SCIENTIFIC COMMUNICATION

Bark consumption by the spiny rat *Euryzygomatomys spinosus* (G. Fischer) (Echimyidae) on a *Pinus taeda* Linnaeus (Pinaceae) plantation in South Brazil

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ABSTRACT. Feeding damage caused by *Euryzygomatomys spinosus* (G. Fischer, 1814) (Echimyidae) is documented for a *Pinus taeda* Linnaeus (Pinaceae) plantation located in Cambará do Sul, Rio Grande do Sul State, Brazil. Under laboratory conditions, feeding acceptance of *P. taeda* trunk sections was tested with positive results for *E. spinosus*, but not for other three co-occurring sigmodontine rodents: *Akodon montensis* Thomas, 1913, *Oligoryzomys nigripes* (Olfers, 1818) and *Delomys dorsalis* (Hensel, 1872).
KEY WORDS. Bark feeding; echimyids; pine plantations; Rodentia.

RESUMO. **Consumo de *Pinus taeda* (Pinaceae) pelo rato-de-espinho *Euryzygomatomys spinosus* (G. Fischer) (Echimyidae) em plantações no Sul do Brasil.** Esse estudo documenta os danos causados por *Euryzygomatomys spinosus* (G. Fischer, 1814) em plantações de *Pinus taeda* Linnaeus (Pinaceae) localizadas em Cambará do Sul, Estado do Rio Grande do Sul, Brasil. Em laboratório foi testada positivamente a utilização de troncos de *Pinus* como recurso por *E. spinosus*, mas não para os outros roedores sigmodontíneos ocorrentes na área: *Akodon montensis* Thomas, 1913, *Oligoryzomys nigripes* (Olfers, 1818) e *Delomys dorsalis* (Hensel, 1872).
PALAVRAS-CHAVE. Equimídeos; plantações de pinus; Rodentia; roedura da casca.

The Neotropical spiny rats (Echimyidae) are known as the most diverse group among the hystricognath rodents from both morphological and ecological perspectives, ranging from semi-fossorial to arboreal life style (Leite & Patton 2002). They comprise for 18 genera (Lara *et al*. 1996, McKenna & Bell 1997, Emmons & Vucetich 1998, Emmons *et al*. 2002, Leite 2003) and around 80 recognized species (Woods 1993, Emmons & Feer 1997, McKenna & Bell 1997, Eisenberg & Redford 1999) found throughout the Neotropics (Emmons & Feer 1997). Although the majority of echimyids occurs in the Amazon Basin (Galewski *et al.* 2005), inhabiting lowland and montane rainforest, eight genera (*Euryzygomatomys*, *Clyomys*, *Callistomys*, *Phyllomys*, *Kannabateomys*, *Carterodon*, *Thrychomys and Trinomys*), are distributed throughout the Brazilian sub region of Atlantic Province, including Central-eastern Brazil, Paraguay, and Northeastern Argentina (Galewski *et al.* 2005).

Euryzygomatomys spinosus (G. Fischer, 1814) has been registered for the South and Southern portions of the Atlantic Rainforest in Brazil (Moojen 1952, D'Andrea *et al*. 1999, Cherem *et al*. 2004). It is a brownish dark rat-like rodent, with the dorsal hairs having lighter bases and spine aspect. It has a diploid number equals to 46 chromosomes (Yonenaga 1975). As far as we are concerned there is no intensive study regarding *E. spinosus* biology and ecology.

This rodent exhibits features apparently related to burrowing habits like high sociability, short tail, and small size (Emmons & Feer 1997, Eisenberg & Redford 1999). Although found primarily under the riparian vegetation located in dense forests, it seems to be a habitat generalist species (Mares & Ojeda 1982). According to Alho (1982) and Mares & Ojeda (1982), *E. spinosus* has a herbivorous feeding habit, being active at night.

Rodents have been registered using exotic forest habitats in both northern and southern hemispheres (Baxter & Hansson 2001), but there is no such a record for *E. spinosus*. Carvalho &

Bueno (1975) speculated, in a broad sense, about the association of unidentified echimyids (supposedly belonging to either *Clyomys* Thomas or *Euryzygomatomys* Goeldi) and ctenomyid rodents (*Ctenomys* Blainville) with pinus plantations in Campos do Jordão, São Paulo State. However, we are unaware of the existence of any *Ctenomys* at altitude higher than 1,500m in Brazil, and the authors have not mentioned how the corresponding echimyid genera were identified, since they were not captured and neither their damage were registered. Baxter & Hansson (2001) emphasize the economic damage that rodents in general cause to plantations. In Brazil, for example, their occurrence [*Agouti paca* (Linnaeus, 1766) and *Coendou insidiosus* (Kuhl), in addition to the genera mentioned above] on exotic forests was treated as agricultural "pests" by Carvalho & Bueno (1975), and control measures were then suggested. In the present study, we aim to register the direct use of a *Pinus taeda* Linnaeus plantation as a feeding resource by *E. spinosus*, based upon the correct species identification (karyotype) and also feeding acceptance of the plant by this rodent under controlled conditions.

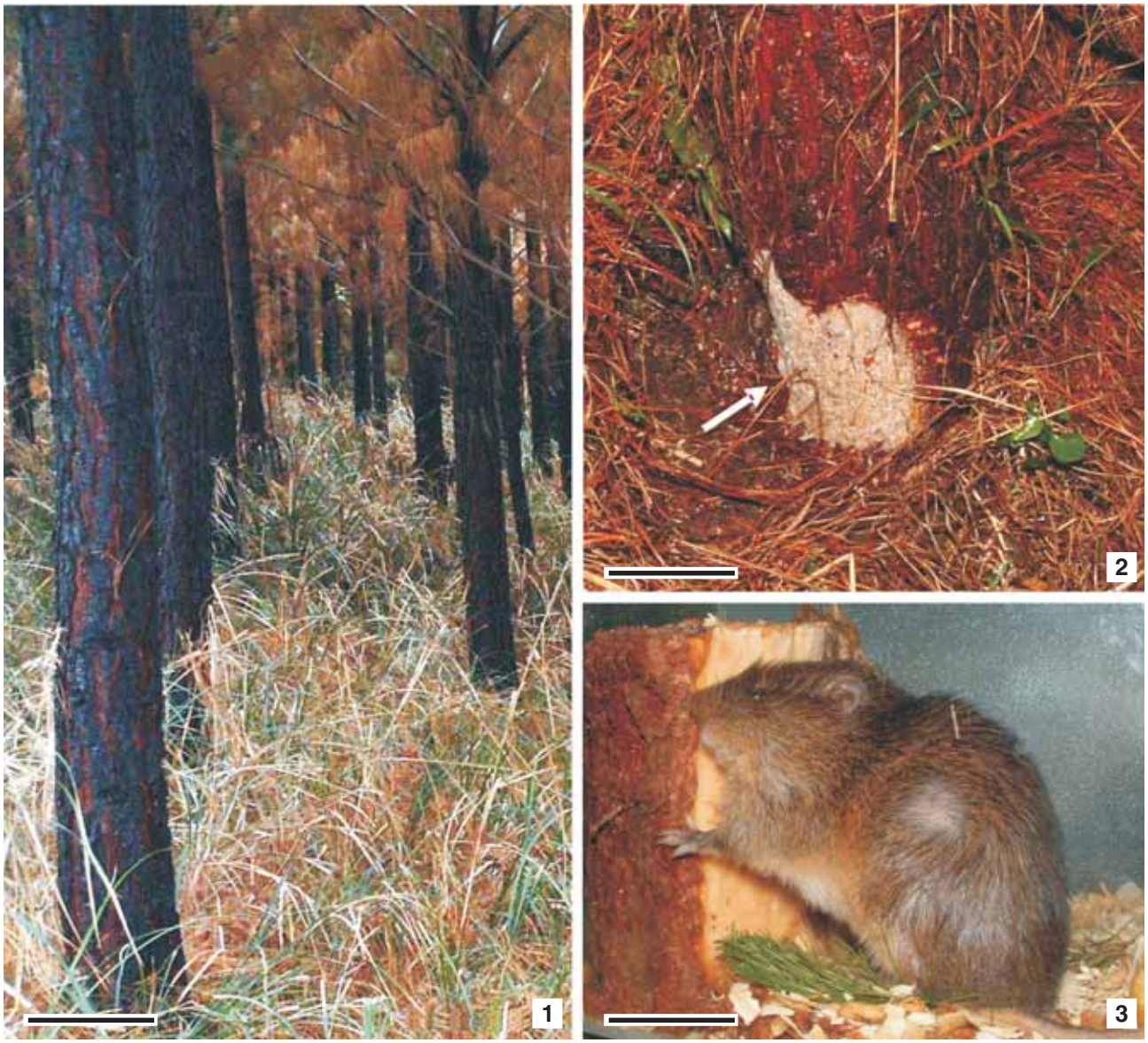
We found *E. spinosus* feeding upon a *P. taeda* plantation belonging to Cambará S.A. Produtos Florestais, Cambará do Sul municipality, Rio Grande do Sul State (RS) (29°10'S, 50°05´W), during September 2004. The study area was 10 ha in size, being composed of four year-old *P. taeda* trees, of which 30% were apparently dead, as indicated by their discolored canopy (Fig. 1). Tree injury was associated to feeding scars always present at their trunk bases; those that were green had no feeding scars. On the same occasion, three other sigmodontine rodents were also collected within the plantation and surrounding areas covered by native forests: *Akodon montensis* Thomas, 1913, *Oligoryzomys nigripes* (Olfers, 1818) and *Delomys dorsalis* (Hensel, 1872). All rodents, including *E. spinosus*, were captured in a 60-m long transect, by using 30 small Tomahawk® traps (9 x 9.5 x 23 cm) that were baited with ear of corn slices and peanut butter, during three consecutive nights. Sections of *P. taeda* trunks were brought to laboratory to test for their use as a feeding resource. In the laboratory, four rodents (one per species) were maintained in separate glass chambers (25 x 35 x 55 cm) at the Laboratório de Citogenética e Evolução Molecular (LCEM) from Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS. Water, ear of corn and orange slices were also offered *ad libitum* within the cages. They were checked daily for the presence of feeding scars on *P. taeda* trunks during five days. After observations, the specimens were karyotyped following protocol proposed by Ford & Hamerton (1956), in order to correctly identify them to the specific level. Voucher specimens were deposited in the tissue collection of LCEM, under numbers from 125 to 129.

Laboratory observations showed that only *E. spinosus* used *P. taeda* as a feeding resource, precisely the bark portion located on those sections coming from the lower part of *P. taeda* trunks (Fig. 3). The feeding damage they produced in laboratory was very similar to the fresh scars found under field conditions (Fig. 2). Thus, *E. spinosus* chews the bark portion of the lower part of *P. taeda* trunks. McNally (1955) analyzed the gut contents of *Rattus* sp., which feed upon *P. radiata* trees, and found out that they chew and remove the bark, thus feeding upon the tissues located bellow, in a similar way to what was found in the present study. He concluded that by doing so, they benefited from the starch and sugars that are present in the conductive vessels. He also pointed out that rodents consume *Pinus* during the winter and at beginning of spring, a time at which other feeding resources are scarce for them. According to Hansson (2002), on the other hand, the majority of records on such kind of plant use by rodents in the northern hemisphere coincide with their own abundance peak, which occurs generally every 3-4 years.

Coniferous trees, including the Pinaceae and pine species that colonized the Northern Hemisphere (North America, Europe and Asia) originated in the Paleozoic age. *Pinus* Linnaeus account for 105 species, some of which dispersed further south, crossing the equator in distribution (Mirov 1967). They occupy harsh environments, such as those located on either arid or extremely cold areas, as well as those having heavily acid and low fertility soils (Richardson & Bond 1991). *Pinus* species used in plantations throughout the world are listed by Higgins & Richardson (1998). *P. taeda* is the main species used in south Brazil, where around one million and a half hectares are cultivated for supplying the wood demand in the industry of cellulose, house construction and furniture building (Higgins & Richardson 1998, Auer & Junior 2000).

The increase of wood consumption in the industry, associated to an inadequate management of native forests and cultivation of exotic species, has been recently associated to several environmental problems. For example, once introduced near to native forests, *P. taeda* may displace native species through either resource competition or allelopathic effects (Crawley 1997, Primack & Rodrigues 2001). Although still having the importance underestimated in our opinion, the question of environmental disturbance caused by the introduction of exotic species has been discussed worldwide (Higgins & Richardson 1998). The case herein described requires attention of researchers, in the sense of the preeminent need for studying the ecology of *E. spinosus*, its impact on *P. taeda* production, and vice-versa, as well as regarding the need for establishing management strategies of their populations if any.

According to information got from local farmers, feeding of *E. spinosus* on *P. taeda* has been occurring since 1960 in Cambará do Sul plantations. However, after 1990 the attack increased substantially, suggesting a significant increase in *E. spinosus* population levels thereafter. If we take into account the prevail variation in abiotic conditions in the region, we would predict that contrary to what happens in the northern hemisphere, there is not an abrupt change in food quality for *E. spinosus* throughout the year. Thus, there is no reason to think that use of *P. taeda* by this spiny rodent is related to scarcity of a specific nutrient required in the diet, but probably to low abundance of the food items preferentially used. That is,



Figures 1-3. (1) *Pinus taeda* trees damaged by *Euryzygomatomys spinosus* on plantation in Cambará do Sul municipality; (2) Fresh damage (arrow) on *P. taeda* trunk base resulting from *E. spinosus* feeding; (3) *E. spinosus* feeding on a peace of *P. taeda* trunk under laboratory conditions. Bars = 30, 15, 5 cm, respectively.

plantations may represent an additional food source used by *E. spinosus* under emergency situation.

In summary, our study indicates an effective use of an exotic habitat produced by the exotic *P. taeda* plantations by a native rodent.

Recently published studies have pointed out that landscape structure plays an important role on the distribution of small rodents (*e.g.* Hansson 1994, Barrett & Peles 1999). We inferred that the existence of native forest adjacent to *Pinus* plantations influence *E. spinosus* occurrence, since most of our study areas were located near them. In addition, our field observations suggested that on those *Pinus* areas where the understory vegetation (native shrubs) was cut off, *E. spinosus* did not occur. Thus, the distribution of this spiny rat in *P. taeda* plantations seems to be constrained by weed control. The determination of the underlying mechanisms that originated and maintains such kind of habitat use and foraging behavior in *E. spinosus* is highly complex. We plain to approach this question

by subdividing the population and testing experimentally feeding responses to habitat fragmentation and to variation on their own population density.

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