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Composition, community structure and vertical distribution of epiphytic ferns on *Alsophila setosa* Kaulf., in a Semideciduous Seasonal Forest, Morro Reuter, RS, Brazil

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RESUMO

(Composição, estrutura comunitária e distribuição vertical de samambaias epifíticas sobre *Alsophila setosa* Kaulf. (Cyatheaceae), em Floresta Estacional Semidecidual, Morro Reuter, RS, Brasil.). Nas florestas tropicais as samambaias arborescentes constituem forófitos importantes para o estabelecimento e ocorrência de espécies epifíticas. A composição, a estrutura e a distribuição vertical de samambaias epifíticas foram estudadas sobre *Alsophila setosa* Kaulf., em fragmento de Floresta Estacional Semidecidual, localizado no município de Morro Reuter (29º32'07"S e 51º05'26"W), Rio Grande do Sul, Brasil. Foram amostrados 60 cáudices de no mínimo 4 m de altura e eles foram divididos em intervalos de 1 m, a partir do solo. O valor de importância específico foi estimado a partir da freqüência nos cáudices , nos intervalos e do valor de cobertura. Foram registradas 14 espécies epifíticas, representando 10 gêneros e cinco famílias. A maior riqueza específica ocorreu em Polypodiaceae. A curva de rarefação para a amostra total não assumiu uma assíntota, sendo que foram estimadas entre 14,98 e 16,95 espécies, apontando que poucas espécies ainda poderiam ser amostradas nessa área. A espécie com maior valor de importância e amplitude vertical foi *Blechnum binervatum* (Poir.) C.V. Morton & Lellinger, com freqüência decrescente no sentido base-ápice do cáudice. Considerando o predomínio de holoepífitos habituais, a remoção de cáudices de *Alsophila setosa* compromete a disponibilidade de microhabitats para epífitos no sub bosque florestal.

Palavras-chave: Epífitos, estimadores de riqueza, samambaia arborescente

ABSTRACT

(Composition, community structure and vertical distribution of epiphytic ferns on *Alsophila setosa* Kaulf., in a Semideciduous Seasonal Forest, Morro Reuter, RS, Brazil). In tropical forests, tree ferns constitute an important phorophyte for the establishment and occurrence of epiphytic species. Composition, structure and vertical distribution of epiphytic ferns were studied on *Alsophila setosa* Kaulf., in a semideciduous seasonal forest fragment, in the city of Morro Reuter (29º32'07"S and 51º05'26"W), in the state of Rio Grande do Sul, Brazil. The sample consisted of 60 caudices of at least 4 m high, which were divided in 1 m intervals from the ground. The specific importance value was estimated trough the coverage value and caudex frequency at the intervals. A total of 14 species was recorded, belonging to 10 genera and five families. The highest specific richness occurred in Polypodiaceae. The rarefaction curve for the total sample did not reach an asymptote with an estimated 14.98 to 16.95 species, showing that a few species could still be recorded. The species with the highest importance value and vertical amplitude was *Blechnum binervatum* (Poir.) C.V. Morton & Lellinger, with a decreasing frequency from bottom to top of the caudex. Considering the predominance of habitual holoepiphytes, the removal of *Alsophila setosa* caudices compromises microhabitat availability for epiphytes in the forest understory.

Key words: Epiphytes, richness estimators, tree fern

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Introduction

In tropical forests, epiphytes are an important component of biodiversity, although still little known (Mucunguzi 2007). Ferns and lycophytes compose a group of plants worthy of attention within the epiphytic environment, because ca. 2,600 of the 13,600 species in this group (Moran 2008) are epiphytes (Kress 1986). As in other vascular plants, several adaptative strategies that help water and nutrient absorption, and avoidance dehydration, can be observed in epiphytic ferns. Some of the strategies are exceptional, such as those for humus collection, which recreate appropriate conditions for epiphytic plants to capture water and nutrients without maintaining connection to the soil (Dubuisson *et al.* 2008). Other adaptations also favor the occurrence of these plants in an epiphytic environment. Among them are poikilohydry; frond trichomes that can complete absorption like roots; small fronds, reduced root system and a long and ramified rhizome; low light saturation point; high tolerance for instability of soil nutrients; as well as wind dispersal of spores (Müller *et al.* 1981; Benzing 1987, 1990; Page 2002; Dubuisson *et al.* 2003, 2008).

Tree ferns provide a favorable habitat for many epiphyte species in the forest understory. These host plants present a substratum which differs from that offered by angiosperm tree trunks, because they do not have secondary growth and, consequently, do not develop wood or bark (Roberts *et al.* 2005). Epiphytism on tree ferns has been studied by Beever (1984) in New Zealand; Roberts *et al.* (2005) in Tasman; Rothwell (1991) in the USA; Medeiros *et al.* (1993), in Hawaii; Cortez (2001) in Venezuela; Heatwole (1993) on Gough Island, in the South Atlantic; and Ahmed & Frahm (2002), Schmitt & Windisch (2005), Schmitt *et al.* (2005), Schmitt (2006) and Fraga *et al.* (2008) in Southern Brazil. These studies, using different methods and phorophytes report from seven (Heatwole 1993) to 34 (Schmitt 2006) fern species. Some epiphytes grow preferably or exclusively on tree ferns (Sehnem 1977, Waechter 1992, Cortez 2001, Windisch 2002).

Epiphytes show a specific vertical distribution, determined by their adaptative strategies, by the characteristics of the substratum offered by the host plants (Benzing 1995) and by a microhabitat gradient. This gradient is defined by light conditions, wind speed and rising temperature, as well as by humidity, which decreases from the ground towards the direction to the canopy (Johansson 1974, Parker 1995, Rudolph *et al*. 1998, Krömer *et al*. 2007, Mucunguzi 2007).

Alsophila setosa Kaulf. (Cyatheaceae) presents a straight, arborescent caudex that can reach 10m high, and occurs in primary and secondary forest formations in South and Southeast Brazil (Schmitt & Windisch 2006). This species has an important role as phorophyte for epiphytic species in the forest understory (Schmitt & Windisch 2005), providing an exceptional microhabitat for plant development. However, *A. setosa* populations are being reduced by vegetation suppression for agriculture (Schmitt & Windisch 2005). In addition, this species has bee extracted because of its gardening potential (Windisch 2002). Schmitt & Windisch (2005) recorded 16 species of vascular epiphytes on *A. setosa,* 14 of which were ferns, but did not discuss the community structure and the vertical distribution of the plants. In this context, the present work investigated the richness, composition, community structure and vertical distribution of epiphytic ferns on *Alsophila setosa*, in a seasonal semideciduous forest in Southern Brazil.

Methods

Study site

The present study was developed in a fragment of seasonal semideciduous submontane forest (29º32'07"S, 51º05'26"W, alt. 658 m), in the city of Morro Reuter, in the northeastern region of the state of Rio Grande do Sul, Brazil. The soil is shallow to deep, originated from basalt, with a moderate content of organic matter and high chemical fertility (Streck *et al*. 2002). The regional climate, according to the Köppen climate classification, is of the Cfa category, which means it is humid with rain throughout the year and the warmest month is higher than 22ºC (Moreno 1961).

Sampling

For the epiphytic community study, 60 caudices of *Alsophila setosa* that were at least 4 m high were randomly selected using the the point-centered quadrat method (Cottam & Curtis 1956). The caudices were divided in 1m intervals from the ground up to 4m, totaling 240 intervals.

Floristic composition

During 2008, monthly visits were made for the floristic survey of the epiphytic ferns. The survey was made by direct observation of the plants in the epiphytic environment. Fertile representative specimens were collected, identified and preserved according to the methodology proposed by Windisch (1992). The vouchers were then deposited in the *Herbarium* Anchieta (PACA) at the Instituto Anchietano de Pesquisas, of Universidade do Vale do Rio dos Sinos – UNISINOS, São Leopoldo, RS. The classification system follows Smith *et al*. (2006), with some changes presented in Smith *et al*. 2008. The categories of holoepiphyte and hemiepiphyte, follow the definitions by Benzing (1995). Holoepiphytes are plants that do not establish a soil relation (usually completing all of their life cycle in the epiphytic environment), and they can be habitual, accidental or facultative. Hemiepiphytes establish a relation with the soil, being primary (when their growth begins on the phorophyte) or secondary (when their growth begins in the soil).

Rarefaction curves and richness estimators

To verify the relation between the increase in species number and the number of intervals a sample-based rarefaction curve (Gotelli & Colwell 2001) was prepared for each height range and for the whole sample, through the statistic software EstimateS 7.5 (Colwell 2005), in which the curve stabilization was considered an asymptote. The same software was used for estimating specific richness by height intervals and the whole sample, through 100 random data resampling(s) with the following nonparametric estimators: *Chao2*, *Jakknife1* and *Bootstrap,* which uses species presence/absence data.

Community structure

Absolute and relative frequency of the species were calculated by caudex and height interval, based on Waechter (1998). Each species coverage on the interval was estimated using the following grading scale: 1 (<20%), 2 (≥20-40%), 3 (≥40-60%), 4 (≥60-80%) and 5 (≥80-100%). Based on the sum of the coverage grades, the relative coverage for each species was calculated. The importance value of the epiphyte species resulted from the arithmetic mean of the relative frequencies on the caudices and on the intervals and from the relative coverage. The specific diversity was determined by the Shannon index (H'), by the use of natural logarithm, with the frequency data, and the equability by the Pielou index (J') (Magurran 1988), determined for the height intervals and for the whole sample.

Vertical distribution

The percentage of species occurrence was analyzed in the four height intervals. Standardization of the number of intervals per caudex prevented a larger occurrence percentage of the species in a height interval from being due to a larger number of sampled sites. Averages of richness per interval were compared through variance analysis (ANOVA), followed by the Tukey test (Zar 1999) at a significance level of 5%, with the software SPSS 15.0.

Results

The floristic survey revealed 14 species of epiphytic ferns, representing 10 genera and six families (Tab. 1). The highest species richness was in Polypodiaceae with eight species, representing 57.14% of the total. The genera *Asplenium* L., *Campyloneurum* C. Presl, and *Pecluma* M.G. Price presented two species each, while the remaining had only one. As for the ecological category, habitual holoepiphytes were dominant (11 species or 78.57%), followed by facultative (two species or 14.29%) and secondary hemiepiphytes (one species or 7.14%).

Table 1. Families and species of epiphytic ferns sampled on *Alsophila setosa* Kaulf. in a Semideciduous Seasonal Forest, Morro Reuter, RS, Brazil and their ecological categories. (HAB = habitual holoepiphytes; HMS = secondary hemiepiphytes; FAC = facultative holoepiphytes). Acronyms formed by the initial letters of the generic and specific names.

Species	Acronyms	Ecological category
ASPLENIACEAE		
Asplenium gastonis Fée	Asga	HAB
Asplenium scandicinum Kaulf.	Assc	HAB
BLECHNACEAE		
Blechnum binervatum (Poir.) C.V. Morton & Lellinger	Blbi	HMS
DRYOPTERIDACEAE		
Rumohra adiantiformis(G. Forst.) Ching	Ruad	FAC
HYMENOPHYLLACEAE		
Polyphlebium angustatum (Carmich.) Ebihara & Dubuisson	Poan	HAB
POLYPODIACEAE		
Campyloneurum austrobrasilianum (Alston) de la Sota	Caau	HAB
Campyloneurum nitidum (Kaulf.) C. Presl	Cani	HAB
Microgramma squamulosa (Kaulf.) de la Sota	Miaq	HAB
Niphidium rufosquamatum Lellinger	Niru	FAC
Pecluma pectinatiformis (Lindm.) M.G. Prince	Pepe	HAB
Pecluma recurvata (Kaulf.) M.G. Prince	Pere	HAB
Pleopeltis hirsutissima (Raddi) de la Sota	Plhi	HAB
Serpocaulon catharinae (Langsd. & Fisch.) A.R. Sm.	Seca	HAB
PTERIDACEAE		
Vittaria lineata (L.) Sm.	Vili	HAB

The rarefaction curve for the total sample (60 caudices) did not form an asymptote (Fig. 1), which means that there are probably still species to be sampled in the site (Gotelli & Colwell 2001). Corroborating with that assumption, the richness estimators presented an amplitude from 14.98 (*Chao2*) to 16.95 (*Jack 1*) species expected (Fig. 1), larger than the total number of species found. Among the rarefaction curves per interval, the only curve corresponding to interval 1 reached an asymptote, while the estimated richness was equal to the observed. At the interval 4, the rarefaction curve was distanced most from the asymptote (Fig. 2), with an estimated richness ranging from 14.64 to 16.93 species.

The 60 caudices presented an average of 3.27 ± 1.53 species with the minimum of one and a maximum of eight species. The mean richness differed significantly among the height intervals ($F = 6.976$; $P < 0.001$), and the lowest mean specific richness was found in interval 1, with only three species. Although the highest total amount of species and mean value were observed in interval 4, statistically it did not show significant differences towards intervals 2 and 3 (Tab. 2).

The highest importance value was observed in *Blechnum binervatum* (Poir.) C.V. Morton & Lellinger (33.17%), occurring in 90% of the phorophytes. The second most important species was *Campyloneurum nitidum* (Kaulf.) C. Presl, with an importance value of 28.80%, and 83.33% occurrence on caudices (Tab. 3). *Asplenium gastonis* Fée and *Niphidium rufosquamatum* Lellinger were found only on one caudex and one interval, thus presenting the lowest importance value (0.35%).

The estimated Shannon's diversity index (H') for the total sample was 1.99 and the equitability (J) was 0.75. For the subsamples per interval the diversity and equitability indices had an increase from the bottom to the top of the caudex (Tab. 2).

Polypodiaceae and Blechnaceae presented the largest vertical distribution. Polypodiaceae had an increase in specific richness from bottom to top of the caudices. Aspleniaceae and Dryopteridaceae had an intermediate distribution without being recorded only at the first interval. The shortest vertical distribution was for Hymenophyllaceae and Pteridaceae, which occurred at the first two and the last two intervals, respectively (Fig. 3).

The two species with the largest vertical distribution (present in all intervals) were *Blechnum binervatum* and *Campyloneurum nitidum*. The first one presented a decreasing frequency from the bottom to the top of the caudex and the latter presented the opposite pattern. Furthermore, the other two Polypodiaceae species with the highest importance value showed an increasing distribution pattern in direction to the top (Tab. 4). *Polyphlebium angustatum* (Carmich.) Ebihara & Dubuisson (Hymenophyllaceae) occurred only at the first two intervals.

Discussion

Richness estimators indicated a number of epiphytic fern species close to the observed number, so that few species could be added to the total sample. However, it must be taken into account that these estimators show the minimum expected values and are not precise predictions of the real amount of species in a community (Colwell *et al*. 2004). The asymptote on the rarefaction curve of the first interval and an estimated richness similar to the observed indicates that all occurring species at this height interval have been sampled, since the curve only reaches an asymptote when all species have been observed (Gotelli & Colwell 2001). The proximity to the asymptote at the rarefaction curve and the estimated richness equal to that found by the *Chao 2* estimator, at the second interval, and the distance from the asymptote at the rarefaction curves, as well as higher estimates for the third and forth intervals, show that an increase in the amount of species for the total sample would probably occur, especially at the last two intervals.

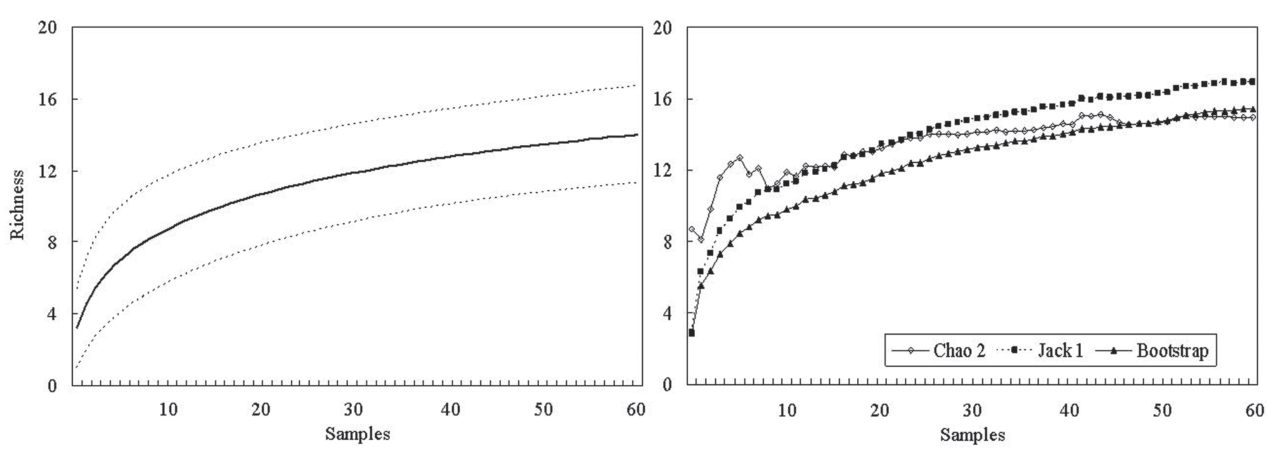

Figure 1. Rarefaction curve and richness estimators of epiphytic ferns sampled on the total number of *Alsophila setosa* Kaulf. caudices in a semideciduous seasonal forest, Morro Reuter, RS, Brazil. The dotted lines indicate the confidence interval.

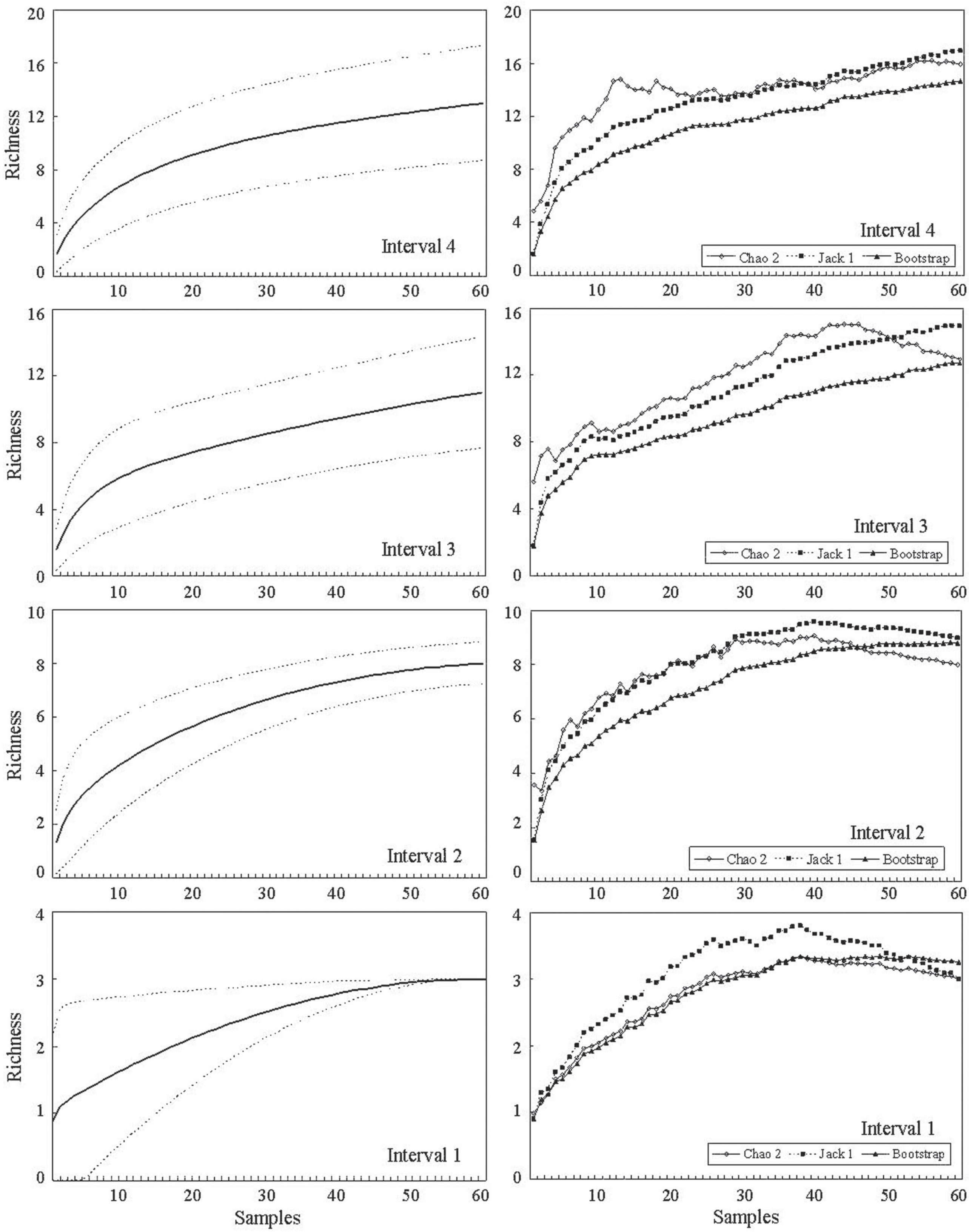

Figure 2. Rarefaction curve and richness estimators of epiphytic ferns sampled on the height intervals of *Alsophila setosa* Kaulf. in a semideciduous seasonal forest, Morro Reuter, RS, Brazil. The dotted lines indicate the confidence interval.

Table 2. Richness maximum observed (Sobs), average richness (S) with standard deviation (SD), Shannon Index (H') and Pielou Index (J') of epiphytic ferns community sampled on height intervals of *Alsophila setosa* Kaulf. in a Semideciduous Seasonal Forest, Morro Reuter, RS, Brazil. Same letter average do not differ according to the Tukey Test (P < 0,001).

Intervals	Sobs	S average ± DP	H'	J'
4	13	1.75 ± 1,38 (b,c)	1.919	0.748
3	11	1.63 ± 1,18 (b,c)	1.766	0.737
2	8	1.35 ± 0,82 (a,b)	1.387	0.667
1	3	0.97 ± 0,45 (a)	0.306	0.279

Table 3. Community structure of epiphytic ferns sampled on *Alsophila setosa* Kaulf. in a Semideciduous Seasonal Forest, Morro Reuter, RS, Brazil, in decreasing order by importance value (IV). (nc = number of caudices; ni = number of intervals; Afc = Absolute frequency on caudices; Rfc = Relative frequency on caudices; Afi = Absolute frequency on intervals; Rfi = Relative frequency on intervals; Tcn = total coverage note; Rc = relative coverage).

Species	nc	ni	Afc	Rfc	Afi	Rfi	Tcn	Rc	IV
Blechnum binervatum	54	106	90.00	27.84	44.17	31.83	163	39.85	33.17
Campyloneurum nitidum	50	105	83.33	25.77	43.75	31.53	119	29.10	28.80
Pecluma pectinatiformis	23	28	38.33	11.86	11.67	8.41	28	6.85	9.04
Serpocaulon catharinae	19	30	31.67	9.79	12.50	9.01	30	7.33	8.71
Asplenium scandicinum	19	28	31.67	9.79	11.67	8.41	31	7.58	8.59
Rumohra adiantiformis	8	10	13.33	4.12	4.17	3.00	10	2.44	3.19
Pleopeltis hirsutissima	6	7	10.00	3.09	2.92	2.10	7	1.71	2.30
Pecluma recurvata	5	6	8.33	2.58	2.50	1.80	6	1.47	1.95
Polyphlebium angustatum	3	4	5.00	1.55	1.67	1.20	8	1.96	1.57
Campyloneurum austrobrasilianum	2	3	3.33	1.03	1.25	0.90	3	0.73	0.89
Vittaria lineata	2	2	3.33	1.03	0.83	0.60	2	0.49	0.71
Microgramma squamulosa	1	2	1.67	0.52	0.83	0.60	2	0.49	0.54
Asplenium gastonis	1	1	1.67	0.52	0.42	0.30	1	0.24	0.35
Niphidium rufosquamatum	1	1	1.67	0.52	0.42	0.30	1	0.24	0.35

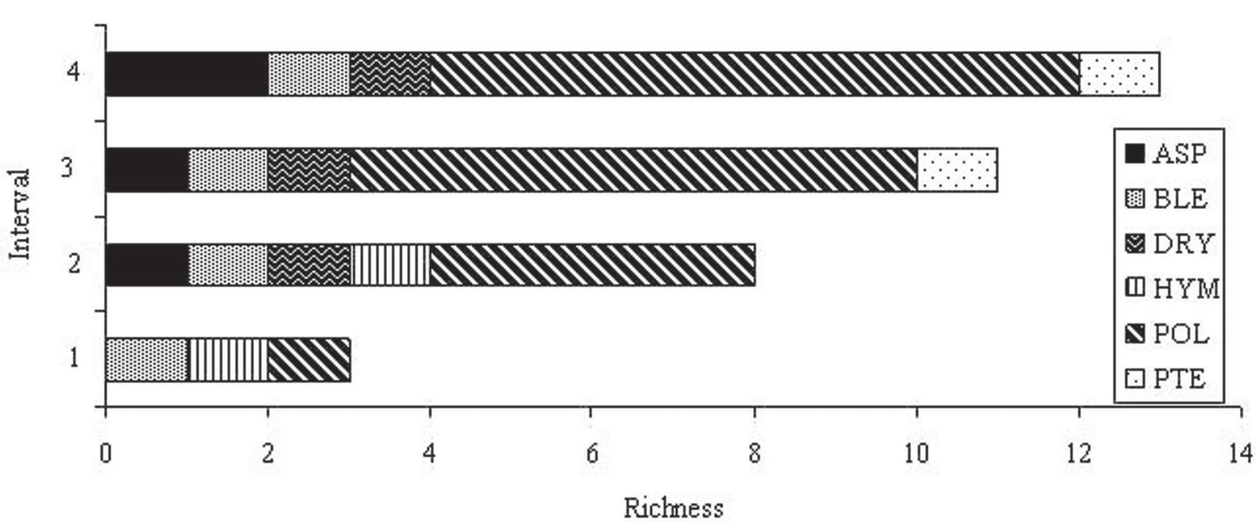

Figure 3. Species richness of epiphytic ferns and it partition among families by height intervals of *Alsophila setosa* Kaulf. in a semideciduous seasonal forest, Morro Reuter, RS, Brazil. ASP = Aspleniaceae; BLE = Blechnaceae; DRY = Dryopteridaceae; HYM = Hymenophyilaceae; POL = Polypodiaceae and PTE = Pteridaceae.

Table 4. Occurrence distribution (%) of epiphytic ferns species sampled on height intervals of *Alsophila setosa* Kaulf. in a Semideciduous Seasonal Forest, Morro Reuter, RS, Brazil. Acronyms according to Table 1.

Height Intervas	*Asga*	*Assc*	*Blbi*	*Ruad*	*Poan*	*Caau*	*Cani*	*Misq*	*Niru*	*Pepe*	*Pere*	*Plhi*	*Seca*	*Vili*
0-1	0.0	0.0	49.1	0.0	50.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-2	0.0	25.0	35.8	30.0	50.0	0.0	22.9	0.0	0.0	3.6	0.0	28.6	6.7	0.0
2-3	0.0	50.0	11.3	20.0	0.0	33.3	37.1	50.0	0.0	39.3	33.3	14.3	40.0	50.0
3-4	100	25.0	3.8	50.0	0.0	66.7	38.1	50.0	100	57.1	66.7	57.1	53.3	50.0

The specific richness of epiphytic ferns recorded in this study was the same found by Schmitt & Windisch (2005) on *Alsophila setosa* caudices, in two areas of seasonal semi-deciduous forest. The recorded families as well as 11 species are the same in both surveys. Similarly to the present study, Schmitt & Windisch (2005) recorded the highest specific richness in Polypodiaceae.

Fraga *et al.* (2008) recorded 20 species of epiphytic ferns on caudices of *Dicksonia sellowiana* Hook. in mixed humid forest. It is important to highlight that *D. sellowiana* has a thick cover of adventitious roots on its caudex, forming a substratum with more porosity and water retention, when compared with *Alsophila setosa.* Medeiros *et al.* (1993) and Roberts *et al.* (2005) also found more epiphytic species on Dicksoniaceae compared to Cyatheaceae. Moreover, humid forests in Southern Brazil are richer in epiphytes than seasonal forests (Rambo 1954, Klein 1975, Roderjan *et al.* 2002), and the same applies for fern richness (Sehnem 1977, 1979).

Polypodiaceae and Aspleniaceae, which comprised 71.43% of the species in this work, are considered the groups with the highest richness among the richest epiphytic families in the world (Madison 1977, Kress 1986, Benzing 1990) as well as in the Neotropical region (Gentry & Dodson 1987). Polypodiaceae is among the richest families in species in the ephiphytic surveys accomplished by de la Sota (1971) in Costa Rica; de la Sota (1972) in Colombia; Labiak & Prado (1998), Kersten & Silva (2001, 2002), Borgo & Silva (2003), Rogalski & Zanin (2003), Giongo & Waechter (2004), Schmitt *et al*. (2005), Schmitt (2006) and Fraga *et al.* (2008) in Southern Brazil.

Habitual holoepiphytes were predominant at the present study, as well as in other studies with epiphytic ferns by de la Sota (1971, 1972), in Costa Rica and Colombia and by Labiak & Prado (1998), Schmitt *et al.* (2005) and Fraga *et al*. (2008) in Southern Brazil. This fact has also been found in surveys of vascular epiphytes, such as those by Kersten & Silva (2001, 2002), Borgo & Silva (2003), Aguiar *et al.* (1981), Waechter (1998), Rogalski & Zanin (2003), Gonçalves & Waechter (2003) and Schmitt & Windisch (2005), in Southern Brazil. According to Fraga *et al*. (2008) the observed pattern suggest that the majority of species found in the epiphytic habitat usually presents specialized morphological and physiological adaptations to occupy this type of environment.

Shannon's diversity and Pielou's equability indices in the present study were lower than those found by Schmitt *et al.* (2005) (H = 2.789; J = 0.859) in a community of epiphytic ferns on caudices of *Dicksonia sellowiana* Hook, in Southern Brazil.

The species with the highest frequency and importance value (*Blechnum binervatum*) had a decreasing occurrence percentage from the lowest to the highest intervals of height. That is because this is a reptant species – growing as a secondary hemiepiphyte, which germinates on the ground and afterwards establishes a relation with the caudex, initially occupying lower intervals. This fact was also observed by Fraga *et al.* (2008) on caudices of *Dicksonia sellowiana* in a mixed humid forest. *Blechnum binervatum* had a high importance value for having large coverage and relative frequencies.

Campyloneurum nitidum (Polypodiaceae), the second species with the highest frequency and importance value, had a preference for superior intervals and 75.24% of its presence was above 2 m, indicating that it is more tolerant to low humidity and high light availability. Dubuisson *et al.* (2008) showed the capture and holding of organic matter by the frond architecture in some Polypodiaceae as water regulation and nutrient accumulation mechanisms, which was observed in *Campyloneurum* C.Presl and in a few species of *Niphidium* J.Sm.

The highest specific richness at intervals 3 and 4 might be related to the strategies used by epiphytic ferns for standing low humidity and high light availability, especially in Polypodiaceae, which were predominant at these intervals. Among the adaptations of this family that can be functioning at distinct combinations and allowing the colonization of a larger amount of species at the superior intervals are poikilohydry (Benzing 1987, 1990), a succulent rizome, a nidular habit (Waechter 1992) and frond trichomes, which can substitute absorption function of the roots (Müller *et al.* 1981).

Polyphlebium angustatum (Hymenophyllaceae) occurs exclusively on tree ferns (Schmitt & Windisch 2005). This species has reptant growth, developing mainly on the inferior portion of the caudex, probably because Hymenophyllaceae fronds have a low saturation point, thus allowing the species to tolerate high humidity levels and low luminosity (Benzing 1987, Dubuisson *et al.* 2008). Although this species was found only up to 2 m high, it is not possible to understand its vertical distribution pattern because it was only recorded on three cadices. Probably due to its sensitivity to draught and high luminosity, this species did not occur at height intervals 3 and 4. However, Fraga *et al.* (2008) recorded a decreasing pattern of frequency, from bottom to top, for *P. angustatum*, which was the most frequent species on *Dicksonia sellowiana*.

In this study the community structure was described with classic phytossociological parameters (Waechter 1992, 1998). Rarefaction curves were used, as well as richness estimators that are now recommended (Gotelli & Colwell 2001), so that the results can be directly comparable to those found in the future, in similar studies with epiphytic ferns. Also, a detailed description of the epiphytism on *Alsophila setosa*, with data that can be accessed for future analysis about the biodiversity of the local epiphytic flora, is presented. The decrease of *A. setosa* populations in forest remnants also decreases microhabitat availability for epiphytes, mainly for habitual or specific tree fern epiphytes, such as *Polyphlebium angustatum* that, according to Sehnem (1977), Bueno & Senna (1992) and Schmitt & Windisch (2005) does not occur on tree phorophytes.

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