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# A Roadside Count of Diurnal Raptors in Rio Grande do Sul, Brazil

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The raptor fauna of South America is the most diverse in the world, but in spite of such richness almost nothing is known about it. Accelerated development in Latin American countries is now the most serious threat to the environment. The rate of habitat change has increased in parallel with the development of new technological equipment. This habitat alteration has also led to a change in the composition of plant and animal life. Rio Grande do Sul is the southernmost state in Brazil, occupying a transitional zone comprised of the southern end of the forested coastal mountains of Serra do Mar and the northern sections of the open hilly grasslands typical of Uruguay (Belton 1984). Rio Grande do Sul retains only 2% of its original forested area (Rambo 1956). Some raptor species, mostly the large eagles and hawk eagles, have suffered a decrease in their ranges, while others have apparently increased their ranges (Albuquerque 1985, Jaksic 1985). The general rule is that forest species tend to become rarer, whilst open-land species tend to become more common. It is important to attempt to measure how these species respond to habitat changes. In the last six years we had an excellent opportunity to travel extensively across one region inhabited by several species that can be commonly recorded on any day of survey. Between 1978 and 1983 we made counts of raptors along 100 km of road between Rio Grande (3202S 5205W) and the Taim Ecological Station (3234S 5235W), accumulating approximately 3,000 records of nine species in 150 trips. The purpose of this study is to give a general view of the annual trends of some common open-land species in the southernmost section of Rio Grande do Sul. It is also intended to stimulate more methodic study and monitoring of these species in other areas of South America.

## STUDY AREA AND METHODS

The road surveyed runs north-south along ricefields, marshes and pastureland, parallel to a wide irrigation channel. Eucalyptus stands and patches of wood are frequent, their distance from the road varying from 40m to 3000m. The average temperature varies between 30°C in summer and 9.9 C in winter months. There is slightly more precipitation between July and September than at other times of year.

Our 150 counts were made between July 1978 and December 1984. The average number of trips per month was 12.5 and the average number of birds seen per month was 250. The counts were done between 07:00 and 18:00 hrs. There was a little more count effort in the months of September and October. We attempted to count all birds seen at no more than 150m from the road. Because on some days there was more than one trip we used the mean number of birds per trip to avoid double counting. We estimated the frequency of a species as the number of individuals of that species divided by the total number of individuals recorded in each month. The counts were done from a bus at 80 kmph. This constrained the survey,

limiting us to the most conspicuous species. Those recorded regularly were: Elanus leucurus, Rosthramus sociabilis, Buteo magnirostris, Buteogallus meridionalis, Circus buffoni, Polyborus plancus, Milvago chimachima, Milvago chimango and Falco sparverius. These were divided into two sub-groups based on their detectability. The first group, the **more conspicuous,** were more regularly detected because of their habit of perching on telephone and fence poles, or flocking. Buteo magnirostris and Rostramus sociabilis often perch on poles along the road; the latter is also very social, flying in flocks. Milvago chimango is also gregarious. The second group, the **less conspicuous,** were either less abundant or had inconspicuous habits: Buteogallus meridionalis and Polyborus plancus often perch on the ground. The remaining species are usually on the wing. These characteristics make detection more irregular from a moving vehicle. The detectability was higher during winter months (June-August) for the resident species and higher during early fall (April) and early spring (September-October) for the migratory Rosthramus sociabilis.

RESULTS

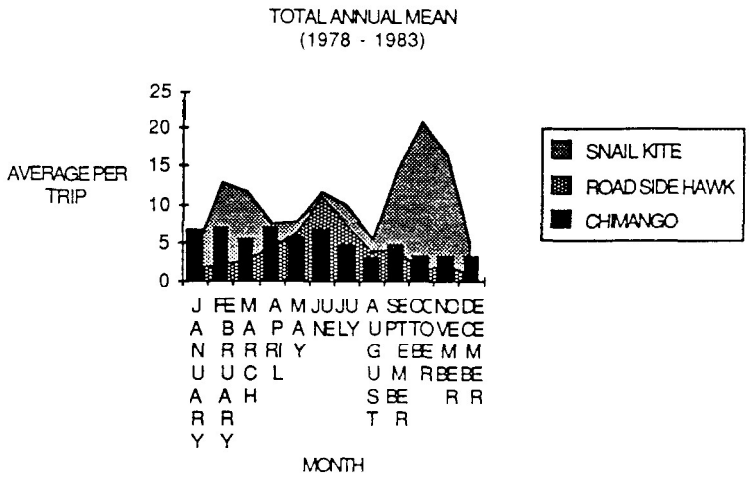
1. General Trends:

1.1 **The more conspicuous:** The average number of birds per trip (Fig.1) suggests that Buteo magnirostris increased in numbers during the winter and decreased in spring-summer. This may be related with the breeding season, when birds move to eucalyptus stands or small woods to nest. The higher number during winter may be because fledglings and immatures join adults along the road. Rosthramus sociabilis shows a pattern more associated with migration, having a low average during winter and a higher one in spring-summer. The species arrives in waves between September and November producing an average of 30 to 40 birds/trip. The average number of Milvago chimango seen per trip seems to remain fairly constant throughout the year (Fig. 1), though there is a slight decrease at the end of winter and beginning of spring. This may be related with breeding, for the same reasons as with Buteo magnirostris.

1.2 **The less conspicuous:** Milvago chimachima, in spite of being a common species in woodlands in the area, was recorded only three times over the six-year period. This may be related to a latitudinal gradient: the species seems to be commoner in northern sections of the state, being gradually replaced by M. chimango in the south (Belton 1984; this study). M. chimachima seems to be more associated with wooded country than chimango (Belton 1984), and because the wooded areas were not often close to the road, its presence was more likely to be overlooked.

Buteogallus meridionalis, Circus buffoni, Falco sparverius, and Polyborus plancus showed a similar pattern to Buteo magnirostris. Their average numbers per trip were higher during the winter period.

Elanus leucurus is a common resident in the state (Belton 1984), but was not recorded from the road during April and May in our six years of counting. This was probably associated with a detectability factor.



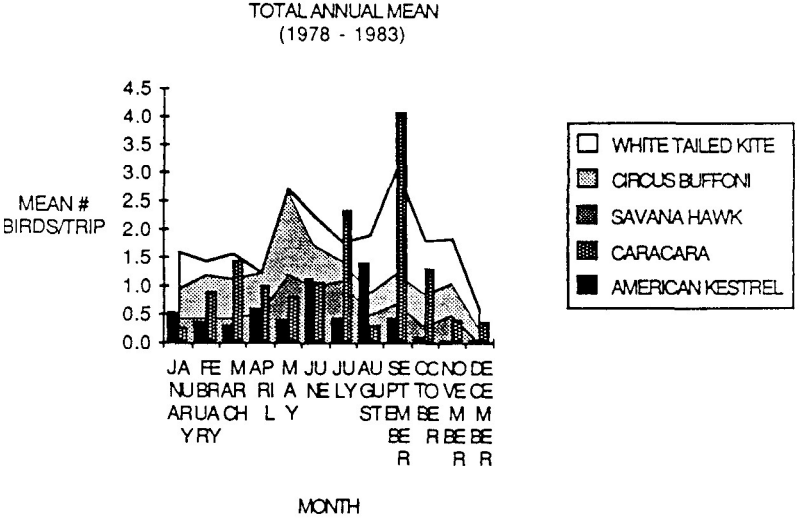
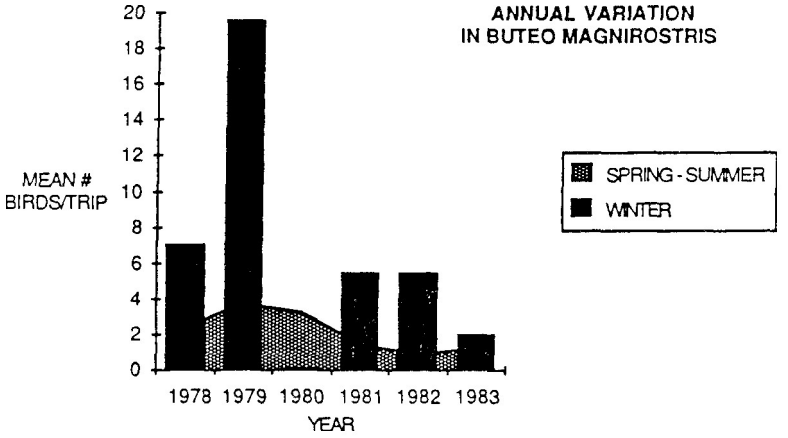




Figure 1: Total annual mean of birds recorded per trip.
a: Most conspicuous species; b: less conspicuous species.



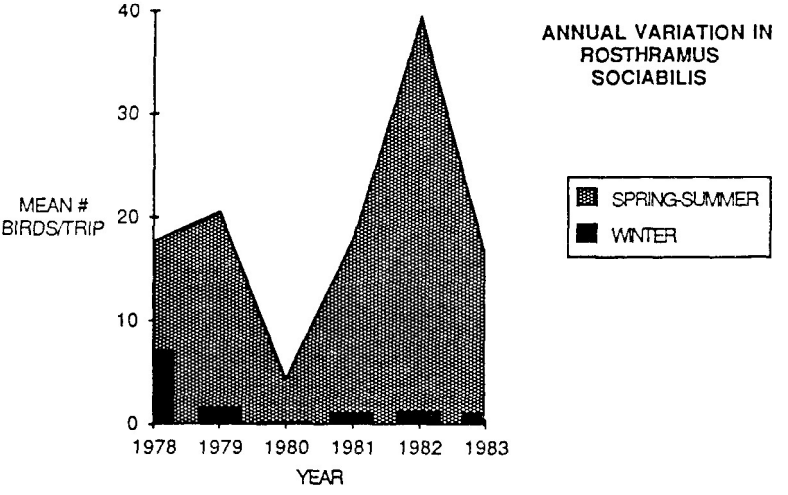




Figure 2: Annual variation in the mean of Buteo magnirostris and Rosthramus sociabilis. There were no trips during the winter of 1980.

2. Variability

We used the Corrected Coefficient of Variation (V*) (Sokal & Rolph 1981) as a measure to compare variation between the species recorded in the study period. With the **more conspicuous** species Buteo magnirostris showed less variability, while Rosthramus sociabilis and Milvago chimango showed more variability over the years. The V* in Buteo magnirostris ranged from 65.33 to 135.02. The highest variability was in December, which corresponds with the hatching period. In Milvago chimango the V* ranged from 52.00 to 156.70. This species showed high variability from January to April, and from August to September. The V* in Rosthramus sociabilis ranged from 70.13 to 178.23; this species is highly variable between March and September. The high variability of presence in Rosthramus sociabilis is mostly related to migration in March-April, when the birds leave the state, and September-October when they return.

Within the **less conspicuous** species, the variability is higher, apparently associated with detectability and to some extent with behaviour.

3. Spatial Dispersion:

Species can be randomly dispersed if the population variance is equal to the population mean, uniformly dispersed if the population variance is less than the population mean, and contagiously dispersed if the population variance is larger than the population mean. The resident species in our study tend to be more uniformly dispersed during the breeding season and more contagiously dispersed during winter. The migratory Rosthramus sociabilis is more contagiously dispersed during its periods of departure (March-April) and arrival (September-November). The contagious distribution may be associated with resource distribution: the land-use pattern in the study area consisted of rotating crops, leaving a time interval between use. This resulted in patchy distribution of good hunting areas for all species but Rosthramus sociabilis. The latter feed and breed in marshes, which are also patchily distributed.

4. Annual Trends:

The analysis of the 1978-1983 variation suggests that Buteo magnirostris showed higher averages in 1978-79 and lower averages in 1980-83 (Fig.2). The year 1979 was a good year for the species (19.5 birds/trip in June, compared to 5.5 in the winters of 1981 and 1982, and 3.0 in 1983). This may be associated with the land use, the land along the study road being used for rice, fodder, some soybean and some ranching (mostly sheep). The farmers rotate the crops between and within years. The winter rains inundate the fields, when rodents and other small mammals take refuge on small rises of land. The raised road is one of several places where they gather during flooding time, while irrigation channels alongside the road create and increase habitats for amphibians. The land use and irrigation may produce periods of high and low abundance of food for Buteo magnirostris, causing the low averages in 1981-1982.

## DISCUSSION

In this kind of study bias is a permanent risk. It is difficult to apply certain scales of abundance, as suggested by Verner (1984). To use a **ratio scale** it is necessary to assume that all target species are sampled equally. The constraints of our methods do not allow such an assumption, but even with this "built-in bias", our study revealed several interesting aspects of population ecology among these common species, such as a cycle in Buteo magnirostris, spatial dispersion in all species, and the migration schedule of Rosthramus sociabilis. It illustrates also that an extremely generalist species like Milvago chimango can maintain its population fairly constantly over the years. The "road ecosystem" produces many opportunities for these open-land raptors. Besides providing road kills for scavengers, it increases certain prey's vulnerability during the inundation period, when rodents concentrate along the roadside's grasses and bushes.

We recommend more systematic counting procedures in other, similar areas of the Neotropics, targeting common species. We also recommend the development of new count techniques for forest-dwelling species which are now declining. Our simple technique of roadside counts from a bus proved to be fairly efficient when the researcher lacks financial support for more detailed study. We hope that in the near future funds will be allocated to enable Latin-American scientists to carry out a more systematic study of raptors in the Neotropics.

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