

Three years on demography of a group of *Alouatta guariba clamitans* Cabrera (Primates, Atelidae): growth and fragmentation¹

João M. D. Miranda^{2,3}; Itiberê P. Bernardi²; Rodrigo F. Moro-Rios^{2,3} & Fernando C. Passos²

¹ Contribution number 1647 of the Departamento de Zoologia, Universidade Federal do Paraná.

² Laboratório de Biodiversidade, Conservação e Ecologia de Animais Silvestres, Departamento de Zoologia, Universidade Federal do Paraná. Caixa Postal 19020, 81531-980 Curitiba, Paraná, Brasil. E-mail: guaribajoao@yahoo.com.br, monobernardi@yahoo.com.br, rtkd@pop.com.br, fpassos@ufpr.br

³ Bolsista do CNPq.

ABSTRACT. This study was carried out in the Chácara Payquerê do Bugre, State of Paraná, Southern Brazil (25°29'52"S and 49°39'24"W) and reports on the demography of a group of *Alouatta guariba clamitans* Cabrera, 1940 followed monthly during three years (from February, 2002 to March, 2005). The growth and subsequent fission of the group are described and argued, as well as their possible underlying causes, focusing on the population ecology and social behavior of this taxa.

KEY WORDS. Brown howlers; dispersal; group fission; group growth; population ecology.

RESUMO. Três anos sobre a demografia de um grupo de *Alouatta guariba clamitans* Cabrera (Primates, Atelidae): crescimento e fragmentação. Este estudo foi realizado na Chácara Payquerê do Bugre, Estado do Paraná, Sul do Brasil (25°29'52"S e 49°39'24"W), registrando aspectos da demografia de um grupo de *Alouatta guariba clamitans* Cabrera, 1940 acompanhado mensalmente durante três anos (de fevereiro de 2002 a março de 2005). O crescimento e a subsequente fissão do grupo são descritos e discutidos, bem como suas possíveis causas, enfocando a ecologia populacional e o comportamento social deste taxa.

PALAVRAS-CHAVE. Bugio-ruivo; crescimento grupal; dispersão; ecologia populacional; fissão de grupo.

Howler monkeys (genus *Alouatta* Lacépède, 1799) are social animals that form groups which usually harbor more adult females than adult males (ALTMANN 1959, RUDRAN 1979, NEVILLE *et al.* 1988, RUMIZ 1990). The social structure of howler monkeys is intimately related to their demographic patterns (RUDRAN 1979, RUMIZ 1990, BROCKETT *et al.* 2000, MIRANDA *et al.* 2004, MIRANDA & PASSOS 2005). The knowledge on the demographical variation of a taxon might lead to important insight into its behavioral ecology, and might represent an important tool for planning management strategies and species conservation (STRIER 1991). Studies on the demography or populational ecology of Brazilian primates are still uncommon (STRIER 1987, 1991, 1999, LYNCH & RIMOLI 2000, DIAS & STRIER 2003, MIRANDA *et al.* 2004, MIRANDA & PASSOS 2005). The brown howler monkeys (*Alouatta guariba clamitans* Cabrera, 1940) is a social animal that lives in relatively small groups (2-13 individuals – NEVILLE *et al.* 1988, TREVES 2001, MIRANDA & PASSOS 2005). The fragmentation of howler monkey groups and their contexts are still poorly documented; however, it is believed that it ensues when group size exceed a stable average (RUDRAN 1979, CARRERA-SÁNCHEZ *et al.* 2003, MIRANDA & PASSOS 2005). In this study, data on the demography, growth and fragmentation of a group of brown howler monkeys is presented.

MATERIAL AND METHODS

This study was conducted in the Chácara Payquerê do Bugre (90ha), located in the Bugre District, Municipality of Balsa Nova, State of Paraná, southern Brazil (25°29'52"S and 49°39'24"W). The study area is a 700ha remnant of Araucaria Pine Forest and is part of the conservation unit known as the Area for Environmental Protection of the Devonian Scarp. Elevation in this area varies between 935 and 1145m above sea level. The climate is *Cfb* (temperate), according to the Köppen classification (IAPAR 1978). Annual average rainfall is around 1600 mm, and annual average temperature is 18 °C (data obtained in the meteorological station of the Municipality of Lapa). The forest is formed by an association between *Ocotea porosa* (Ness.) L. Barroso Barr. (imbuia), *Ilex paraguariensis* St. Hil. (erva-mate), *Podocarpus lambertii* Klotz. (pinheiro bravo) and *Araucaria angustifolia* (pinheiro-do-paraná) (Bertol.) O. Kuntze (MAACK 1968).

From February, 2002 to March, 2005, several studies on the ecology and behavior of *A. g. clamitans* have been carried out in the study area (MIRANDA & PASSOS 2004, 2005, MIRANDA *et al.* 2004). The present study focused on a group of brown howler

monkeys, recording monthly its sex/age composition, its demographic changes and its fragmentation during three years. Demographic data were obtained using the *ad libitum* method (ALTMANN 1974), recording the changing of age categories, births and disappearances. Age/sex categories used in the present study were proposed by MENDES (1989): infant, juvenile I, juvenile II, subadult male, adult female and adult male. All animals were identified and recognized based on their age/sex categories, body size, coloration and individual marks.

RESULTS

In February, 2002, the study group (G. Forninho) was composed by six individuals: two adult males (AM), three adult females (AF), and a juvenile I (JI). In 2003, four births were recorded: two in January (male and female), one in July (male), and one in August (male). In January, 2004 the dominant AM died or disappeared, apparently causing social instability (MIRANDA *et al.* 2004). A fragmentation into two groups ensued: G. Carrano and G. Vavá (Fig. 1). This fragmentation occurred gradually over a period of four months (January to April) and began with what seemed to be the formation of subgroups. Encounters between subgroups became increasingly sporadic, until the rare encounters between members of the newly formed groups included agonistic behaviors. The new configurations were: G. Vavá with two AFs, one SAM, one JII (male) and two JI; G. Carrano with one AM, one AF and one JII (female). After fragmentation, two births occurred in G. Vavá, one in April (male) and another in July (male), reaching a total of 8 individuals.

Starting in July, a change in the age class of the SAM into AM in the G. Vavá brought about a new fragmentation, also proceeding slow and gradually as before. This new fragmentation generated a group called G. Piá, which was composed by one AM, one AF, one JII, one JI and one infant (Fig. 1). In December, 2004, the JII male was observed wandering solitarily outside the home range of either of the original groups in four different occasions. When this individual attempted to approach a group, it was expelled by adult group members (both males and females).

DISCUSSION

A primate social group must have an appropriate size to maintain a stable formation (CARPENTER 1934, RUDRAN 1979, DUNBAR 1988, CARRERA-SÁNCHEZ *et al.* 2003). According to STRIER *et al.* (1993), the development of subgroups might be the first step toward group fission. The fission of a group might be a natural consequence of its growth and development (SANTINI 1985). The growth of a group might be one of the determining factors in their fragmentation (SANTINI 1985, CARRERA-SÁNCHEZ *et al.* 2003, MIRANDA & PASSOS 2005). The first fission of a group might occur when the number of individuals is well above average (6.25 individuals/group, according to the review for this species by MIRANDA & PASSOS 2005). This fact, associated with the social destabilization caused by the loss of a dominant male,

might have caused the rupture of the G. Forninho, splitting it into two groups (G. Vavá and G. Carrano). Apparently, the adult male was expelled by a female, possibly to protect her infant against infanticide (see MIRANDA *et al.* 2004, AGUIAR *et al.* 2005).

The second fragmentation might have simply resulted from weak associations, increasing the probability of group fission according to CARPENTER (1934). The formation of small groups in *A. senilicus* was also considered unstable by RUDRAN (1979). Alternatively, the second fragmentation might have been caused by the presence of a majority of juvenile males in the group. Subadult females integrate themselves as adult females into their own groups, or they can simply migrate (RUDRAN 1979, BONVICINO 1989, CALEGARO-MARQUES & BICCA-MARQUES 1996, MIRANDA & PASSOS 2005). The formation of a group with two adult males with age graded could generate instability merely by the presence of two adult males that would competing for copulation and group leadership (MENDES 1989, CALEGARO-MARQUES & BICCA-MARQUES 1997). Finally, the insertion (or insertion attempt) of a new male into a group might lead to aggressive behaviors and intolerance by adult individuals (RUDRAN 1979, FROELICK *et al.* 1981, ZUNINO *et al.* 1986, MENDES 1989, ZUCKER & CLARKE 1998). That is, in addition to group increase, the birth of more males than females might also increase the probability of group fragmentation. However, the death or disappearance of the adult dominant male is probably the most important event to generate subsequent fragmentation (MIRANDA *et al.* 2004).

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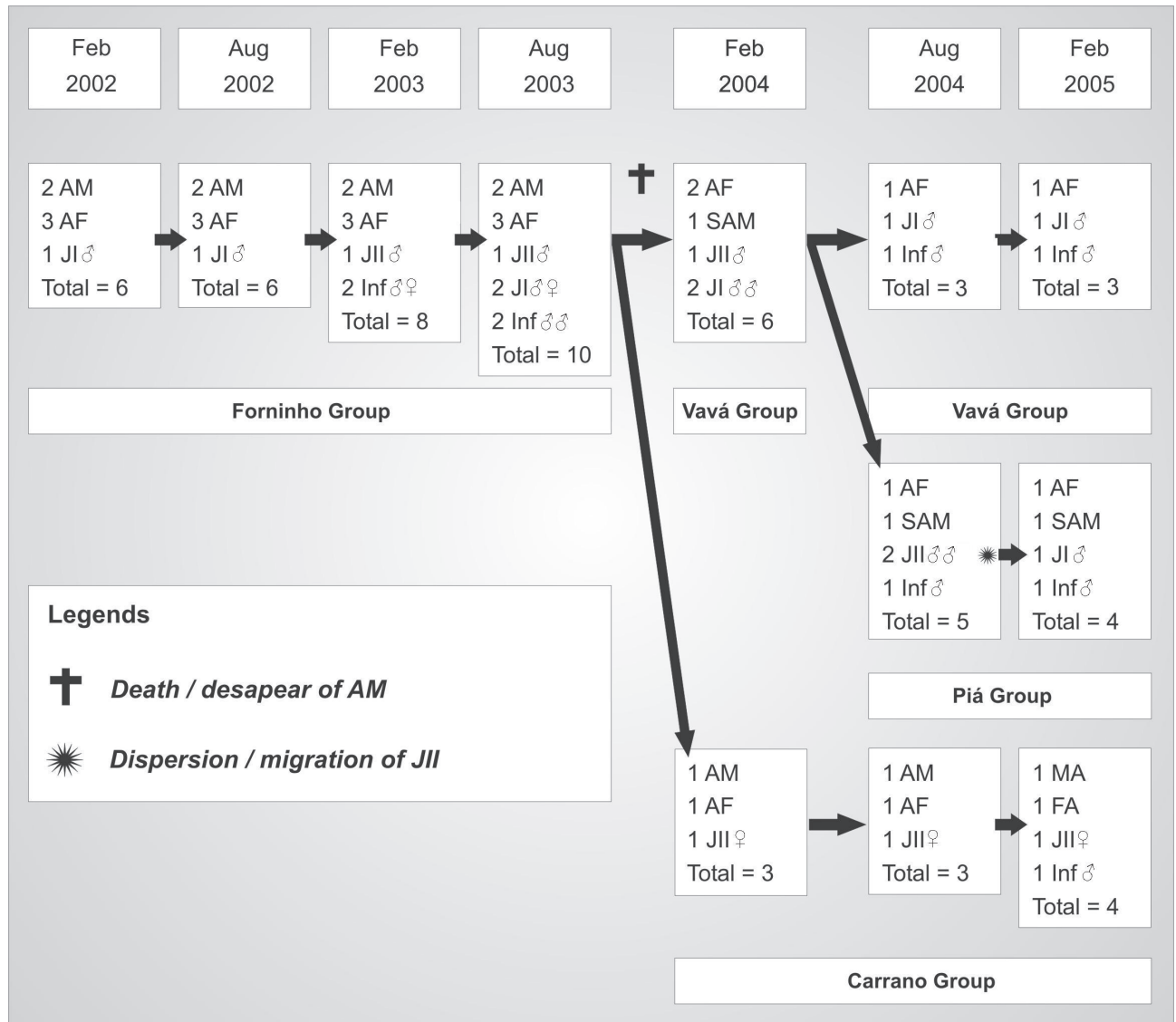


Figure 1. Schematic representation of the demographic characteristics of the G. Forninho, its growth and fragmentation.

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