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Multiple Transects or Multiple Walks? A Response to Magnusson (2001)

Stephen F. Ferrari

Line transect surveying has been an extremely fruitful method for the study of platyrrhine populations, especially in the Amazon (Peres, 1997; Pontes, 1997; Lopes and Ferrari, 2000; Ferrari *et al.*, 1999, 2000, 2002), but also in the Brazilian Atlantic Forest (Cullen Jr. *et al.*, 2001; Chiarello, 2002). Survey data provide useful information on species diversity and population density, in addition to complementary data on behavioural and ecological parameters. Reliable estimates of both diversity and population density are dependent on good sampling, i.e. number of sightings (Buckland *et al.*, 1993; Peres, 1999; Ferrari *et al.*, 2002), which is determined by transect length. Most recent surveys have been based on a total transect length of at least 100 km, and almost invariably involve repeated walks of transects of less than 10 km in length.

Magnusson (2001) questioned the validity of this procedure, arguing that a short transect will sample an inadequately small area in most cases, and that repeated walks are not only relatively vulnerable to factors such as non-random ranging behaviour, but also constitute a form of pseudoreplication. The author recommends walking transects only once, which would require establishing and measuring 100 km of trails for a 100 km transect. Whatever the validity of the theoretical basis for this recommendation, there are a number of reasons for supporting the procedure in which a single short transect is walked repeatedly until total transect length is reached.

The principal reason for the repeated sampling of short transects is a practical one. To begin with, the preparation of a single kilometre of transect, which includes selection, orientation, trail clearance, marking and measurement, typically requires at least a day, depending on the availability of manpower and logistics (primarily, the distance from camp sites). Setting up a 100 km transect line would thus require a period of approximately four to five months, and the investment of financial resources rarely available for studies of this type. In addition, depending on the characteristics of the study site, it may be either impossible to accomodate a trail system of this size, or impractical due to logistic considerations. In any case, a transect of 100 km may not provide an adequate number of sightings for some or even all species, depending on the study area (Ferrari *et al.*, 2002).

Given these questions, the repeated sampling of short transects is virtually unavoidable for the collection of samples of adequate size, although this does not necessarily mean, as Magnusson (2001) implies, that researchers are unaware of its theoretical limitations. It also does not mean that this type of procedure is inadequate for the collection of reliable data on primate abundance, especially in relation to the objectives of most studies. On the contrary, the standard method currently used in primate surveys would seem to provide more reliable data, overall, than a single transect, as will be argued below.

The independence of samples appears to be the fundamental question here. Whatever the length of the transect, a basic assumption is that it will be located randomly in relation to the distribution of primates and their movements at the study site. At any given moment, then, the location of a surveyor on the transect should be random in relation to that of the resident primates. When repeating the same transect, what is crucial is the maintenance of an adequate interval of time between walks, to guarantee the independence of the samples. Any field primatologist will know that individuals of even the most sedentary species rarely remain at the same location in the forest for more than two or three hours, even if that location is a large fruit-bearing tree, which Magnusson (2001) identifies specifically as a major problem in the repeated-walks procedure.

The random placement of transects relative to the spatial distribution of primates, and the use of adequate intervals between walks should guarantee the reliability of the data collected using the "repeated-walks" procedure. As the primates will have a different distribution on each occasion, repeated walks do not constitute sampling replication, but rather a means of accumulating a sample of adequate size. The only significant foreseeable problem with this procedure is that different habitat types within the study area may not be sampled adequately, although this will depend on a variety of factors, such as habitat heterogeneity. However, while the "single-transect" procedure might overcome this problem, it also has potential shortcomings. For example, if a species is both rare and patchily distributed at a study site, the chances of an encounter on a single walk of a long transect may be significantly reduced in comparison with repeated walks of a shorter transect, assuming that this transect traverses an area occupied by members of that species.

Despite whatever theoretical limitations it might have, repeated sampling of a transect may also provide information that would be unavailable from a single long transect. Repeated encounters with resident groups will almost invariably provide more accurate information on group composition and size, for example, an important parameter for the calculation of density estimates. In addition, more reliable data may be collected on variables such as habitat preferences, vertical stratification, and feeding ecology.

On balance, then, while the principal reason for adopting the repeated-walks procedure may be a practical one, it would seem to provide more reliable data than a single long transect. In fact, as long as walks are separated by an adequate interval of time, there appears to be no good reason for assuming that they are not independent samples of primate abundance. Perhaps the best support for the procedure comes from the multiple-site surveys that have provided important insights into both zoogeographic patterns (Peres, 1997; Ferrari *et al.*, 2000) and the effects of habitat fragmentation or hunting pressure (Lopes and Ferrari, 2000; Cullen Jr. *et al.*, 2001; Chiarello, 2002; Ferrari *et al.*, 2002). In all these cases, the application of the repeated-walks procedure permitted the surveying of many more sites than would have been possible using single transects, permitting a more systematic analysis of among-site variation.

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Distribuição e Situação Atual de Conservação de *Alouatta caraya* (Humboldt, 1812) no Rio Grande do Sul, Brasil

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Introdução

Dados sobre a distribuição e a densidade de populações de bugios ainda são escassos na literatura, assim como de suas áreas de ocorrência e uso do espaço. *Alouatta caraya*, contudo, possui uma vasta distribuição geográfica, que se estende desde o nível do mar até alcançar os 3.200 m de altitude (Giudice e Ascunce, 1998), e tem sido abordada e confirmada em diversos estudos científicos, mostrando uma extensa área de dispersão. A espécie vive nas florestas úmidas, nos bosques semi-deciduais com clima estacional, nas florestas de inundação, adaptando-se aos diferentes ambientes alterados pelo homem (Giudice e Ascunce, 1998). Habitam biomas como o Cerrado, a Caatinga e o Chaco, em ambientes com dados médios anuais de temperatura de 21.45°C, alcançando uma média de precipitação de 1.116 mm (Pastor Nieto e Williamson, 1998).

Eisenberg e Redford (1999) comentaram a distribuição de *A. caraya* localizando a espécie no sul do Brasil, norte da Argentina e leste do Paraguai, vivendo em habitats florestais,