | <i>Lamanonia ternata</i> Vell. <i>Weinmannia paulliniifolia</i> Pohl |
| Dicksoniaceae | <i>Dicksonia sellowiana</i> Hook. |
| Elaeocarpaceae | <i>Sloanea monosperma</i> Vell. |
| Erythroxylaceae | <i>Erythroxylum deciduum</i> A. St.-Hil. |
| Euphorbiaceae | <i>Sapium glandulosum</i> (L.) Morong <i>Sebastiania brasiliensis</i> Spreng. <i>Sebastiania commersoniana</i> (Baill.) L.B. Sm. & Downs <i>Stillingia oppositifolia</i> Baill. ex Müll. Arg. |
| Fabaceae | <i>Mimosa scabrella</i> Benth. |
| Lauraceae | <i>Cinnamomum amoenum</i> (Nees) Kosterm. <i>Cinnamomum glaziovii</i> (Mez) Kosterm. <i>Cryptocarya aschersoniana</i> Mez <i>Nectandra megapotamica</i> (Spreng.) Mez <i>Ocotea pulchella</i> Mart. |
| Loganiaceae | <i>Strychnos brasiliensis</i> (Spreng.) Mart. |
| Melastomataceae | <i>Miconia cinerascens</i> Miq. <i>Miconia hyemalis</i> A. St.-Hil. & Naudin |
| Monimiaceae | <i>Mollinedia elegans</i> Tul. |
| Myrtaceae | <i>Acca sellowiana</i> (O. Berg) Burret <i>Blepharocalyx salicifolius</i> (Kunth) O. Berg <i>Calyptanthes concinna</i> DC. <i>Campomanesia xanthocarpa</i> O. Berg <i>Eugenia involucrata</i> DC. <i>Eugenia schuechiana</i> O. Berg <i>Eugenia uruguayensis</i> Cambess. <i>Myrceugenia euosma</i> (O. Berg) D. Legrand <i>Myrceugenia glaucescens</i> (Cambess.) D. Legrand & Kausel <i>Myrceugenia mesomischa</i> (Burret) D. Legrand & Kausel |

| Família | Espécie |
|---------------|---|
| | <i>Myrceugenia miersiana</i> (Gardner) D. Legrand & Kausel |
| | <i>Myrceugenia oxysepala</i> (Burret) D. Legrand & Kausel |
| | <i>Myrcia guianensis</i> (Aubl.) DC. |
| | <i>Myrcia lajeana</i> D. Legrand |
| | <i>Myrcia oligantha</i> O. Berg |
| | <i>Myrcia palustris</i> DC. |
| | <i>Myrcianthes gigantea</i> (D. Legrand) D. Legrand |
| | <i>Myrrhinium atropurpureum</i> Schott |
| | <i>Siphoneugena reitzii</i> D. Legrand |
| Podocarpaceae | <i>Podocarpus lambertii</i> Klotzsch ex Endl. |
| Primulaceae | <i>Myrsine coriacea</i> (Sw.) R. Br. ex Roem. & Schult. |
| | <i>Myrsine lorentziana</i> (Mez.) Arechav. |
| | <i>Myrsine umbellata</i> Mart. |
| Proteaceae | <i>Roupala brasiliensis</i> Klotzsch |
| Rhamnaceae | <i>Rhamnus sphaerosperma</i> Sw. |
| | <i>Scutia buxifolia</i> Reissek |
| Rosaceae | <i>Prunus myrtifolia</i> (L.) Urb. |
| Rutaceae | <i>Zanthoxylum rhoifolium</i> Lam. |
| Salicaceae | <i>Casearia decandra</i> Jacq. |
| | <i>Xylosma</i> cf. <i>prockia</i> (Turcz.) Turcz. |
| | <i>Xylosma pseudosalzmannii</i> Sleumer |
| Sapindaceae | <i>Allophylus edulis</i> (A. St.-Hil., A. Juss. & Cambess.) Hieron. ex Niederl. |
| | <i>Matayba elaeagnoides</i> Radlk. |
| Solanaceae | <i>Solanum mauritianum</i> Scop. |
| | <i>Solanum pseudoquina</i> A. St.-Hil. |
| Symplocaceae | <i>Symplocos tetrandra</i> Mart. |
| | <i>Symplocos uniflora</i> (Pohl) Benth. |
| Theaceae | <i>Laplacea acutifolia</i> (Wawra) Kobuski |
| Winteraceae | <i>Drymis brasiliensis</i> Miers |

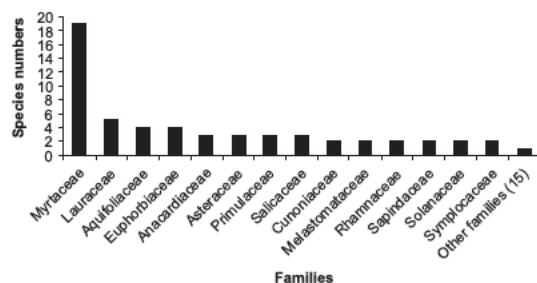


Figure 2 – Families with the highest species richness recorded in the floristic inventory of an *Araucaria* forest fragment, São Francisco de Paula, RS, Brazil.

(41.7%–29 species) obtained DBH values of 5 to 10 cm and 201 individuals (59.3%–34 species) had values greater than 10 cm. The families with the greatest number of individuals were Myrtaceae (166), Euphorbiaceae (57) and Araucariaceae (43) (78.5% of the total; Myrtaceae represented 49%). Six dead trees were excluded from the analysis. The collector's curve to ratify sample sufficiency, based on the entire sample, showed a reduction in the exponential growth of species from SU number 11, stabilizing at SU number 16 (Fig. 4).

We recognized four vertical strata occurring in the fragment (Tab. 3, Fig. 5). Average height (AH) of all individuals was 13.2 m (standard deviation –

Table 2 – Description of four tree communities according to their characteristics of topography, drainage, geomorphology and indicator species registered in an *Araucaria* forest fragment, in São Francisco de Paula city, RS, Brazil.

| Community | Relief position | Drainage | Geomorphology | Indicator species |
|-----------------|---|------------------------------|---|---|
| Sub-xerophilous | Tops and upper thirds of the slopes | Well drained | Flat or convex areas usually with outcrops | <i>Dasyphyllum spinescens</i> , <i>Xylosma pseudosaximannii</i> and <i>Zanthoxylum rhoifolium</i> |
| Mesophilous | Middle thirds of the slopes | Well to moderately drained | Convex slopes with shallow soils, subject to short periods of permanent flooding | <i>Lamanonia ternata</i> , <i>Myrceugenia miersiana</i> , <i>Sebastiania commersoniana</i> and <i>Siphoneugena reitzii</i> |
| Hygrophilous | Upper, middle and lower thirds of the slopes | Moderately to poorly drained | Concave valleys areas; presence of perennial or intermittent watercourses; great abundance of epiphytes | <i>Dicksonia sellowiana</i> , <i>Eugenia involucrata</i> , <i>Sapium glandulosum</i> and <i>Sebastiania brasiliensis</i> |
| Hydrophilous | Flat areas of lowlands along the lower thirds of the slopes | Moderately to poorly drained | Areas with water accumulation forming marshy soils; great abundance of epiphytes | <i>Myrceugenia glaucescens</i> , <i>Myrcia lajeana</i> and <i>Weinmannia paulliniifolia</i> |

SD = 5.2 m). The histogram of DBH values showed predominance of individuals in the smaller size classes (Fig. 6). Average DBH (ADBH) was 16.6 cm (SD = 12.9 cm) and the species with the highest values were: *A. angustifolia*, *Ocotea pulchella* Mart., *Lamanonia ternata* Vell., *Weinmannia paulliniifolia* Pohl, *Cryptocarya aschersoniana* Mez and *Cinnamomum glaziovii* (Mez) Kosterm.

The five species with the highest IVI in the survey were as follows: DBH 5–10 cm: *M. mesomischa* (23.8%), *Myrcia lajeana* D. Legrand (10.8%), *Siphoneugena reitzii* D. Legrand (8.7%), *Myrceugenia miersiana* (Gardner) D. Legrand & Kausel (8%) and *Sebastiania brasiliensis* Spreng. (7.4%) (see Appendix 1 in the electronic version of this paper); DBH >10 cm: *A. angustifolia* (18.3%), *Sebastiania commersoniana* (Baill.) L.B. Sm. & Downs (9.6%), *M. mesomischa* (7.1%), *O. pulchella* (5.5%) and *Myrceugenia glaucescens* (Cambess.) D. Legrand & Kausel (5.3%) (see Appendix 2 in the electronic version of this paper). When considering the entire sample, the species with highest IVI were *A. angustifolia* (14.8%), *M. mesomischa* (10.4%), *S. commersoniana* (7.4%), *M. lajeana* (5.2%) and *S. reitzii* (4.3%).

Myrceugenia mesomischa had AH = 8.8 m (SD = 2.4 m) and ADBH = 9.9 cm (SD = 6.4 cm) occupying both understory levels (Tab. 3). In contrast, *A. angustifolia* was first in importance in the general survey, registering AH = 18.2 m (SD = 5.1 m) and ADBH = 25.2 cm (SD = 15.5 cm), forming the emergent strata (Fig. 7-8). *M. mesomischa* showed the highest

abundance of the survey, reaching 17% (59 individuals) of the entire sample (*A. angustifolia* had 9.6%). Of this total, 39 individuals (66.1%) had DBH values from 5 to 10 cm, 15 (25.4%) had values from 10 to 15 cm and only five individuals (8.5%) had values over 15 cm. The *M. mesomischa* individual that had the highest DBH (49.4 cm) recorded a height of 7 m, while the AH of this SU was 15.4 m. Considering the heights of the species, we observed that 52 individuals (88.1%) had values ranging from 6 to 12 m. In the SU where we recorded the highest species height (16 m) the canopy was 20 to 22 m tall.

The diversity indices were 3.07 nats (H') and 0.81 (J') for the total sample. For the tree component with DBH from 5 to 10 cm the values were 2.63 nats (H') and 0.78 (J') and for all species with DBH over 10 cm the values were 2.96 nats (H') and 0.84 (J').

Discussion

Myrceugenia mesomischa stood out as the species with highest frequency in the general survey, occurring in 80% of the SUs. The species was absent mainly on the plains along the lower third of the slopes where there is greater water accumulation, which results in marshy, waterlogged soils most of the year (hydrophilous communities). In these areas, *M. mesomischa* was replaced by *Myrcia lajeana* and *Myrceugenia glaucescens* occupying structural niches similar to those described for the species. In other environmental conditions, such as well drained to moderately drained areas, the species remained common throughout the environmental gradient

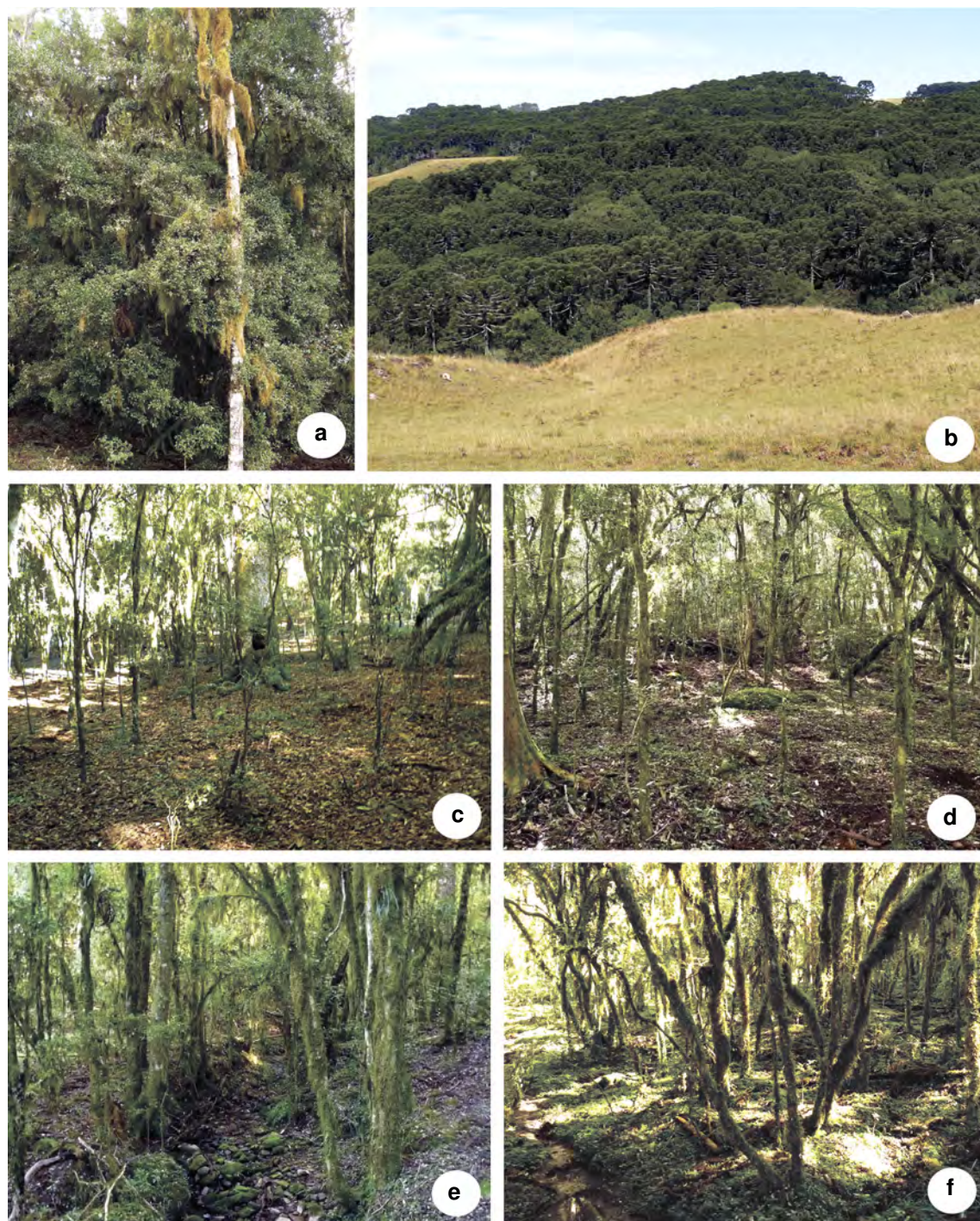


Figure 3 – a. *Myrceugenia mesomischa* with dense, dark-green foliage; b. fragment of *Araucaria* forest studied; c. sub-xerophilous community; d. mesophilous community; e. hygrophilous community; f. hydrophilous community. All communities recorded in the phytosociological survey of an *Araucaria* forest fragment, São Francisco de Paula, RS, Brazil.

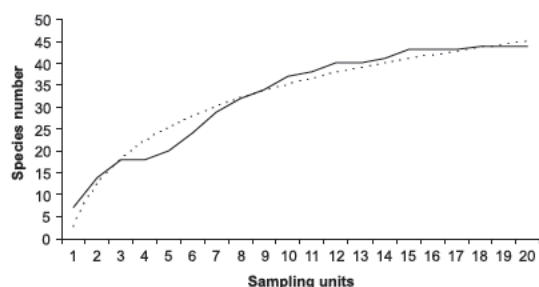


Figure 4 – Species-area curve registered in the phytosociological survey of an *Araucaria* forest fragment, São Francisco de Paula, RS, Brazil.

variation of the slope profile, occurring successfully in the other described communities. Despite the high RDo values of *M. mesomischa*, this parameter is influenced by RD, related to the large number of individuals and not by the significant size of its basal area. Among the Myrtaceae species recorded in the study, *M. mesomischa* corresponded to 35% of individuals of this family whereas second-place *Myrcia lajeana* obtained 13.9%. Sonego *et al.* (2007) also reported *M. mesomischa* as one of the six species with higher IVI among 41 species sampled in one of the remnants of *Araucaria* forest at FLONA. Even though there was no detailed data about *M. mesomischa*, the authors also highlighted the species because of its high number of individuals and high frequency, which indicates a regular distribution of these populations in the two study areas.

The structural data obtained for *M. mesomischa* when compared with *A. angustifolia*, made explicit the different ecological niches occupied by these species in the study area. While the latter is known to be the main climax species of emergent and canopy strata of the *Araucaria* forest, *M. mesomischa* occupied the upper and

lower understory strata prevailing as a species of great importance in this environment. This is evident by comparing phytosociological and structural data presented for both species, as well as the highest IVI values obtained by *M. mesomischa* among species with DBH ranging from 5 to 10 cm. However it is noteworthy that even with the high IVI obtained by the species, among the 43 species of the tree component evaluated, *M. mesomischa* presented the 32nd position in ADBH value and the 37th position in AH value.

The sum of relevant data obtained for *M. mesomischa* indicates that it is an important understory constituent in the forest fragment evaluated, which has already been reported for other similar Myrtaceae species of RS occurring in the study region. Among the ten species with highest IVI in the general survey, five were representatives of Myrtaceae, while in DBH values ranging from 5 to 10 cm there were six representatives. Klein (1984) indicated the family as the most abundant in the understory of the *Araucaria* forest in Southern Brazil, mainly at

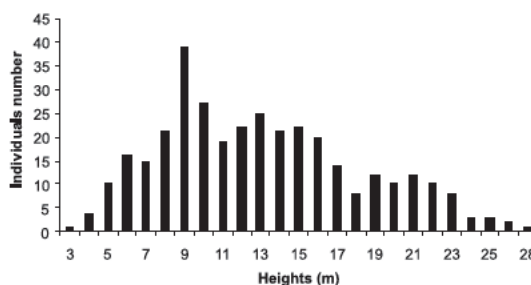


Figure 5 – Histogram of heights of the tree component recorded in the phytosociological survey of an *Araucaria* forest fragment, São Francisco de Paula, RS, Brazil.

Table 3 – Description of vertical strata through their height intervals and common species found in an *Araucaria* forest fragment, in São Francisco de Paula city, RS, Brazil.

| Strata | Height intervals (m) | Common species |
|---------------------|----------------------|--|
| Emergent | 24 to 28 | <i>Araucaria angustifolia</i> , <i>Ilex brevicuspis</i> , <i>Ocotea pulchella</i> , <i>Sapium glandulosum</i> and <i>Sebastiania commersoniana</i> |
| Canopy | 18 to 23 | <i>Allophylus edulis</i> , <i>Myrceugenia glaucescens</i> , <i>Myrcia lajeana</i> , besides species from the emergent strata |
| Superior understory | 11 to 17 | <i>Myrceugenia mesomischa</i> , <i>Myrceugenia miersiana</i> , <i>Myrcia lajeana</i> and <i>Siphoneugena reitzii</i> |
| Inferior understory | 3 to 10 | <i>Calypttranthes concinna</i> , <i>Dicksonia sellowiana</i> , <i>Myrceugenia mesomischa</i> and <i>Sebastiania brasiliensis</i> |

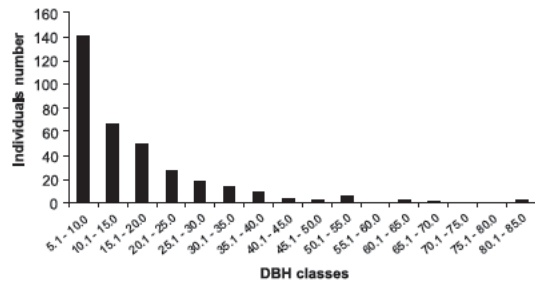


Figure 6 – Histogram of DBH classes of the tree component recorded in the phytosociological survey of an *Araucaria* forest fragment, São Francisco de Paula, RS, Brazil.

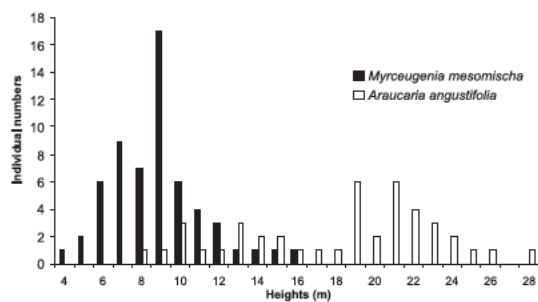


Figure 7 – Comparative histogram of heights of *Myrceugenia mesomischa* (59 individuals) and *Araucaria angustifolia* (43 individuals) evaluated in the phytosociological survey of an *Araucaria* forest fragment, São Francisco de Paula, RS, Brazil.

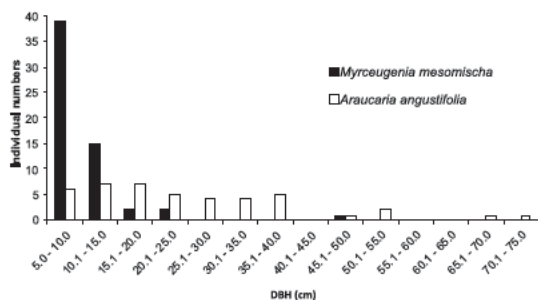


Figure 8 – Comparative histogram of DBH classes of *Myrceugenia mesomischa* (59 individuals) and *Araucaria angustifolia* (43 individuals) evaluated in the phytosociological survey of an *Araucaria* forest fragment, São Francisco de Paula, RS, Brazil.

altitudes between 900 and 1200 m, where some species reach values of frequency between 20 to 30% of the communities. Of the 52 tree species of the family listed by the author for the region, 23 were described as exclusive to the *Araucaria* forest (44.2%). Therefore, this forest took second place in species richness and diversity of this family in the RS, only behind the Atlantic Forest with 41 species, summing 28 exclusive species (68.3%). On the other hand, in the Serra do Sudeste region, of the 14 species found by the author, none is exclusive, which remains true due to the occurrence of *M. mesomischa* in both regions mentioned.

The recognized importance of the family in the understory colonization of *Araucaria* forest and the large number of individuals suggests an evolutionary success of this group in the occupation of this ecological niche. One reason that may be linked to the success of dispersal of these species is the berry fruit type that attracts numerous agents of the fauna. In the case of *M. mesomischa*, successful colonization can be further enhanced by fruiting between September and November, a period of the year when virtually no other zoochoric species are fruiting in the *Araucaria* forest (Seger 2010). Also according to the author, since the seeds of the species have a membranous testa and do not show dormancy, seed germination can occur soon after dispersal or even inside the fruit. The period of the year also supports this feature, being the optimal time for germination and for seedling development and establishment. Avila (2010), evaluating natural regeneration mechanisms of the *Araucaria* forest in the FLONA, highlighted *M. mesomischa* as one of the main species forming the local seedling bank. However, the confirmation of these strategies still needs more accurate evaluation of the dispersal and colonization strategies displayed by the species.

Regardless the fact that Landrum (1981) cited *M. mesomischa* as an ambiguous species, we believe that according to the material examined, *M. mesomischa* is clearly different from *M. cucullata* (for more details see Species description section and Sobral 2003). The recognition of the tree habit in *M. mesomischa* brings to 517 the number of native tree species occurring in the RS by adding it to the 516 species already described by Sobral *et al.* (2006). Moreover, we are also providing a detailed description of fruit morphology and fruiting phenology according to recent data verified in Seger (2010). Nevertheless, future studies should check other taxonomic important aspects of *M. mesomischa*, for example,

the possible need for experts to propose a lectotype or a neotype for this species.

Despite the high number of individuals founded in this study, similar to that reported by Sonego *et al.* (2007), *M. mesomischa* seems to be a rare occurrence in the *Araucaria* forest and even in the Serra do Sudeste region since few studies recorded it. This fact deserves attention because besides its possible natural rarity, there is a recognized level of destruction and fragmentation of its habitat, which shows the need to reevaluate the species' current, delicate conservation status.

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