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Demography and Genetics of the Krahó and Gorotire Indians of Brazil

Three populations of two Brazilian Ge-speaking groups, the Krahó and Gorotire, have been studied demographically and the results compared with previous investigations on their genetic polymorphisms. The Krahó population is older, more acculturated, and has a smaller sex ratio than the Gorotire. It may also have derived from a larger number of founders. Intertribal marriages occurred with relative frequency among the Krahó, but in the Gorotire the predominant picture is one of exchange with other Cayapo subgroups. The latter have a distribution range roughly $9 \times$ larger than the Krahó. The reproductive histories of the Krahó and Gorotire are similar, leading to equivalent estimates of selection potential. But mortality may have been selectively more important among the Krahó. Wright's fixation index *F* is of the same order of magnitude in the two groups and intermediate between values obtained among the North American Indian Zuni and the East Indian Bhil. Despite considerable exogamy it showed positive values.

1. Introduction

Evolutionary processes can only be completely understood if the genetic changes are considered in the context of the demographic structure of the populations under study. The effects of fertility, mortality and mating patterns should be carefully evaluated and correlated with the genetic variability. Sociocultural factors are of course also very important and should be examined if we want to unravel the complex network of causes responsible for our biological variation. Therefore, it is to a certain extent surprising to verify that the number of human populations adequately studied from the point of view of both demography and genetics is rather small (see Ward & Weiss, 1976, for a review). We hereby report basic demographic information for two groups of Brazilian Indians (Krahó and Gorotire), extract from these data evaluations about the opportunity for the action of natural selection among them, and relate these results to previous investigations on their genetic polymorphisms (Salzano *et al.*, 1972 *a,b*, 1977; Mestriner *et al.*, 1976; Gershowitz & Neel, 1978).

2. Materials and Methods

The Ge-speaking *Krahó* are one of the main branches of the Eastern Timbira. They live in the northern region of the Brazilian State of Goiás, in the Indian reservation of Kraolandia. The local post of the Indian governmental agency is located at about 25 km from the small neo-Brazilian town of Itacajá (latitude $8^{\circ}10'S$, longitude $47^{\circ}50'W$). A short summary about their history follows. At the time of the first contacts with pioneer fronts they lived some 250 km to the northeast in the region of the Balsas river and its tributaries, like the Neves and Macapá. As the land became occupied the Krahó were pushed west, in the direction of the Tocantins river. During this process many fights were recorded between these Indians and the colonizers, as well as between them and the Xavante or Xerente.

At the beginning of the 19th century, when they established peaceful contacts with neo-Brazilians, it was estimated that the Krahó numbered 3000–4000 persons. But a

census performed in 1852 by Frei Rafael de Taggia furnished a much lower figure (620). They lived where the town of Pedro Afonso is now, about 90 km south of their present location and had suffered a serious population decrease due to epidemics. Other estimates about their numbers in the recent past are as follows: 1930, 400; 1948, 500; 1962-63, 562; 1972, 610 (review in Melatti, 1974; the 1972 value was obtained from the governmental Indian agency files).

Despite these 200 years of contact with non-Indians, the evidence is mostly negative for the presence of foreign genes among the Krahó. The studies of Salzano *et al.* (1977) and Gershowitz & Neel (1978) in 192 individuals detected only $Gm^{a,b}$ (a sign of Black admixture) in the frequency of 0.010 and $Gm^{f,b}$ (a Caucasian marker) in that of 0.003. Historical information, however, indicates intertribal marriages with other Timbira groups, such as the Canela (Apanickrá), Kenkateye, Põrekamekra and Apinayé, as well as with the Xerente (Melatti, 1974).

The Gorotire are a Cayapo subgroup and they also speak a Ge language. Verswijver (1978) states that there are at present 14 Cayapo villages with a total population of about 2400 Indians. Their history is quite complex due to a constant process of fissions and fusions. A summary about these events can be found in Salzano (1971), and a more detailed report in Verswijver (1978). In short, it seems that until the end of the last century the Cayapo of the Xingu river inhabited a large village of about 1500 persons. These Indians were called Gorotire. Shortly afterwards the cycle of periodic splits and reunions started giving rise to the subgroups that exist at present. The village now called Gorotire is located at latitude 7°44'S, longitude 51°10'W, near the Fresco river, in the southern part of the State of Pará. A census performed among them by the governmental Indian agency on May 1973 yielded a total of 482 individuals. Peaceful relations of the Gorotire with non-Indians started in 1937 but due to the difficult accessibility of the place where they live they have not been much influenced by the outside world.

The demographic information to be reported here was obtained from 29 April-5 May 1974 among the Krahó and from 6-10 May 1974 among the Gorotire. The subjects came to the examination centres in family groups, and the interviews involved one or both spouses and their children. The information was obtained with the help of interpreters and local chiefs. The latter were responsible for assembling the Indians and clarified any doubts. The ages of all persons were estimated by visual inspection, comparisons between the figures in parents and children being also performed to arrive at the final decision. After the interviews blood samples were collected and processed as described in Salzano *et al.* (1977).

3. Results

The age and sex distribution observed in the three populations studied is given in Table 1. The mean age found among the Krahó was 26 years, with no heterogeneity between villages. The Gorotire population is younger, its mean age (22 years) being significantly lower than that of the Krahó ($t=3.0$; $P<0.01$). Demographic information about three other Cayapo subgroups has been presented by Salzano (1971), and can be compared with the present findings among the Gorotire. An analysis of variance coupled with the Newman-Keuls test (Zar, 1974) indicates that the average found among the Gorotire is significantly higher than that observed in the Txukahamae (18 years; $q=3.9$; $P<0.05$). The differences between the Gorotire and the two other subgroups (Mekranoti and

Table 1 Age and sex distribution in two Krahó and one Gorotire Indian population

| Population and sex | Age Interval | | | | Total | Mean age | |
|---------------------|--------------|-------|-------------|---------|-------|----------|------|
| | 0-14 | 15-30 | 31 and more | Unknown | | ± | s.d. |
| <i>Krahó</i> | | | | | | | |
| <i>Pedra Branca</i> | | | | | | | |
| Males | 50 | 34 | 35 | 13 | 132 | 23.3 ± | 17.9 |
| Females | 45 | 40 | 47 | 7 | 139 | 28.0 ± | 21.4 |
| Total | 95 | 74 | 82 | 20 | 271 | 25.7 ± | 19.7 |
| Per cent | 38 | 29 | 33 | — | — | — | — |
| Sex ratio | 111 | 85 | 74 | 186 | 95 | — | — |
| <i>Cachoeira</i> | | | | | | | |
| Males | 24 | 23 | 20 | 25 | 92 | 26.0 ± | 19.2 |
| Females | 25 | 19 | 28 | 28 | 100 | 27.7 ± | 19.7 |
| Total | 49 | 42 | 48 | 53 | 192 | 26.9 ± | 19.4 |
| Per cent | 35 | 30 | 35 | — | — | — | — |
| Sex ratio | 96 | 121 | 71 | 89 | 92 | — | — |
| <i>Total Krahó</i> | | | | | | | |
| Males | 74 | 57 | 55 | 38 | 224 | 24.3 ± | 18.4 |
| Females | 70 | 59 | 75 | 35 | 239 | 27.9 ± | 20.8 |
| Total | 144 | 116 | 130 | 73 | 463 | 26.2 ± | 19.7 |
| Per cent | 37 | 30 | 33 | — | — | — | — |
| Sex ratio | 106 | 97 | 73 | 109 | 94 | — | — |
| <i>Gorotire</i> | | | | | | | |
| Males | 118 | 65 | 84 | 10 | 277 | 23.2 ± | 18.9 |
| Females | 100 | 63 | 63 | 14 | 240 | 21.6 ± | 17.3 |
| Total | 218 | 128 | 147 | 24 | 517 | 22.4 ± | 18.2 |
| Per cent | 44.2 | 26.0 | 29.8 | — | — | — | — |
| Sex ratio | 118 | 103 | 133 | 71 | 115 | — | — |

s.d. = Standard deviation.

Kuben-Kran-Kegn) are not statistically significant. The overall sex ratio observed among the Krahó is 94, with the expected decrease in older ages. Among the Gorotire the value obtained was 115, with marked fluctuations in the three age groups. Previously we had observed a shortage of males among the other Cayapo groups (Salzano, 1971), the total sex ratio encountered being 88.

The historical information about intercrosses between the Krahó and other tribes is substantiated by our data. As can be seen in Table 2, we have records of marriages with the Canela, Apinayé and Xerente, in this order of decreasing frequency. As for the Gorotire, we found marriages involving persons who originated from five other Cayapo subgroups. In order of decreasing frequency we have individuals who identify themselves as Kuben-Kran-Kegn, Txukahamae, Mekranoti, Ko-krai-moro and Xikrin. We also observed one marriage with Mundurucu and another with a Juruna Indian, both Tupi-speaking tribes.

Data about migration patterns are shown in Tables 3-5. The frequency of marriages of locally born persons is much larger among the Krahó than among the Gorotire (70% vs 11%; $X^2 = 75.7$; 2 d.f.; $P < 0.001$). The latter are significantly more exogamous than the other Cayapo populations studied (Salzano, 1971; 67-76% of endogamy; $X^2 = 121.4$; 6 d.f.; $P < 0.001$). Table 4 indicates that the Krahó parents born outside Pedra Branca who had children there came from five other localities or groups. The outside contribution in Cachoeira derives from Pedra Branca and Canela villages.

Table 2 **Intertribal or intergroup marriages in the three villages**

| Type of marriage | No. | | Type of marriage | No. |
|------------------------------|--------------|-----------|--|-----|
| | Pedra Branca | Cachoeira | | |
| <i>Krahó</i> | | | <i>Gorotire</i> | |
| Krahó x Krahó | 31 | 9 | Gorotire x Gorotire | 7 |
| Krahó x Apinayé | 6 | 0 | Gorotire x Kuben-Kran-Kegn | 23 |
| Krahó x Xerente | 4 | 0 | Gorotire x Txukahamae | 7 |
| Krahó x Canela | 2 | 0 | Gorotire x Mekranoti | 5 |
| Krahó x Krahó/Apinayé | 2 | 0 | Gorotire x Ko-krai-moro | 2 |
| Krahó x Krahó/Xerente | 3 | 0 | Gorotire x Gorotire/Kuben-Kran-Kegn | 2 |
| Krahó x Krahó/Canela | 4 | 12 | Gorotire x Gorotire/Mekranoti | 1 |
| Krahó/Canela x Krahó/Canela | 0 | 5 | Gorotire/Kuben-Kran-Kegn x Kuben-Kran-Kegn | 4 |
| Krahó/Canela x Krahó/Xerente | 0 | 1 | Gorotire/Kuben-Kran-Kegn x Txukahamae | 2 |
| Krahó/Canela x Krahó/Apinayé | 0 | 1 | Gorotire/Kuben-Kran-Kegn x Mekranoti | 1 |
| Apinayé x Apinayé | 1 | 0 | Gorotire/Kuben-Kran-Kegn x Ko-krai-moro | 1 |
| Total | 53 | 22 | Gorotire/Txukahamae x Ko-krai-moro | 1 |
| | | | Gorotire/Mekranoti x Ko-krai-moro | 1 |
| | | | Kuben-Kran-Kegn x Kuben-Kran-Kegn | 11 |
| | | | Kuben-Kran-Kegn x Txukahamae | 12 |
| | | | Kuben-Kran-Kegn x Mekranoti | 7 |
| | | | Kuben-Kran-Kegn x Ko-krai-moro | 2 |
| | | | Kuben-Kran-Kegn x Xikrin | 1 |
| | | | Kuben-Kran-Kegn x Mundurucu | 1 |
| | | | Kuben-Kran-Kegn x Kuben-Kran-Kegn/Txukahamae | 2 |
| | | | Kuben-Kran-Kegn/Mekranoti x Txukahamae | 1 |
| | | | Txukahamae x Txukahamae | 4 |
| | | | Txukahamae x Mekranoti | 4 |
| | | | Txukahamae x Juruna | 1 |
| | | | Ko-krai-moro x Ko-krai-moro | 3 |
| | | | Ko-krai-moro x Mekranoti | 1 |
| | | | Total | 107 |

Table 3 **Endogamous and exogamous marriages among the Krahó and Gorotire**

| Population | | Both partners locally born | One partner from another locality | Both partners from outside | Total number of marriages | Number of localities represented |
|-----------------|-------|----------------------------|-----------------------------------|----------------------------|---------------------------|----------------------------------|
| <i>Krahó</i> | | | | | | |
| Pedra Branca | { No. | 33 | 17 | 3 | 53 | 6 |
| | { % | 62 | 32 | 6 | — | — |
| Cachoeira | { No. | 24 | 3 | 1 | 28 | 4 |
| | { % | 86 | 11 | 3 | — | — |
| Total | { No. | 57 | 20 | 4 | 81 | 6 |
| | { % | 70 | 25 | 5 | — | — |
| <i>Gorotire</i> | | | | | | |
| Gorotire | { No. | 12 | 48 | 48 | 108 | 7 |
| | { % | 11 | 45 | 44 | — | — |

Table 4 **Back stochastic migration matrix for two villages of Krahó Indians**

| Birthplace of progeny | | Birthplace of parents* | | | | | | Total |
|-----------------------|-------|------------------------|----|----|----|---|----|-------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | |
| 1 | { No. | 199 | 17 | 21 | 1 | 7 | 15 | 260 |
| | { % | 77 | 6 | 8 | <1 | 3 | 6 | — |
| 2 | { No. | 8 | 90 | — | — | — | 4 | 102 |
| | { % | 8 | 88 | — | — | — | 4 | — |

* Key to localities or groups: 1, Pedra Branca; 2, Cachoeira; 3, Galheiro; 4, Morro do Boi; 5, Apinayé; 6, Canela.

Table 5 **Birthplaces of fertile adults living in Gorotire**

| Birthplace of parents | Progeny born in Gorotire | |
|-----------------------|--------------------------|----|
| | No. | % |
| Gorotire | 164 | 33 |
| Kuben-Kran-Kegn | 185 | 37 |
| Ko-krai-moro | 21 | 4 |
| Mckranoti | 31 | 6 |
| Txukahamac | 96 | 19 |
| Mundurucu | 3 | 1 |
| Juruna | 2 | <1 |
| All places | 502 | — |

Thirty-seven per cent of the fertile persons living in Gorotire identify themselves as Kuben-Kran-Kegn, 19% as Txukahamae, other affiliations being less represented. If we now consider the location of all Krahó and Gorotire groups, we will see that the former are much more restricted geographically. The Krahó localities extend through an east-west axis of 270 km and a north-south line of 230 km. Their distribution range, therefore, can be estimated as about 62,000 km². The corresponding figures for the Cayapo are 810 km, 680 km and about 550,000 km².

The average number of liveborn and surviving offspring both in all families and the completed ones are very similar among the Krahó and Gorotire. Roughly, the females who completed reproduction had about 5 children, and 3 of them survived to the age of reproduction. The average liveborn offspring in completed sibships is somewhat lower among other Cayapo subgroups (roughly 4; Salzano, 1971).

Table 6 **Liveborn offspring among the Krahó and Gorotire**

| Populations | All families | | Completed families | |
|-----------------|--------------|----------------------------|--------------------|----------------------------|
| | No. females | Mean no. LB \pm s.e.* | No. females | Mean no. LB \pm s.e.* |
| <i>Krahó</i> | | | | |
| Pedra Branca | 55 | 3.0 \pm 0.3 | 25 | 4.8 \pm 0.5 |
| Cachoeira | 27 | 2.6 \pm 0.4 | 9 | 4.3 \pm 0.6 |
| Total | 82 | 2.9 \pm 0.3 | 34 | 4.6 \pm 0.4 |
| <i>Gorotire</i> | | | | |
| Gorotire | 107 | 3.2 \pm 0.2 | 36 | 4.6 \pm 0.5 |

* LB = Liveborn; s.e. = Standard error of the mean.

Table 7 **Surviving offspring per female who had at least one liveborn child among the Krahó and Gorotire**

| Populations | All families* | | | Completed families* | | |
|-----------------|---------------|---------------------------|---------------------|---------------------|---------------------------|---------------------|
| | No. females | Mean no. SO \pm s.e. | Decrease as % LB | No. females | Mean no. SO \pm s.e. | Decrease as % LB |
| <i>Krahó</i> | | | | | | |
| Pedra Branca | 45 | 3.0 \pm 0.3 | 0 | 24 | 3.8 \pm 0.4 | 21 |
| Cachoeira | 22 | 2.5 \pm 0.3 | 4 | 9 | 3.2 \pm 0.4 | 26 |
| Total | 67 | 2.8 \pm 0.2 | 3 | 33 | 3.6 \pm 0.3 | 22 |
| <i>Gorotire</i> | | | | | | |
| Gorotire | 95 | 2.7 \pm 0.2 | 16 | 35 | 3.2 \pm 0.3 | 30 |

* SO = Surviving offspring; s.e. = Standard error of the mean; LB = livebirths.

Combining the fertility and mortality data, it is possible to calculate Crow's (1958) index of potential selection. The values thus obtained are shown in Table 8, where they are compared with similar data from nine other tribes. The total index (I) found for the Krahó was 0.73, with a larger (0.41) mortality than a fertility (0.23) component. For the Gorotire, $I = 0.96$, with about equal contributions from mortality and fertility differences. These values are somewhat higher than those obtained among the three other Cayapo subgroups studied ($I = 0.71$; Salzano, 1971). If we consider the results encountered among the group A (predominantly hunters and gatherers with incipient agriculture) and group B (agriculturalists and tribes somewhat acculturated) populations there is no clear dichotomy regarding the total indices. However, it is interesting to note that the mortality component of selection opportunity (Im) is generally higher than the fertility fraction (If) among group B Indians, while it is lower or of about the same magnitude as If in the group A tribes.

Table 8

Comparison of the Krahó and Gorotire with other South American tribes in relation to opportunities for selection

| Subsistence pattern and tribe | Reference | Selection potential* | | | |
|-------------------------------------|--|----------------------|----------------------|------------------------------------|----------|
| | | <i>I_m</i> | <i>I_f</i> | <i>I_f/p_s</i> | <i>I</i> |
| <i>Group A</i> | | | | | |
| Xavante | Salzano <i>et al.</i> (1967) | 0.49 | — | 0.41 | 0.90 |
| Yanomama† | Neel & Weiss (1975) | 1.22 | 1.36 | — | 4.24 |
| Ayoreo | Pérez Diez & Salzano (1978) | (a)‡ 1.17 | 1.49 | 1.99 | 3.16 |
| | | (b)‡ 0.33 | 1.56 | 2.08 | 2.41 |
| Cayapo | Salzano (1971) | (c)‡ 0.34 | 0.28 | 0.37 | 0.71 |
| | Present communication | (d)‡ 0.41 | 0.39 | 0.55 | 0.96 |
| | | (e)‡ 0.36 | 0.34 | 0.46 | 0.82 |
| <i>Group B</i> | | | | | |
| Caingang | Salzano (1961, 1963, 1964) | 0.69 | 0.35 | 0.59 | 1.28 |
| Cashinahua | Johnston <i>et al.</i> (1969); | 0.79 | 0.11 | 0.19 | 0.98 |
| | Johnston & Kensinger (1971) | | | | |
| Macá | Salzano <i>et al.</i> (1970) | 0.56 | 0.21 | 0.32 | 0.88 |
| Terena | Salzano & de Oliveira (1970) | 0.27 | 0.28 | 0.36 | 0.63 |
| Ticuna | Salzano <i>et al.</i> (1978 <i>a</i>) | 0.33 | 0.15 | 0.20 | 0.54 |
| Wapishana | Salzano <i>et al.</i> (1978 <i>b</i>) | 0.43 | 0.10 | 0.14 | 0.57 |
| Krahó | Present communication | 0.41 | 0.23 | 0.32 | 0.73 |

Group A, Predominantly hunters and gatherers with incipient agriculture;

Group B, Agriculturalists and tribes somewhat acculturated.

* Selection potential: $I_m = pd/ps$ where pd = premature deaths and ps = proportion surviving or $1 - pd$; $I_f = Vf/\bar{x}^2$ where Vf = variance in offspring number in completed sibships, and \bar{x} = mean number of livebirths per woman who completed her reproduction; $I = I_m + I_f/ps$ = index of opportunity for selection or potential selection; see Crow (1958).

† Calculated by a method that is different from the original one; see Neel & Weiss (1975).

‡ (a) Including infanticides; (b) not including infanticides; (c) without the Gorotire; (d) Gorotire; (e) total of Cayapo.

In what way can these results be equated with the genetic variability present in these groups? Salzano *et al.* (1977) presented data related to 12 polymorphisms (blood groups ABO, MNSs, P, Rh, Lewis, Duffy, Kidd and Diego; haptoglobin, Gc, acid phosphatase and phosphoglucomutase types) in the Krahó and Gorotire. The genetic distance between the Krahó villages of Pedra Branca and Cachoeira, using six of these loci (MNSs, Rh, Kidd, Duffy, Diego and haptoglobin) was calculated as 0.208, while the mean considering five Cayapo subgroups (including the Gorotire) was 0.223. These are the within tribe interpopulation differences.

A convenient measure of intrapopulation variability is Wright's (1921, 1969) fixation index F . It can be calculated, for a given locus, as $F = 1 - H/2pq$, where H is the observed proportion of heterozygotes and p and q are the allele frequencies at that locus. It measures the deviation from Hardy-Weinberg expectations due to the joint effect of all forces acting on the pattern of genetic variation, such as non-random mating, migration and selection. Data on 11 pairs of co-dominant alleles are available for comparison between the Krahó and Cayapo, and the appropriate figures are presented in Table 9. A positive F indicates that the observed number of heterozygotes is lower than that expected, and a negative F an excess of these individuals. Only two significant values

Table 9 Values of F deriving from heterozygote proportions in codominant systems

| Genetic systems | Alleles | Cayapo | | | Krahó | | |
|------------------|--------------------|--------|--------|-------|-------|--------|--------|
| | | N | F | X^2 | N | F | X^2 |
| MNSs | I^M, I^S | 777 | 0.049 | 1.87 | 189 | -0.036 | 0.24 |
| | I^S, I^B | 777 | 0.016 | 0.20 | 189 | 0.045 | 0.37 |
| Rh | C, c | 831 | 0.040 | 1.33 | 190 | -0.039 | 0.29 |
| | E, e | 831 | 0.052 | 2.25 | 190 | -0.116 | 2.56 |
| Duffy | Fy^a, Fy^b | 536 | -0.021 | 0.24 | 189 | 0.019 | 0.07 |
| Hp | Hp^1, Hp^2 | 889 | -0.080 | 5.69* | 192 | 0.037 | 0.26 |
| Gc | Gc^1, Gc^2 | 972 | 0.005 | 0.02 | 192 | -0.024 | 0.11 |
| Acid Phosph. | P^A, P^B | 440 | 0.090 | 3.56 | 191 | -0.054 | 0.56 |
| PGM ₁ | PGM_1^1, PGM_1^2 | 583 | 0.063 | 2.31 | 191 | 0.280 | 14.97† |
| EST D | EsD^1, EsD^2 | 163 | 0.066 | 0.71 | 146 | 0.107 | 1.67 |
| Km | Km^1, Km^2 | 916 | -0.011 | 0.11 | 192 | 0.039 | 0.29 |
| Weighted average | | | 0.016 | | | 0.022 | |

* Significant at the 5% level; † Significant at the 0.1% level.
Sources: Salzano *et al.* (1972a,b, 1977); Mestriner *et al.* (1976); Gershowitz & Neel (1978).

were observed, in the haptoglobins among the Cayapo ($F = -0.080$, $X^2 = 5.69$; $P < 0.05$) and in the phosphoglucumutase system among the Krahó ($F = 0.280$; $X^2 = 14.97$; $P < 0.001$). Since they occur in opposite directions and in different pairs of alleles, not much importance should be placed on them. The weighted average is of the same order of magnitude in the Cayapo and Krahó (0.016 and 0.022, respectively).

4. Discussion

The Krahó and Gorotire speak languages classified in the same group and with as much as 81 % of cognates (Salzano *et al.*, 1977), what suggests a common origin. But their recent history is distinct. The Krahó have about 200 years of contact with non-Indians, which had a marked impact in their culture. The number of intertribal marriages which occurred among them is much higher than those observed in less acculturated groups. They are more restricted, geographically, than the Cayapo and may have derived from a larger number of founders than the Gorotire. Their mean age is higher and the sex ratio similar to what is found among non-Indians.

But the picture that emerges from the present and previous investigations is predominantly one of uniformity. Salzano *et al.* (1978) have performed a six-locus comparison (same list as that given in the previous section) among 22 middle or South American Indian tribes. The Krahó-Cayapo genetic distance considering these loci (0.219) was the smallest from the three obtained within Ge-speakers, and amounted to 61 % only of the average considering all tribes (0.358). Inspection of the allele frequencies in five other systems that show variation in Amerindians (Salzano *et al.*, 1977) indicated that in only two the gene frequencies obtained in their local populations did not overlap (the Krahó showing higher frequencies of P^1 and ACP^A).

The intratribal, intervillage differentiation observed among the Krahó and Cayapo seems to be of about the same degree of magnitude and their reproductive histories are similar, leading to equivalent estimates of selection potential (although its mortality component may be more important among the Krahó). Their weighted fixation indices (0.016 and 0.022) are of the same order of magnitude and intermediate between

those obtained among the North American Indian Zuni (0.002; Workman *et al.*, 1974) and the East Indian Bhil (0.069; Papiha *et al.*, 1978). Harpending *et al.* (1973) asserted that if a population is not highly endogamous this index should be negative as a result of the effects of migration alone. It is therefore interesting to verify that we obtained positive values, despite the considerable amount of intertribal marriages which occurred among the Krahó and the extensive fission-fusion events which happened among the Cayapo.

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