Inventory of caddisflies (Trichoptera: Insecta) of the Campos do Jordão State Park, São Paulo State, Brazil

Marcia Regina Spies[1,3] & Claudio Gilberto Froehlich[2]

[1]Programa de Pós-Graduação em Entomologia,
Faculdade de Filosofia Ciências e Letras de Ribeirão Preto,
Universidade de São Paulo – USP,
Av. Bandeirantes, 3900, CEP 14040-901, Ribeirão Preto, SP, Brazil, www.ffclrp.com.br
[2]Faculdade de Filosofia Ciências e Letras de Ribeirão Preto,
Universidade de São Paulo – USP,
Av. Bandeirantes, 3900, CEP 14040-901, Ribeirão Preto, SP, Brazil, e-mail: cgfroeh@usp.br
[3]Corresponding author Marcia Regina Spies, e-mail: marciaspies@gmail.com

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Abstract: Due to the incipient state of knowledge of the caddisflies of Brazil, faunistic inventories are extremely important. An inventory of the Trichoptera fauna of Campos do Jordão State Park (CJSP), São Paulo State, based on adults and larvae, is presented here, as well as comments on its taxonomic composition and the implications this poses for the value of conserving the Araucaria Forest. The samples were taken between August 2005 and February 2007. Larvae were collected with a Surber sampler in several kinds of mesohabitats, in 1st to 4th order streams throughout CJSP. Adults were sampled with light and Malaise traps, and also entomological nets. In all, 40 genera of Trichoptera belonging to 15 families were recorded. The CJSP fauna include 60% of the genera and 93% of the families reported from Brazil. Despite the high richness recorded, the cumulative curve for genera was still rising, indicating the possibility of a further increase with additional sampling effort. The high caddisflies richness, as well as the records of rare South American genera, may be related to peculiarities of the Serra da Mantiqueira, which seems to have maintained the habitat and climatic characteristics necessary to allow the survival of a Gondwanan relict of *Araucaria* moist forest, a hypothesis reinforced by the finding of relictual genera with a Gondwanan distribution, such as *Neoatriplectides* and *Tolhuaca*.
Keywords: *larvae, adults, Araucaria Forest, Gondwanan relict, Serra da Mantiqueira.*

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Resumo: Frente ao caráter incipiente do conhecimento sobre a fauna de Trichoptera no Brasil, inventários faunísticos são de extrema importância. Aqui é apresentado um inventário da fauna de Trichoptera do Parque Estadual Campos do Jordão (PECJ), São Paulo, com base em larvas e adultos, bem como comentários sobre a composição taxonômica e possíveis implicações para a conservação da Floresta de Araucária. As coletas foram realizadas entre agosto de 2005 e fevereiro de 2007. As larvas foram coletadas com amostrador tipo Surber em diversos tipos de mesohábitats, em riachos de 1ª a 4ª ordem. Os adultos foram capturados com armadilhas luminosas e Malaise, além de redes entomológicas e atração com luz em lençol branco. No total, foram registrados 40 gêneros de Trichoptera, pertencentes a 15 famílias. O PECJ apresentou 60% dos gêneros e 93% das famílias registrados no Brasil. Apesar da alta diversidade registrada, as curvas de acumulação de gêneros não apresentaram estabilização, indicando incremento de gêneros com o aumento do esforço amostral. A alta riqueza de Trichoptera do PECJ, bem como o registro de gêneros raros na América do Sul, pode estar relacionada à peculiaridade da Serra da Mantiqueira, que parece representar um relicto gondwânico, hipótese reforçada pelo registro de gêneros relictuais com distribuição gondwânica como *Neoatriplectides* e *Tolhuaca.*
Palavras-chave: *larvas, adultos, Floresta de Araucária, relicto gondwânico, Serra da Mantiqueira.*

Introduction

The order Trichoptera is worldwide in distribution, with 12,627 species included in the Trichoptera World Catalogue as of June 2006, distributed in 610 genera and 46 families (Moor & Ivanov 2008). In the Neotropical region, as of 1999, 2,196 species were recorded (Flint Jr. et al. 1999), and in Brazil the last checklist reported 378 species (Paprocki et al. 2004). However, as of July 2009, at least 46 additional species have been described and seven new distribution records have been reported (Holzenthal & Pes 2004, Huamantinco & Nessimian 2004, Blahnik 2005, Robertson & Holzenthal 2005, 2006, Calor et al. 2006, Johanson & Malm 2006, Holzehthal & Robertson 2006, Wasmund & Holzenthal 2007, Calor 2008, Dumas & Nessimian 2008, Santos & Nessimian 2008, 2009a, b, Santos et al. 2009), increasing the number of Trichoptera species known for Brazil to 431.

The first studies on the caddisfly fauna of Brazil date from the nineteenth century. However, only during the second half of the twentieth century were more wide-ranging studies carried out, including mainly new species descriptions, but also the presentation of biogeographic and phylogenetic data (e.g., Flint Jr. 1966, 1971, 1974, 1978, 1982, Holzenthal 1986, 1989). These studies were very important in contributing to an initial development of the knowledge of the Trichoptera fauna in Brazil.

Caddisflies larvae are important in aquatic insect assemblages, both in abundance and biomass, as well as in richness (Wiggins 1996). This group, together with the Ephemeroptera and Plecoptera, are indicators of water quality, due their sensibility to pollution (Rosenberg & Resh 1993). These orders are intensively used in biomonitoring in water quality programs of rivers and streams, as well as in environmental impact evaluations (e.g., Wallace et al. 1996, Compin & Céréghino 2003).

Caddisflies are important components of the energy flow and nutrient dynamics in freshwater environments, showing great diversity in trophic adaptations and microhabitat exploitation (Flint Jr. et al. 1999). Silk production by larvae (from modified salivary glands) and the behavioral adaptations driven by its use, have allowed a high ecological and taxonomic diversification (Mackay & Wiggins 1979). The caddisfly fauna is more diversified in lotic and cold habitats that in other continental habitats (Mackay & Wiggins 1979). In general, mountainous regions with fast flowing waters present a greater diversity that similar areas flatter in relief (Flint Jr. 1982).

Only a portion of the biodiversity of Brazilian caddisflies is known, as shown by Paprocki et al.'s checklist (Paprocki et al. 2004), where nine states (out of 26) do not have any records of Trichoptera species and 10 states have less than 15 caddisfly species. Another indication of the lack of knowledge about this group is the high number of new species described in the last five years, as cited above. Here an inventory of the Trichoptera fauna of Campos do Jordão State Park is presented, as well as comments on its taxonomic composition and the possible implications this poses for promoting conservation of the Araucaria Forest.

Material and Methods

1. Study area

The study was carried out in Campos do Jordão State Park (CJSP) (22° 30' to 22° 41'S and 45° 27' to 45° 31'W), in Campos do Jordão municipality, São Paulo State (Figure 1). The Park has about 8,385 ha and is situated in the Serra da Mantiqueira (Seibert 1975). The relief has high declivity, with an altitudinal difference of over 300 m from the mountains to the bottom of valleys. The highest point in CJSP is 2,007 m, and the lowest 1,030 m, in the Sapucaí-Guaçu River Valley. The average altitude is 1,650 m. The hydrographic system is composed of the Sapucaí-Guaçu River and seven main tributary streams: Canhambora, Campo do Meio, Galharada, Casquilho, Serrote, and Coxim (on the east side) and Paiol (on the west side).

The soil of CJSP belongs to the crystalline complex, formed mainly of metamorphic rocks (gneiss, gneissified granite, migmatic phacoidal gneiss, aplite and granulite). The vegetation cover of CJSP is a mosaic of Atlantic Rain Forest, Araucaria Forest and grassland fields in the highest areas (Figure 2a and b). Grassland occurs mainly on thin soils (with stone-line) and/or bauxitic soils, whereas the soils of gneiss-granite origin promote the development of forests (Seibert 1975). Winds from the Atlantic side favor the establishment of Atlantic Rain Forest, whereas continental winds favor the development of *Araucaria angustifolia* Forest (Seibert 1975). Thus, the Araucaria Forest (which also includes *Podocarpus*) predominates on the continental side of the Serra da Mantiqueira and the Atlantic Rain Forest predominates on the Paraiba River Valley side (Seibert 1975).

The climate of the region, according to Köppen's classification, is subtropical of altitude (Cfb type), without a dry season and with the average temperature in the hottest month lower than 22 °C. The average yearly rainfall is 1,800 mm. The rainiest month is January, with more than 300 mm, and the driest month is July, with about 30 mm. However, the CJSP does not have a hydric deficiency, because in the months with low rain the temperature is also low. The relative air humidity is high the whole year (Seibert 1975).

2. Sampling

Larvae and adults were collected in the CJSP in 10 four-day sampling periods, between August 2005 and February 2007. The larvae were collected in 32 sampling sites in the main tributaries of the

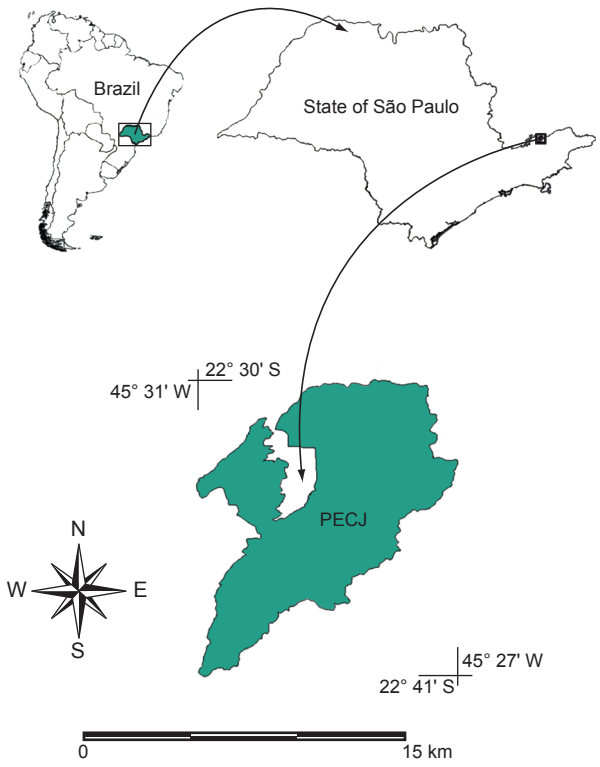

Figure 1. Localization of Campos do Jordão State Park, São Paulo State.

Figura 1. Localização do Parque Estadual Campos do Jordão, São Paulo.

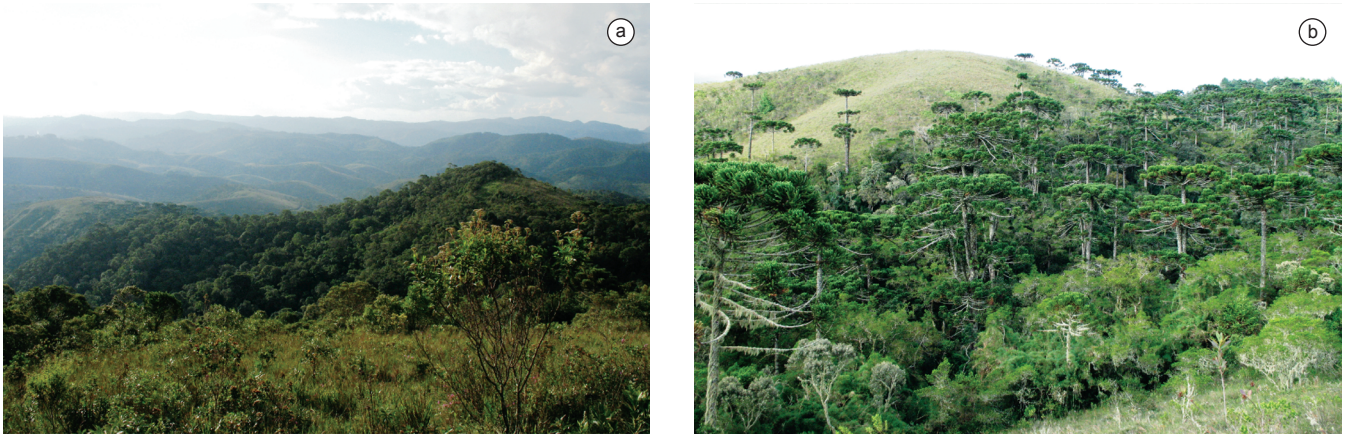

Figure 2. Vegetational formations present in the Campos do Jordão State Park, São Paulo State. a) grassland fields and Altantic Rain Forest; b) Araucaria Forest and grassland fields.

Figura 2. Formações vegetacionais presentes no Parque Estadual Campos do Jordão, São Paulo. a) mosaico de Campos de Altitude e Floresta Ombrófila Densa; b) mosaico de Floresta de Araucária e Campos de Altitude.

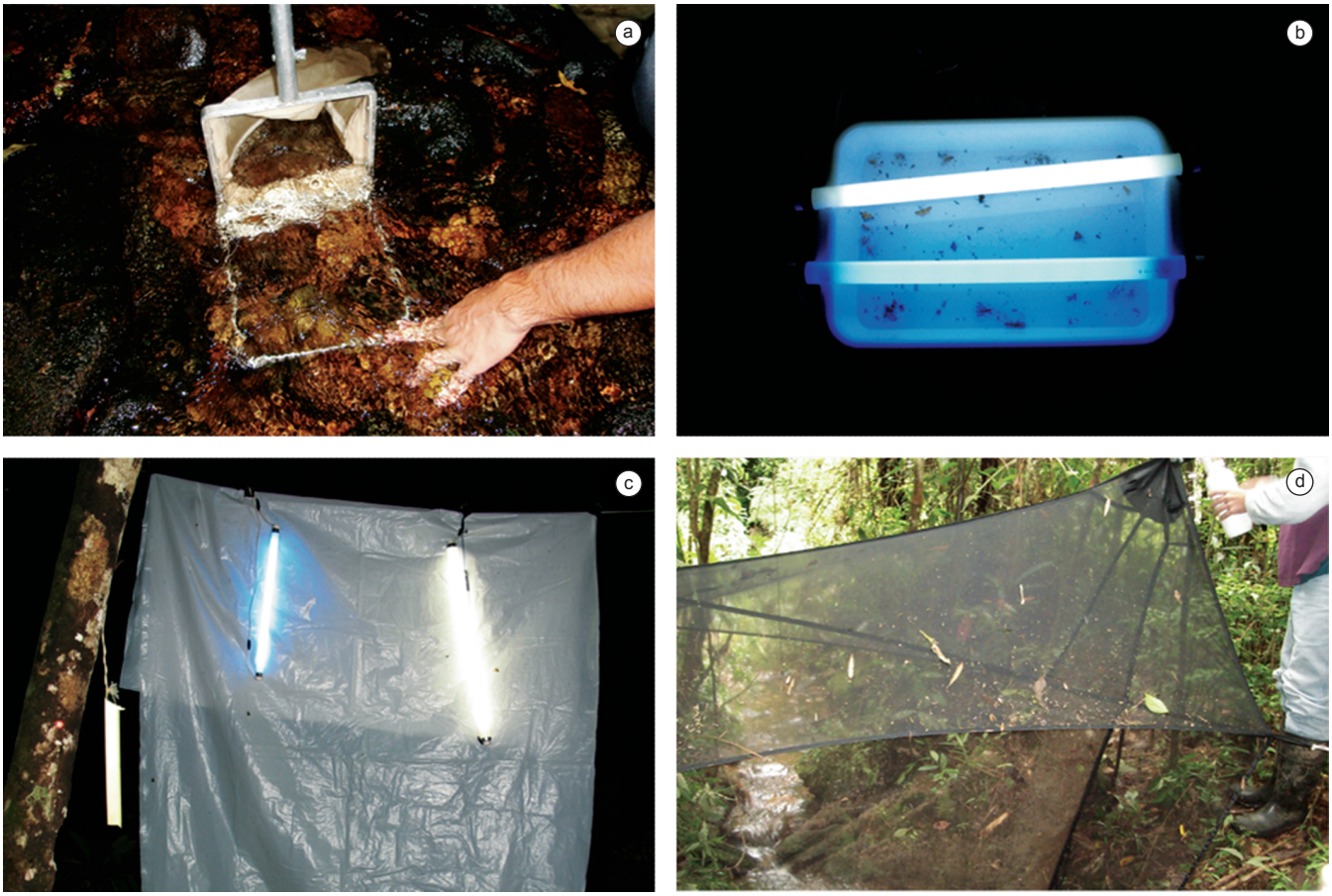

Figure 3. Sampling methods used for caddisfly collection in the Campos do Jordão State Park, São Paulo State: a) Surber sampling for larvae collection; b) light attraction in tray; c) white sheet and d) Malaise trap for collection of adults.

Figura 3. Métodos de amostragens utilizados para coleta de Trichoptera no Parque Estadual Campos do Jordão: a) amostrador de Surber para coleta de larvas; b) atração luminosa em bandeja; c) lençol branco e d) armadilha Malaise para coleta de adultos.

Sapucaí-Guaçu River (the Canhambora, Campo do Meio, Galharada, Casquilho, Serrote, Coxim and Paiol streams) and also in lower order tributaries and in four artificial ponds inside CJSP. Collections of larvae were obtained with a Surber sampler (0.0361 m^2 of area and 0.25 mm mesh, Figure 3a) in five types of mesohabitats in streams and also in lentic habitats (e.g., stones in riffles; leaf packs in riffles; leaf packs in pools, sand in pools and waterfall walls - Figure 4a-d). The material was fixed with 4% formalin, taken to the laboratory, washed through a 250 µm mesh sieve, sorted under a stereomicroscope and stored in 80% ethanol.

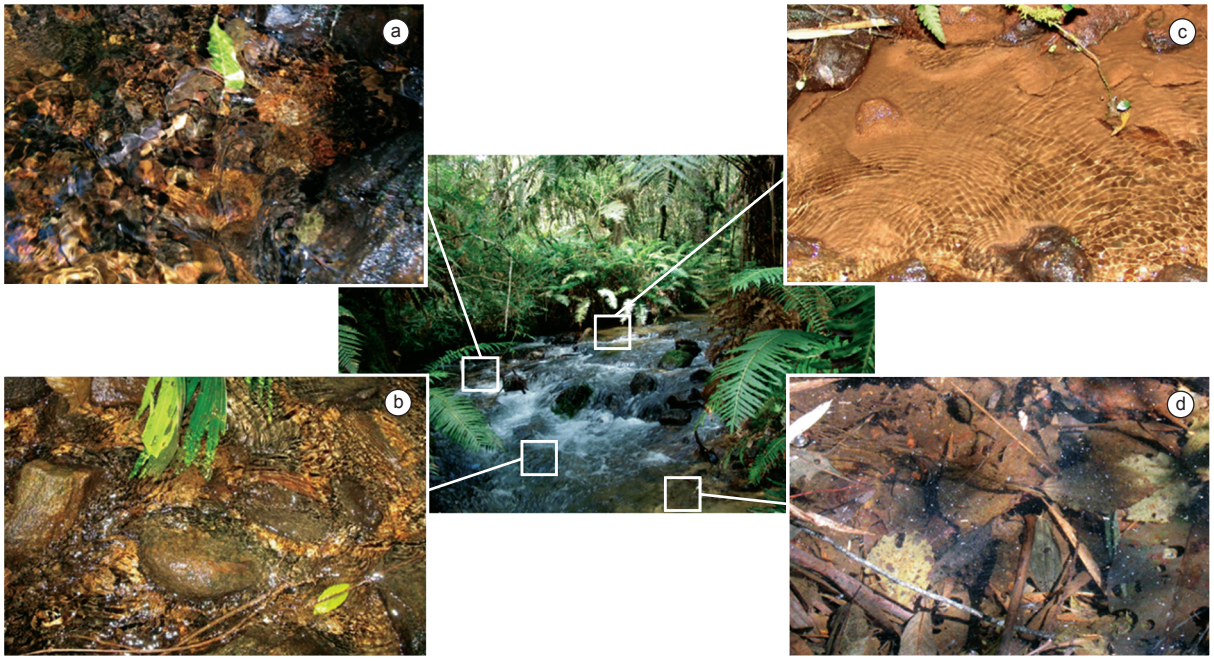

Figure 4. River section showing the localization and structure of the mesohabitats. a) leaf packs in riffles; b) stones in riffles; c) sand in pools and d) leaf packs in pools.

Figura 4. Secção de riacho mostrando a localização e estrutura dos mesohábitats. a) folhas em corredeira; b) pedra em corredeira; c) areia em remanso e d) folhas em remanso.

The adults were collected using a white sheet and attracting lights (15 W ultraviolet and 20 W white lights powered by 12 V batteries) (Vanzolini & Papavero 1967), hung at the stream bank (Figure 3c), and trays of 80% ethanol with lights on them (15 W ultraviolet and 15 W white lights powered by 12 V batteries) (Figure 3b). The lights were operated from sunset for about two hours. A Malaise trap (Figure 3d) was maintained continuously for two years over the Galharada Stream, at a 4th order site. At the sites where the larvae were collected, the riparian vegetation was swept with an entomological net in order to also collect insects with a daytime activity. Adults collected with an entomological net or Malaise trap were fixed in 80% ethanol. The specimens collected on the white sheet were killed with ethyl acetate and afterwards, in the laboratory, were pinned with entomological pins or micro pins and maintained dry in entomological boxes with naphthalene. When there was a large number of specimens of a particular morphotype, some were pinned and the remaining individuals preserved in 80% ethanol.

The adults were identified to genera, except in the family Hydroptilidae, following taxonomic keys of Flint Jr. (1996) and Angrisano & Korob (2001), or using various papers describing individual species. The larvae were also identified to genera, except for the family Glossosomatidae, following the taxonomic keys of Angrisano & Korob (2001), Pes et al. (2005) and Wiggins (1996).

3. Statistical analysis

The sampling effort was evaluated by smoothed accumulation curves of genera (randomized collector curves) and by qualitative non-parametric richness estimators (Bootstrap, Chao 2, ICE and Jackknife 1 and 2). The use of randomized curves was adopted to avoid variation in curve shape during the addition of samples (Colwell & Coddington 1994).

The generic accumulation curves and estimators were calculated using 100 randomizations. The Chao 2, ICE and Jackknife 1 and 2 estimators estimate the richness based on rare species frequency. They differ only in the criterion by which they consider a species rare. With Jackknife 1, for example, rare species are those that occur in only one sample unit, while with Jackknife 2 and Chao 2 rare species are those that occur in only one or two sample units (Santos 2003). For the ICE estimator, the user chooses the frequency to define rare species, although common choices are in the interval one to ten sample units (Santos 2003). In the current study, rare species were defined as those that occurred in up to 10 sample units in the data set. Bootstrap uses frequency data of all taxa sampled and not only rare species (Santos 2003). The curves were generated by EstimateS 8 software (Colwell 2006).

The accumulation curves were obtained separately for larvae and adults, due to the different sampling methods of the two life stages employed in the inventory. In the curve generated for adults, the Malaise trap records were not considered, because these samples aggregate caddisflies collected during periods of one to three months. The other sampling methods for adults consisted of collections during a period of ca. two hours at each site. So, for adults, each period of two hours using white sheet, tray or entomological net was considered a sampling unit and, for larvae, each Surber sampling.

Results

Considering the combined efforts from all sampling methods used, 40 genera of Trichoptera were recorded in CJSP, belonging to 15 families (Table 1). Of these, 32 genera were recorded as larvae and 29 genera as adults. Eleven genera were collected solely as larvae and nine as adults (Table 1).

The accumulation curves and the richness estimators employed showed a tendency for genera to increase in both curves, for larvae and adults. However, the curve for larvae showed a stronger tendency

Table 1. Taxonomic composition of Trichoptera, based on larvae (by mesohabitat type) and adults (by sampling method), sampled between August 2005 and February 2007 in streams of Campos do Jordão State Park, São Paulo State. In mesohabitats, for larvae genera occurrences smaller than 1% of the total abundance were not considered. StR = stones in riffles; LR = leaf packs in riffles; LP = leaf packs in pools; SaP = sand in pools; Ww = waterfall walls; L = lentic; M = Malaise trap; EN = entomological net; S = white sheet light attraction; T = tray light attraction.

Tabela 1. Composição taxonômica de Trichoptera, baseada em larvas (por tipo de mesohábitat) e adultos (por método de amostragem), coletadas entre agosto de 2005 e fevereiro de 2007 em riachos do Parque Estadual Campos do Jordão, São Paulo. Nos mesohábitats, para a ocorrência das larvas, foram desconsideradas as ocorrências que representaram menos de 1% da abundância total. StR = pedras em corredeira; LR = folhas em corredeira; LP = folha em remanso; SaP = areia/ em remanso; Ww = Cachoeira; L = Lêntico; M = armadilha Malaise; EN = rede entomológica; S = atração luminosa em lençol branco; T = atração luminosa em bandeja.

Family	Genus	Larvae						Adults			
		StR	LR	LP	SaP	Ww	L	M	EN	S	T
ANOMALOPSYCHIDAE	*Contulma* Flint 1969	x	x	x	x	-	-	x	-	x	-
ATRIPLECTIDIDAE	*Neoatriplectides* Holzenthal 1997	x	-	x	x	-	-	-	x	-	-
CALAMOCERATIDAE	*Phylloicus* Müller 1880	x	x	x	x	-	-	x	x	x	x
ECNOMIDAE	*Austrotinodes* Schmid 1955	x	-	x	-	-	-	-	-	-	-
GLOSSOSOMATIDAE	*Canoptila* Mosley 1939	-	-	-	-	-	-	x	x	x	x
	Mortoniella Ulmer 1906	-	-	-	-	-	-	x	x	x	x
	Tolhuaca Schmid 1964	-	-	-	-	-	-	x	x	x	-
HELICOPSYCHIDAE	*Helicopsyche* Siebold 1856	x	x	x	x	x	-	x	x	x	x
HYDROBIOSIDAE	*Atopsyche* Banks 1905	x	x	x	-	x	-	x	-	x	x
HYDROPSYCHIDAE	*Blepharopus* Kolenati 1859	x	x	x	-	x	-	x	x	x	x
	Leptonema Guérin 1843	x	x	x	x	-	-	-	-	x	x
	Centromacronema Ulmer 1905	-	-	-	-	-	-	x	-	-	-
	Macronema Pictet 1836	x	-	-	-	-	-	-	-	-	-
	Smicridea McLachlan 1871	x	x	x	-	x	-	x	x	x	x
	Synoestropsis Ulmer 1905	-	-	-	-	-	-	-	-	x	-
HYDROPTILIDAE	*Alisotrichia* Flint 1964	x	x	-	-	x	-	-	-	-	-
	Byrsopteryx Flint 1981	x	x	-	-	x	-	-	-	-	-
	Leucotrichia Mosley 1934	x	-	x	-	x	-	-	-	-	-
	Metrichia Ross 1938	x	x	-	-	x	-	-	-	-	-
	Neotrichia Morton 1905	x	x	x	-	x	-	-	-	-	-
	Oxyethira Eaton 1873	-	-	-	-	-	x	-	-	-	-
LEPTOCERIDAE	*Achoropsyche* Holzenthal 1984	-	-	-	-	-	-	-	-	x	x
	Atanatolica Mosely 1936	x	x	x	-	x	-	-	-	-	-
	Grumichella Müller 1879	x	x	-	-	x	-	x	x	x	x
	Nectopsyche Müller 1879	x	x	x	-	-	-	x	x	x	x
	Neoathripsodes Holzenthal 1989	-	-	-	-	-	-	-	-	x	-
	Notalina Mosely 1936	x	x	x	x	-	-	x	x	x	x
	Oecetis McLachlan 1877	x	x	x	x	-	-	x		x	x
	Triplectides Kolenati 1859	x	x	x	x	-	-	x	x	x	x
ODONTOCERIDAE	*Anastomoneura* Huamantinco & Nessimian 2004	x	x	x	x	-	-	-	-	-	x
	Barypenthus Burmeister 1839	x	-	x	x	-	-	-	-	-	-
	Marilia Müller 1880	x	x	x	x	-	-	x	x	x	x
PHILOPOTAMIDAE	*Alterosa* Blahnik 2005	-	-	-	-	-	-	-	x	x	x
	Chimarra Stephens 1829	x	x	-	-	-	-	-	x	x	-
	Gen 1	x	x	-	-	-	-	-	-	-	-
POLYCENTROPODIDAE	*Cyrnellus* Banks 1913	-	-	x	-	-	-	-	-	x	-
	Polycentropus Curtis 1835	x	x	x	-	-	-	x	x	x	x
	*Polyplectropu*s Ulmer 1905	x	x	x	-	x	-	x	-	x	x
SERICOSTOMATIDAE	*Grumicha* Müller 1879	x	x	x	x	-	-	-	-	x	x
XIPHOCENTRONIDAE	*Xiphocentron* Brauer 1870	x	x	-	-	x	-	x	x	x	-
	Total	30	26	23	12	13	1	19	17	26	20

to reach stabilization than the curve for adults (Figure 5a and b, respectively).

In collections of larvae in lotic environments, the mesohabitat of "stones in riffles" had the greatest richness (29 genera) while the lowest genera richness was observed in "waterfalls walls" and "sand in pools" (13 and 12 genera, respectively) (Table 1).

In adult sampling, light attraction with a white sheet was the most efficient method, since 90% of the genera (26 genera) were recorded by this method (Table 1). Some genera were only collected by one of the sampling methods used: three genera by use light and white sheet; two genera by use of an entomological net; and one genus each by the Malaise trap and tray light methods.

The Trichoptera families with the greatest diversification in the study area were Leptoceridae (eight genera), and Hydropsychidae and Hydroptilidae (six genera each) (Figure 6). Approximately 53% of the families recorded in the study area were represented by a single genus (Figure 6).

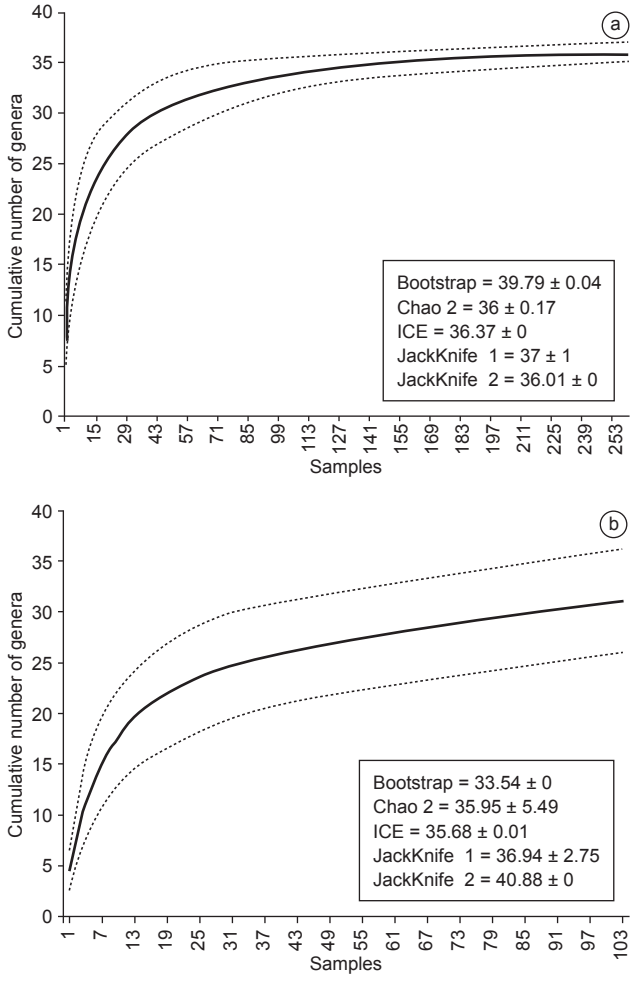

Figure 5. Accumulation curves of genera (smoothed) for a) larvae and b) adults of Trichoptera sampled in streams of Campos do Jordão State Park, São Paulo State, between August 2005 and February 2007. The continuous lines represent the average curves and the dotted lines the standard deviation of each curve. Qualitative non-parametric estimates of genera richness are presented for the full sample.

Figura 5. Curvas de acumulação de gêneros (randomizadas) a) para larvas e b) para adultos de Trichoptera coletados em riachos do Parque Estadual Campos do Jordão, São Paulo, entre agosto de 2005 e fevereiro de 2007. As linhas contínuas representam as curvas médias e as linhas pontilhadas o desvio padrão de cada curva. Estimativas não-paramétricas qualitativas de riqueza de gêneros são apresentadas para a amostragem total.

Discussion

In Brazil, 16 families and 66 genera of Trichoptera are reported (Pes & Hamada 2003, 2004, Paprocki et al. 2004, Holzenthal & Pes 2004, Huamantinco & Nessimian 2004, Blahnik 2005, Pes et al. 2005, Robertson & Holzenthal 2005, Blahnik & Holzenthal 2008). The CJSP fauna represents a significant proportion of the total Brazilian fauna, since 60% of the genera and 93% of the families of caddisflies were recorded in the area. These results emphasize the importance of the preservation and better conservation of CJSP, which is under impacts such as grazing and annual fires (MRS personal observation). In fact, grazing activity by livestock has strong impacts over the riparian area, the stream channel and the benthic invertebrate community structure (Scrimgeour & Kendall 2003). Additionally, fire causes indirect effects on food webs and the structure of freshwater macroinvertebrate communities, mainly through the increase of sediment discharge into streams, carried by runoff (Minshall 2003; Mellon et al. 2008).

The records of some genera from only larvae or adults emphasize the importance of sampling both life stages in faunistic inventories. In a previous study carried out in CJSP, focused on the larval community of Ephemeroptera, Plecoptera and Trichoptera of riffles, 11 families and 17 genera of Trichoptera were recorded (Oliveira & Froehlich 1997). The differences in number of genera and families recorded by Oliveira & Froehlich (1997) and the present one reinforce the importance of sampling both larvae and adults in a faunistic inventory. The latter presents an estimate of diversity likely close to the real diversity.

Despite the utilization of complementary sampling methods, the smoothed accumulation curves (for adults and larvae) did not reach an asymptote and the estimators indicated the collection of additional genera with increased sampling effort. However, this may be due to the impossibility of constructing a single accumulation curve using

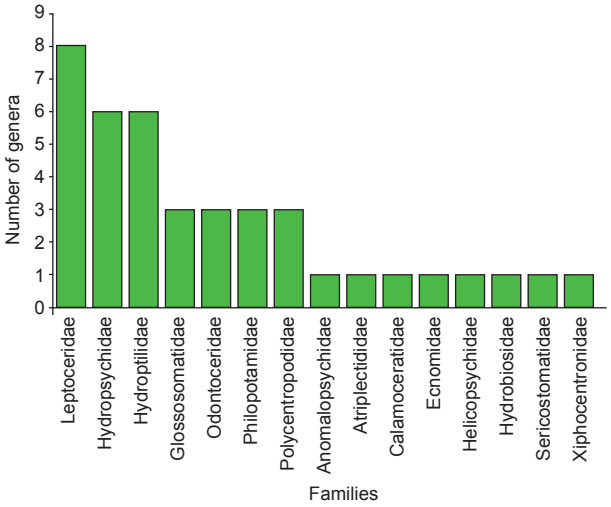

Figure 6. Generic contribution of each family in caddisfly fauna recorded in the Campos do Jordão State Park, São Paulo State, between August 2005 and February 2007.

Figura 6. Contribuição de gêneros de cada família na fauna de Trichoptera registrada no Parque Estadual Campos do Jordão, São Paulo, entre agosto de 2005 e fevereiro de 2007.

records both of adults and larvae. Thus, although each dataset might underestimates the true richness, their combination (40 genera) likely reflect the total genera richness in the area.

The high efficiency of light attraction methods is probably due to the nocturnal activity of most genera, as well as to the great attractivity of light (including ultraviolet light) to caddisflies (Flint Jr. et al. 1999). However, complementary methods are necessary, because there are several genera/species with diurnal activity, which are not attracted to light. The utilization of entomological nets and Malaise traps were helpful in the collection of diurnal species.

The number of genera recorded in the present study was higher than previous studies based on larvae (20 genera - Huamantinco & Nessimian 1999; 25 genera - Oliveira & Bispo 2001; 33 genera - Pes et al. 2005; 25 genera - Spies et al. 2006). The high genera richness in the present study is explained, at least in part, by i) the complementary sampling methods employed, ii) the sampling of both larvae and adults, and iii) the collection in many sampling sites.

Some caddisfly genera collected in the CJSP have narrow distributions or are only rarely recorded in South America, such as *Anastomoneura* (Odontoceridae), *Contulma* (Anomalopsychidae), *Neoathripsodes* (Leptoceridae), *Neoatriplectides* (Atriplectididae), *Tolhuaca* and *Canoptila* (Glossosomatidae). The occurrence of these rare genera highlights the uniqueness of the area. The high richness of caddisfly genera in CJSP support previous studies indicating high richness of other freshwater invertebrates in the area, such as aquatic Oligochaeta (Gorni & Alves 2008) and Ephemeroptera, Plecoptera and Trichoptera and aquatic Coleoptera in relation to other preserved areas (Bispo & Oliveira 2007; Segura et al. 2007). Thus, high richness and the occurrence of rare South American genera of caddisflies and, other freshwater invertebrates in CJSP, seems to be related to singular features of the Serra da Mantiqueira, such as the cold climate compared to neighbor areas, high altitude, and relictual vegetation (Araucaria Forest).

An additional hypothesis to be considered in explaining the fauna richness is the possibility that this area is a Gondwanan relict, which is reinforced by the occurrence in the park of genera with a Gondwanan distribution, such as *Neoatriplectides* and *Tolhuaca* (Holzenthal 1997; Robertson & Holzenthal 2005). In fact, the vegetation in the highlands of CJSP also reflects this pattern, since the *Araucaria* and *Podocarpus* trees both have an admittedly Gondwanan distribution (Sauer 1988; Kunzmann 2007). Robertson & Holzenthal (2005) call attention to the disjunct and congruent distributions of *Tolhuaca* and *Araucaria* in South America and Holzenthal (1997) to the distribution of the family Atriplectididae, which has representatives in South America, Australia and the Seychelles Islands. These could be considered a relict of pre-rupture Gondwana, i.e., pre-Cretaceous. Thus, it is possible that the Serra da Mantiqueira has maintained favorable conditions that allow the concentration of genera/species of Gondwanan relicts.

The Araucaria Forest has suffered a reduction of 87% from its original distribution in Brazil in the last decades (SOS Mata Atlântica 1998). Additionally, only 0.62% of its original distribution is currently in protected areas (Silva & Dinnouti 1999). Thus, considering the degree of threat to this type of forest, and the relevance of remnant fragments in maintaining a high biological diversity, including that of Trichoptera, as demonstrated by the results of this study, the effective maintenance of existing parks and protected areas, as well as the inclusion of other remnant areas in conservation units is fundamental.

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