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2.2.3.4.2. *The non-adaptation of a savanna indian tribe (Canela, Brazil) to forced, forest relocation: an analysis of factors* (*)

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The Ramkokamekra-Canela, living on an extension of the Brazilian central plateau, were obliged in 1963 to abandon their traditional savanna (*cerrado*) lands, and were resettled in a forested area only about 45 to 50 kilometers away but some 180 meters lower in elevation. It became necessary for them to remain in this somewhat more humid habitat for five years before they could all return to their beloved, breezier savanna environment. During this exile, the Canela believed that infant mortality was devastatingly high and that the older people were being rapidly eliminated by diseases. Some Canela succeeded in adapting to forest life and wanted to stay, but since by far the majority felt strongly about returning to their savanna fatherland, largely for cultural or psychological reasons, the whole tribe did return by 1968 to a new savanna village site within their old area where they are displaying higher morale than I have witnessed since my first Canela field studies in 1957.

All the funds for the crucial 1964 field research were supplied by the Wenner-Gren Foundation for Anthropological Research and the National Science Foundation. The Smithsonian Institution furnished support for the 1966, 1969, 1970, and 1971 follow up field stays, and the I Seminário de Estudos Brasileiros supplied intercontinental transportation in 1971. Many thanks are due Dr. Betty J. Meggers, Smithsonian Institution, who has very helpfully critiqued this paper at several points in its development. Eventually, a far more extensive monographic edition will be published elsewhere. I am deeply grateful to the personnel of Brazil's National Indian Foundation, from the Federal to the tribal levels, for their permission to do field work among the Canela and for their very helpful and extensive cooperation. The research from 1957 was carried out under the auspices of Dr. Eduardo Galvão and the Museu Paraense Emílio Goeldi, where many, many thanks are due.

This drastic territorial relocation was caused by a messianic movement (Crocker 1967) in which a cult of daily dancing was considered necessary to bring on the millennium. A constant supply of beef was needed to maintain the cult, and after an unacceptable number of

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cattle had been stolen from the local Brazilian hinterlanders, these farmers and ranchers finally attacked the Canela and drove them out of their territory by force of arms.

The focus of this research will be set upon analyzing the various kinds of factors contributing to the Canela capacity to stay in a relatively low, seasonal deciduous, dry forest versus their drive to return to a savanna environment. After some background material to enhance over-all comprehension has been presented, an account of the forest exile events and the methodological nature of the study will be discussed. The crucial part of the paper lies in the analysis of the various categories of factors which contributed to the tribe remaining in or leaving the forest. Finally, there will be a summary of the findings and conclusions with comments for anthropologists about cross-cultural comparisons and suggestions for administrators on moving indigenous peoples.

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The Canela are located in the center of the State of Maranhão, and to the southern part of the Municipality of Barra do Corda, about 15 kilometers to the southwest of latitude 6° S and longitude 45° W. They speak a dialect of the general language known as Gê and are considered to be one of the Eastern Timbira tribes (Lowie 1946); the others are the Kraho (Melatti 1970), Gaviões (Laráia and Matta 1967), and Krīkati (Lave, 1967). These tribes all originally lived in the savanna (*chapada* in regional Brazilian) and supported themselves mainly on hunting and gathering, though they all had a simple form of slash-and-burn horticulture. The Canela, in particular, have become well known in the anthropological literature through the monograph of Curt Nimuendaju (1946) who spent some 15 months with this tribe between 1929 and 1936.

When the local Brazilian refers to the Canela Indians, he believes he is designating one tribe that lives in two villages, Ponto and Porquinhos. Actually he is referring to two historically different peoples, namely, the Ramkokamekra and Apanyekra tribes, who were not even friendly to each other as late as the 1930's (Nimuendaju 1946: 150). The former people live 70 to 75 kilometers due south, and only very slightly to the east of Barra do Corda, in savanna country (largely *campos cerrados* and *cerrados*; see Goodland 1971) about 20 kilometers from where a finger of the Brazilian Planalto Central terminates and the land falls off into a more forested zone (*mata-sêca* or *axarandados;* see I.B.G.E. 1957, p. 405). The Apanyekra now live some 55 to 60 kilometers west of the Ramkokamekra, which puts them

about 80 to 85 kilometers from Barra do Corda in a southwesterly direction and some 45 to 50 kilometers southeast of Grajaú. (These distances are modifications from the I.B.G.E. 1957 maps, p. 402 and 407. Local road and trail statements about the same distances can be somewhat different.)

A fundamental ecological difference between the Ramkokamekra-Canela and the Apanyekra-Canela is that while both live in the savanna, the latter are very fortunate to be situated near the Corda River on the edge of uninhabited dry forests so that they have suffered considerably less from the lack proteins in the form of fish and wild game. The Ramkokamekra have had to make the best of the lesser savanna game and the fish of small streams, living as they do on the Santo Estévão. During 1957-63, they were split into two villages, Ponto and Baixão Prêto.

It appears that the Ramkokamekra [1] since 1936, have ranged in population between about 300 (Nimuendaju 1946:33) and 436 (1971), whereas the Apanyekra numbers have been slightly more than half this amount. This population advantage has enabled the Ramkokamekra to protect themselves more sucessfully from the advancing frontier of local Brazilian farmers and cattle ranchers, which has been moving very slowly but inexorably into both immediate areas since 1840.

The easier access (less distance and little forest) to the Ramkokamekra made it possible for the former Indian Protection Service and the present National Foundation For The Indian to maintain one or more families adjacent to the Ramkokamekra villages since 1939 so that the young people have been exposed to simple schooling with the result that eight men can read and write Portuguese well enough to send decipherable notes and letters to friends and merchants. The

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1 The Ramkokamekra-Canela most frequently call themselves the "mõl-tum.lɛ" (going along — dirty, old or experienced — little: the little old experienced ones at living). Only a very few old people (ʌĩʔkʰlo, 70 in 1960) were familiar with "Lam.kʰo.Kʰãm-mɛʔkʰla" (almecega — grove — in — Indian people: Indians of the almecega grove). Nimuendaju mistook /kʰo/ (grove) for /ko/ (water) since he was not aware of /k/ contrasting with /kʰ/ (Nimuendaju 1946: 31). He was lucky to be right on ʌapəɾ -yeʔkʰla (piranha — Indian people) because only with a very slight but phonemic change, aapə̃n, for a man, means "your mother-in-law." The Apanyekra call the Ramkokamekra the "Kʰẽy.lum-mɛʔkʰla" (upper — side — Indian people), and the latter do actually live considerably higher and closer to the same sierra, and further to the east. Nimuendaju (1946: 32) thought kgl (kʰẽy) meant "east" rather than "upper", so his designation of his four moiety systems as "eastern" and "western" is erroneous. They are "upper" and "lower." This correction should not be of much help to the old structuralists in anthropology.

Apanyekra, on the other hand, have only occasionally had single men as representatives of the Indian Protection Service (to be referred to as the "Service") so the effects of city thinking are considerably less evident.

It is interesting to conjecture about why a messianic movement occurred among the Ramkokamekra and not among the Apanyekra. The evidence suggests that the Ramkokamekra, with their far closer recent contacts with outsiders and their more complete dependence on the material goods of the civilized world including medicine, nevertheless, were far more demoralized and in greater need of imagining a satisfying and satisfactory future than were the Apanyekra.

In 1963 a Ramkokamekra-Canela prophetess, called Maria Castelo Kee-kʰwëy, (2) 40, (3) believed that the fetus in her womb (Kraa-Kʰwëy:

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2 In order to be able to present Canela names and interesting terms in a manner that the professional reader can nearly pronounce, the sounds of the phonetic symbols of Kenneth L. Pike (1947) have been utilized herein, except that most allophones of the phonemes have been left out to simplify matters. Certain words were written employing allophones instead of only phonemes to facilitate pronounciation in English and Portuguese. This very limited and incomplete exposition of Canela phonetics and phonemics is, nevertheless, being offered to clarify this carefully developed orthography I hope to use in subsequent Canela publications. This same orthography could most probably be employed for the other Eastern Timbira tribes. Mr. Jack Popjes of the Summer Institute of Linguistics, who has been with the Canela since 1968, has recently worked up the Canela phonemic systems in a professional manner (1971). Except for modifications toward Mr. Popjes' approach in [ř], /β/, /w/, /y/, and /h/, the following usages are almost entirely a product of my own research, development, and choices. Vowels: /ɨ/; /e/; [e]; /ɛ/; /a/; /ï/; /ë/; /ɜ/, [ɛ̈]; /u/; /o/; /ɔ/. The following are nasalized to form separate phonemes: /ĩ/; /ã/; /ĩ/; [y, ñ, š, ž]; /h/, [h, x, ?]. Contrastive vowel length is indicated by single /k/, [k, g]; /kʰ/; /m/; /n/; /β/, [β, g]); /w/, [w̌, v]; /l/, [l, ř]; /y/, [ɛ̈]; /u/; /ɔ/. Consonants: /p/, [p, b]; /t/, [t, d]; /¢/, [¢, č]; and double vowels. Vowel length occurs when a syllable is not terminated by a consonant; when it is, the vowel is short. Two independent morphemes may be separated by hyphens if the meaning warrants this clarification. Stress almost always falls on the terminal syllable of independent morphemes. When it does not, an apostrophe (used very seldom) is placed before the syllable to indicate the stressed condition. Periods are used to separate independent morphemes from their subsequent dependent morphemes, unless the dependent morpheme is stressed. So, syllables before a period (very frequent) will always be stressed, and periods not only identify unstressed suffixes but become at the same time the main device for indicating stress. (Abbreviated for the typewriter, there can be the following changes: /e/: ê; /ɛ/: e; /ə/: ä; /o/: ô; /ɔ/: o; /ɛ̃/: ẽ; /ɜ̃/: ã; /ɔ̃/: õ. /ã/ and /ĩ/ as very rare phonemes, assimilate to "ã" and "ũ". Changes for consonants are obvious: the diacritic "v" over an allophone is left out; /¢/: c; /kʰ/: kh; /β/: ŋ; /ʔ/: ?).

Errata, page 216, footnote 2, beginning line 13:

Except for modifications toward Mr. Popjes' approach in [ɛ̈], /ŋ/, /w/, /y/, and /h/, the following usages are almost entirely a product of my own research, development, and choices. Vowels: /i/; /e/ [e, ɩ]; /ɛ/; /a/; /ï/; /ë/; /ə/ [ɛ̈]; /u/; /o/; /ɔ/. The following are nasalized to form separate phonemes: /ĩ/; /ɛ̃/; /ã/; /ï̃/; /ə̃/ [ɛ̈̃]; /ũ/; /ɔ̃/. Consonants: /p/ [p, b]; /t/ [t, d]; /¢/ [¢, č/; /k/ [k, g]; $/k^h/$; /m/; /n/; /ŋ/ [ŋ, g]; /w/ [ƀ, v]; /l/ [ľ, ř]; /y/ [y, ñ, š, ž]; /h/ [h, x, ʔ]. Contrastive vowel length is indicated by single and double vowels.

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dry-girl) was communicating signals from the great culture hero Awkʰee. She predicted that on May, 1963 Awkʰee would come and change the R-Canela into *civilizados* and that he would transform the current Brazilian city people and hinterlanders into Indians hunting animals in the forest with bow and arrow. The R-Canela as newly formed *civilizados,* would be living in cities and flying the largest jets. In order to help bring about this change of circumstances, Kʰee-kʰwëy ordered the Canela to sell their worldly goods and to commence dancing according to certain prescribed patterns most evenings until dawn. Eventually her orders included the stealing and killing of some 40 to 50 head of cattle over a four month period, a loss which the local ranchers could not tolerate. So, they hired a professional gunman, Miguel Veríssimo, from the municipality to the east (Tuntum), who with eight henchmen led about 200 ranchers and farmers to attack the Indians. Five Canela were killed and six wounded in the July 7-11 skirmishes, but two courageous Service personnel led by the Mayor of Barra do Corda, Walter Ribeiro de Sampáio, intervened on the 12th to prevent a planned second attack, which surely would have terminated the existence of the tribe. Two brave Service agents (Vergilio Galvão and Bento Viéira) and one Canela Service employee, Tôômi, 29, rounded up the R-Canela, scattered and hidden in the stream-thickets ("gallery forests") of the region, and walked them in the direction of Barra do Corda. Trucks met them in Matinho, about 20 kilometers from the city on the 15th, and on the 16th they were walked some 30 kilometers to the Service-maintained reservation of the Guajajara (Tupi-speaking) Indians, also known as the "Tenetehara" (Wagley and Galvão 1949).[4] Since the Canela (mɛhĩĩ) were ancient enemies of the Guajajara (Plĩzĩĩ.lɛ) Indians (Nimuendaju 1946:33),

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3 Ages for the R-Canela have been worked out so that the error is rarely more than ± 1 for those less than 30, ± 2 for below 60, and ± 3 for 60 and above. Since references to the activities and comments of Canela individuals could come from the field materials as being between 1957 and the present time, I usually include the year somewhere in the paragraph when citing a name and age so that the person referred to can be understood as being at that time at that age. This device also serves to distinguish between individuals of the same name but of different generation, since a man's sister's son and a woman's brother's daughter (both in the classificatory sense) sometimes bear the same name.

4 The Guajajara (Tenetehara) are seen by the Canela as being totally different in nature. They meet each other daily in Barra do Corda and live there together temporarily in the Service shed but can communicate only in Portuguese. The Canela inevitably tell an outsider, with great pride, that quantities of food given to a Canela will be shared by all tribal members who happen to be staying there at the time (usually true), whereas, in contrast, a Guajajara will sneak off with the handout to share it only with his family, and then try to save as much of the booty as possible for the future—evil concepts to the Canela. The shorter, more mongoloid looking

various people predicted that trouble would occur between these savanna (pɔ̃ɔ̃-gatɛ-yɛ : savanna: peoble) and forest peoples (ıılɔm-gatɛ-yɛ: forest people). Serious problems did not arise, however, until just before the R-Canela had left the area.

Most of the Canela (meaning from now on the R-Canela) remained in the forest (ıılɔyˀ) on the Guajajara Indian reservation for five years. They settled in two communities close to two Guajajara Service posts, known as "Sardinha" (Marcação) and "Baixão dos Peixes." Roughly, the Ponto population stayed in Sardinha while a reduced Baixão Prêto group moved eight kilometers up stream to Baixão dos Peixes. Each year a few families migrated back to the savanna. The first group of three families returned in 1964 to live in an inconspicuous parte of the ancient tribal territory, the Campestre (pɔ̃ɔ̃-hipok), always hiding in the stream-forest. The savanna hinterlanders (kupɛ̃-gahãk) spread threatening stories that any Canelas returning to the savanna would be killed on sight, but this never happened. In 1963, Service personnel and even the head of the Service, who appeared in Sardinha in July, forbade any return to the savanna, but by 1964 when the apparent plight of the tribe had become more evident, an eventual return was promised.

In 1966, the first chief, Pedro Gregório Kʰeeʔë, 45, came back from Brasilia saying that the head of the Service had given him permission to go back to the savanna (pɔ̃ɔ̃ : *cerrado*) with his tribe. Consequently, in late August, he took about one fifth of the fathers' of families back to the savanna where they cut out a village site near where the tribe had lived around 1900, in the area called "Escalvado" (~~A?klw~~-ʔkʰa-ʔtëy: hard surface). In 1967, Pedro Gregório's followers returned to the savanna with their families and put farm plots in the Escalvado stream-forest. Other leaders took followers to the savanna areas of Arrodeador and Baixão Prêto. The bulk of the tribe returned during the first and the middle part of 1968. Half a dozen die-hard families, who really had adapted completely to forest living, trekked back to the savanna just before the end of the year. Between January and June 1969, a second village large enough for the whole tribe was built nearby, still in the Escalvado area. This was the first time since 1955 that all of the R-Canela people had lived in one village except for a brief period during the messianic movement in 1963.

Aʔkʰɔ̃/

Guajajara were full agriculturalist, unlike the Canela, and lived between the Corda-Mearim on the southeast and the Gurupi River some 275 kilometers to the northwest. Apparently, the Guajajara were culturally similar over this entire area (Wagley: personal communication), ~~and they fortunately have been well studied by Drs. Wagley: personal communication),~~ and they fortunately have been well studied by Drs. Wagley and Galvão (1946).

While living in Sardinha and Baixão dos Peixes, the Canela earned a lot about the advantages of the products of hard agricultural labor through their extensive contacts with the hinterlanders in the forest and the small city of Barra do Corda, and also because of the presence of Guajajara Indians in the Canela village, at the Post, and in the nearby Guajajara settlement. They also broadened their skills into making all kinds of material artifacts for sale to the city *civilizados* to supplement their scarce income. It was also during this exile that the Canela men were shamed by the Guajajara Indians into wearing clothing all the time, even while at home.

In 1969, very happy about being back in their loved savanna, the Canela started to plant numerous fruit trees and to raise pigs (kro) and chickens (ho-cã?cãk) to an extend I have near seen. Their morale is high and they expect to live in this new village (Escalvado or Ponto Nôvo) for a long time to come. In January of 1970, the new National Indian Foundation (to be referred to as the "Foundation") finished a road directly from Barra do Corda to Escalvado. At the time of this writing (1971), a large brick house (about eight rooms) has been completed as the new Post. Still more dramatic, a gasoline-run generator furnishes electricity to light the Post and village. It also serves to raise well water for showers and basin washing, and to power a sending-receiving radio to link the Post with Foundation operations in São Luis, Belém, and Brasília. A separate schoolhouse has been completed and the arrival of a city-trained teacher expected. The Canela are much healthier and have successfully supplemented their diet by hunting. Relatively few people have died, and a result, the population increased by 19 in 1969-70 and 20 in 1970-71, each for rises of 4.8 percent to a new high of 436 on August 31, 1971. This can be compared with about 412 Canela in 1960, and close to 382 present in the two villages in 1966.

Historically, a remarkable thing about the Canela is that they surrendered to Brazilian military control 157 years ago in 1814 (Nimuendaju 1946:32), but still have lost fewer of their traditions than many Indian groups that were "pacified" in the 1950's. This is probably because the population pressure bearing upon them grew very gradually during the last century so that they could slowly readapt to the new conditions generation by generation (Crocker 1964, p. 343). In any case, by mid-20th century both Canela tribes had adopted almost all the artifacts and techniques of the local hinterland Brazilians. Since at least 1880, many families have had axes (wakʰë), machetes (wapɔʔʔ), shotguns (gatɔ̃k: explode), dogs (lɔp), chickens, pigs, horses (kavlo), and have built their houses (iikʰlɛ) of inajá palm thatch (pɔo) essentially in the hinterland style. Some families must have had certain

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of these items since pacification. By 1910 cloth (kupẽ-?kʰə: non-Indian's skin or bark) was available, but women (Indian women: piže) only began using it consistently for clothing during the 1930's. The Canela, nevertheless ,have faithfully maintained most of their social traditions such as marriage practices, kinship patterns, and team log racing. The circular form of their village, with paths leading from peripheral houses to a central round plaza (kəə), is still maintained. This community center serves as a spacious arena for festivals (amzi-kʰin: self-loving; fun), daily singing and dancing (amɛʔkrɛ), and meetings of the ruling council of elders (aypɛn-pal: inter-listening).

The difference between hinterlander and present Canela agricultural techniques is largely quantitative. Whereas the small farmer of the region might plant a minimal garden (pul) of eight *linhas* (6 acres) to support his family poorly, the Canela usually puts in only two (0.6 hectares), and where the hinterlander family might have three machetes to share between its various men, the Canela family is likely to have only one. In other respects, the agricultural system and the technology are largely the same, so the major differences really lie in social patterns. When employed to work in hinterland gardens, the Canela will accomplish less than half what is expected from a hinterlander. Very little can be said to explain this contrast other than that the Canela talk and play a great deal while working and believe they must enjoy exerything they do. Ideally, several unattached girls (mɛnklɛɛklɛɛ.lɛ: the slippery ones) are designated in the morning council meeting to boost the morale of any sizeable work group with their bantering and jokes, and after quitting time, with anything else. Few Canela have any sense of pride in accomplishing a large amount of agricultural work. On the other hand, they would be extremely proud of bringing back a number of game animals (plĩĩ.lɛ: game animal, small) for their families and other Canelas to enjoy.

Research Approach

In early July 1963, while I was attending a meeting of the Brazilian Anthropological Association in São Paulo, the late Dr. Herbert Baldus informed me that there was an account in the newspapers of *"bandoleiros"* machine-gunnig the Canela Indians of Barra do Corda, Maranhão. Directly after the meetings had terminated, my wife and I visited the Canela, as had been previously planned, to find that they had been removed to the forest village of Sardinha, on the Guajajara Indian reservation about 30 kilometers south-by-southwest of Barra do Corda. The Canela had not yet even built houses or shacks. They were living under the shade of trees during the rainless "summer" season (*verão*) in clearings that had only recently been made. The

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circular form of the future village was already apparent, however, and various families had placed themselves in the woods, more or less correctly according to tradition, around the rounded clearing that would eventually be the plaza. They were obviously suffering from semi-starvation and consequently the Service was furnishing sacks of manioc *farinha* (kʰwël-ȼom: manioc-grains), rice (alëy-xï), and cattle (plĩĩ.ti: game animal, large) for slaughter.

This great Canela misfortune was obviously something to be studied in detail, but it was only possible to remain there for two weeks at that time. Soon after returning to the United States, I applied to foundations (see page ~~[illegible]~~) for suficient support to return to study the Canela adaptation to forest living. I arrived with my wife in the middle of the wettest "winter" (*inverno;* February) in years, accordng to local Brazilians and Service personnel. By this time the Canela had completed their usual village (kʰĩĩ) pattern, but these structures were closer together and made largely of forest materials. They were also nearer the Service Post houses than usual, about 50 meters away instead of around 300 to 500, while the closest Guajajara village was about a third of a kilometer away. The Canela chosen proximity to the Service houses demonstrated their fear of the ranchers and their reliance on the Service for protection.

As must often be the case, many of the notes taken for studying the adaptation to the forest were merely the result of casual observations, and these turned out to furnish the best information until 1969 when direct questioning and discussions about the matter became more fruitful. As usual, the Canela could not explain what they were doing. The astounding thing was how they simply withdrew into their skins, so to speak, and let the unpleasant world pass by. One morning in early April, 1964, I sat in the plaza with dozens of Canela and watched horses, mules (kavlo-gahʔg.lɛ: lesser horse) and cattle graze in the village, between the radial pathways and around the houses, while whole sections of vines still heavy with beans (pədžu ʔtɔ̃y.lɛ) were consumed, and not a single Canela raised his voice or a stick to chase the animals away. Earlier in the season corn (pɔ̃ɔ̃xï) still on stalks had vanished in a similar manner.

Some of the psychological observations made in the field for this study could probably have been more reliably derived if various techniques for psychological testing had been utilized, but I was not equipped in such a manner. I had, however, minored in psychology and knew the tribe well from previous visits made between 1957 and 1960 totaling 24 months. It was clear to me that the Canela adaptive pattern

of withdrawing from unpleasant aspects of living was being unconsciously carried out by almost the entire group instead of by just individuals confronted by particular situations, as had been previously established as a personality pattern. There are dozens of recorded observations of this withdrawal technique, and several will be included in this paper. The pattern was so obvious that my colleagues will possibly accept this important explanation for the Canela non-adaptation to the forest even though no Rorschachs, Thematic Aperception Tests, or any formal tools were utilized to attempt to prove this point in a more standardized manner. A lot of dreams were collected,[5] however, as well as rationalizations for not carrying out what would have been forest survival behavior. By 1969 the very verbal informant Kaapel-tïk (bacaba-black), 38, was actually able to explain some of the more overt behavior. He said that if the Canela had worked well in the forest, they would have been afraid the Service would require them to stay there.

The fundamental question being raised in this study is why did the Canela return to the savanna even though there were so many socio-economic advantages to life in the forest? Any hinterland Brazilian farmer would have chosen to cultivate land on the Guajajara reservation rather than a strip of gallery forest in the savanna. But obviously a man does not live by manioc alone and the Canela traditions had adapted them to enjoy sandy, grassy, semi-closed savannas, poor as these might be in soil quality.

A reliable formal methodology for resolving this kind of problem has probably not been developed. Ideally it would be important to compare this territorial relocation with a number of other ones to identify, contrast, and control certain of the variables. Before this can be done, however, it is necessary to study this particular case and prepare it for cross-cultural comparison. This preparation is being

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5 A great deal more material on this Canela forest-maladjustment topic was collected than can be presented in this paper. Besides a collection of dreams, data on cerrado herbal medicines missed in the forest, and statistics on forest farm plot sizes, there are daily diaries written by three Canelas starting in 1964 with numerous examples of suffering in the forest. Pï?to, 40, wrote two pages a day in Portuguese while Həwpïï, 36, and Kaapel-tïk, 32, wrote a page in Canela and translated it into Portuguese. These materials will be presented in a larger future publication. Kaapel-tïk, 32, is a classificatory nephew of Kaapel-tïk, 54, the outstanding deputy commandant of the *Pəbye* novices in Nimuendaju's time (1946: 182) This elder Kaapel went on from his leadership of the *Pəbye* to command the smaller Canela village of Baixão Prêto in 1957, and to become the second chief of the entire tribe.

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partly done herein by reconstructing an ecological set of categories that would logically cover all the significant influences or impulses which could conceivably be factors contributing to "staying" or "returning." Proceeding in this manner makes it more difficult to omit any logically possible kind of contributing factor.

As the analysis proceeds, it will become evident that certain contributing factors are operating either to (1) attract the Canela to the forest, (2) repel them from the forest, (3) draw them back to the savanna, or (4) inhibit the tribe from returning. All contributing factors have been viewed as such vectors, or a composite of these vectors, each with its own relative strength and direction. The assessment of direction is relatively easy, but most estimations of relative strength are obviously not very reliable. It is, nevertheless, better to proceed anyway, realizing that subjective error can never be entirely eliminated from studies of this sort. At least it is possible to partly objectify some of the thinking through employing the processes outlined above.

It should become clear to the reader that each logical category contains a number of contributing factors; nevertheless, only the factors that seem to be operationally most significant will be included in the study. It will also become evident that there are composite factors such as the "forest habitat" taken as a whole. Such generalized factors can be seen as operating as a single complex unit with its various contributing factors derived from some or most of the logical categories.

Categories of Factors

All influences on forest-staying or savanna-returning can be seen as being inorganic, organic, dimensional, or cultural in nature, and can be included in the following, sometimes overlapping, logical categories: (A) Mineral (excluding water), (B) Water, (C) Climate, (D) Catastrophics, (E) Flora, (F) Fauna, and the dimensional relationships, (G) Spacial and (H) Temporal, which may be cultural or non-cultural. The purely cultural influences can be seen as being extra-or intra-societal. In this analysis the significant Extra-societal categories are: (I) Hinterlanders, (J) Barra do Corda People, (K) Indian Protection Service Personnel, (L) Guajajara Indians, and (M) Greater City People. The Intra-societal categories will be sub-divided as: (N) Technological, (O) Sociological, and (P) Psychological. (Logically, the next category might be Biological, followed by Chemical and Physics, to the extent that these approaches to the study of nature can be divided. It should be obvious, however, that these categories are not pertinent to the analysis since men organically and inorganically are essentially the same wherever they are, so there can be no contrasts.).

I. The Physical Environment (inorganic and organic).

A. Mineral (soils).

The forest soils near Sardinha are considerably richer than the arable areas bordering the Canela savanna streams known as "gallery forests." This was appreciated by all the Canelas because it simply could be seen that any crop would grow taller and denser in the forest. The nature of the forest soil, and its advantage in supporting relatively heavy crops for considerably less labor, was the big attraction to the forest setting for the dozen or more Canela families that learned to take pride in a productive garden.

Agricultural soil samples were only taken of a savanna gallery-forest garden near the old village of Baixão Prêto. The University of Wisconsin Agricultural Service's comment was that, "The nitrogen and organic matter are medium but everything else is very low."

Turning to a different Mineral category factor, it is important to examine the use of earth in house construction. Since it was difficult in the forest to obtain palm fronds to build their huts, many Canelas resorted to the dried-clay, pole-reinforced solution of the local forest Brazilians. With all the floors of natural or hardened earth instead of savanna sand and so many clay walls no longer penetrable by breezes, it would seem that conditions for good health had been considerably altered.

Considering another Mineral factor, the pathways in and around the two forest villages and by the Corda River are of hard earth (aʔkʰlõ-ʔkʰə-ptëy) and clay (galɛ̃k), not of sand (pže-nom: earth-grains) as they had been in the savanna except near the streams. This difference may be hypothesized as having contributed to a more rapid spread of disease.

There are other Mineral factors, like the presence of goiter cases and therefore the lack of sufficient iodine in the savanna, but none is sufficiently significant in a savanna-forest comparative manner to be included in this analysis.

B. Water.

The savanna water supply found in the form of small, fast-moving streams is relatively pure and healthy. Considering the possibilities of pollution, for Ponto there were no communities upstream on the Santo Estévão and for Baixão Prêto there was only Ponto nine kilo-

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meters above. The Corda River, which flowed by the Canela settlements at Sardinha and Baixão dos Peixes, was probably less pure than the Santo Estevão but could only have carried significant human contamination in times of great rains and high water, and then only from the Canela area itself. There are about ten hinterland Brazilian settlements above Baixão dos Peixes between Oriente and Barreira, but they were neither large enough (two to twelve houses) nor close enough (five to 25 kilometers) to pollute the river, which must be some ten to fifteen meters across and two to three meters deep.

There is the possibility that there are natural materials in the Corda River that cause human health problems. Some Barra do Corda people believe this, but I have obtained no scientific evidence that this is true.

As an over-all view, the purity of the water for bathing, drinking, and cooking must be seen as being roughly the same in both areas except for the short period when the initial heavy rains in November and December wash out the shrubbery close to the forest villages.

Another Water factor is the frequent Canela complaint that the Corda River ran too fast and was so deep that children could be swept away, though none actually did drown during the five year Canela stay in the region.

No other Water factors are being considered comparatively significant. Rain water (ƚɑ) and relative humidity contrasts will be taken up under Climate.

C. Climate.

This category offers a fascinating contrast between the Brazilian savanna (pɔ̃ɔ̃; *cerrado*) and the forest Canela communities. Whereas the differences appear to be great, it turns out they are only slight and almost entirely local. In any case, the Canelas, hinterlanders and Barra do Corda people are all convinced that the differences are considerable and enjoy telling you about the superiority of the savanna climate. They mean it is dryer and fresher, at least in June and July. This is the dry season "summer", for both places when the winds blow, the nights are cold, and the grasses turn yellow and brown. Mild rains and dew may bring back the greenery for late August and September, but the heavy downpours only begin in November or December, opening a sporadic "winter" season which terminates in May or early June. The annual rainfall pattern is said to be similar to what exists all over the Planalto Central, except that the commence-

ment of the rainy season is somewhat delayed by six weeks or two months (I.B.G.E. 1957: 405).

The distance from Ponto to Sardinha may be only 45 to 50 kilometers but the direction lies approximately from southeast to northwest and is exactly along the line of the increasing rainfall gradient which runs from considerably less than 500 mm. per year in northern Bahia to well over 2000 mm. in northwestern Maranhão according to current maps (ECEPLAN 1969: 44). If anything local can be reliably determined from the very large scale design of such a chart, it appears that Ponto would be near the 1200 mm. line and Sardinha 1300 mm. per year, a minimal difference which should hardly be noted. A far more dramatic contrast, however, can be found in the chart depicting Martonne's aridity index (ECEPLAN 1969: 80) where Ponto is 20 and Sardinha 30 when the entire range from northern Bahia to northwestern Maranhão is only 10 through 40. Knoche's aridity index (ECEPLAN 1969: 81), however, gives the two locations as about 20 and 25 when the range in question is from 20 to somewhat over 120. The annual average relative humidity graph (ECEPLAN 1969: 73) gives Ponto about 74 percent and Sardinha 75 and the average annual temperature (ECEPLAN 1969: 28) reads about 21.5°C. for both. It would appear that although Ponto is a long way from Bahia, it lies near the edge of the arid area to the southeast and stands just where the gradient begins to rise sharply.

The ECEPLAN charts probably should not be used in this manner because they certainly are not accurate to within as little as 50 kilometers, but since the two locations in question do lie along a meteorological gradient, it is logically probable that small differences do exist. The descent from about 300 meters elevation to about 120 would tend to enhance this probability, as would the definite change in vegetation from *cerrado* (not *cerradão*) to a low, seasonal deciduous, mesophytic forest.

Turning to on-the-spot meteorological measurements, the records are poor and incomplete. A total annual precipitation of 949.8 mm. is registered for Barra do Corda for 1956, the only year for which such figures are available. As for temperature, the average of maximums was 24.2°C. and of minimums 17.5°C., with the maximum being 37.7°C. in October and the minimum 14.4°C., in july, and the compensated average being 23.8°C. (I.B.G.E. 1959: 71). In 1956, Barra do Corda was considerably drier and warmer than the ECEPLAN averages would have us believe.

During parts of 1958 and 1959, Service agents in Ponto and Baixão Prêto supported by the research program kept simple temperature and

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relative humidity records. The relative humidity results are not considered reliable, however, largely because the two instruments, hair hygrometers, could not be properly calibrated after travel. Later attempts were made in the forest in 1964 and the savanna in 1970 but the hygrometers were broken in transit. During the brief 1971 stay, a sling psychrometer functioned well in the savanna. Comparative readings for three weeks in October between the Canela village of Escalvado and the new Barra do Corda meteorological station (supposedly forest), served only to demonstrate that there were *no* significant differences between the two places during that period.[6] The Barra do Corda meteorological station (5°30'00" S — 45°16'00" W), however, stands on a plateau (150.00 meters altitude) outside the city (81 meters) in an area largely cleared of floral cover for other new constructions. Away from the cleared areas, a low relatively dense sort of scrub bush (aʔkʰet) characterizes the region. Sardinha, in contrast, is in more of a forest (iilɔm), on the edge of a river (ko-ʔgati: water-large), near two 4.8 meter cascades (ko-tɔɔlɔk: water-descending) of 34 cubic meters per second (I.B.G.E. 1959.71) and topographically in somewhat of a bowl — a river bottom valley (see map, Fialho 1950: 105). Many of the Sardinha farm plots were situated in taller deciduous dry forests further to the west.

Apparently, relative humidity contrasts can often be accounted for more by certain local topographic effects (Camargo 1971:80) than by larger scale differences such as 50 kilometers up the climate gradient, 180 meters lower in elevation, or even by savanna versus dry forest foliage. Sardinha was probably more humid largely because of its position in a valley bottom near a river. In addition, it was likely to have been more humid because the evaporation rate must have been lower than in the savanna where the sandiness of the soil (largely white), the far lighter tree canopy, the lower water table, and the relatively unobstructed access of the sun and wind to the soil, grass, and foliage are all savanna factors serving to raise evaporation rates. This was especially the case during the maximum temperature period of the early afternoon and during the dry season of June through August.

Daily temperature absolute maximums and minimums which ranged from 40 to 15°C. for Ponto on August 6 and 7, 1959, and 15.5°C.

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6 The Barra do Corda meteorologist, Antônio G. Cordeiro, was very helpful in furnishing relative humidity readings, for which I am extremely grateful. He also gave me various important ideas about the weather of the region, such as the fact that there could be only very slight differences between the macro-climates of Ponto and Sardinha even though appearances tended to make one feel otherwise after living in both places.

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for Porquinhos on July 21, 1966, were exceeded by extre
11 and 10°C. for three nights in a row in Sardinha in A
(4th-6th). The Canela considered Sardinha much colder t
and it was, at least at certain times. Higher relative hum
also have been a factor in their feeling that it was cold
still cooling, predawn air, very light breezes often carrie
mist from the river through the village.

Viewed as a whole, the Ponto and Sardinha macro-c
probably quite similar. Open areas in each region would
because of local conditions than climate differences, but
open areas might have slightly different annual averages
dinha being a little wetter due to the 50 kilometer diffe
relatively steep meteorological gradient. The really pert
rences were probably only in relative humidity daily extren
to the general openness of Ponto and its higher evaporation
the relatively closed features of Sardinha seen in the gr
retaining abilities of its topography, soil, and flora. All
been reasoned from the available data rather than proved l
logical measurements, but any inhabitant of the region v
that the savanna of Ponto is dryer.

D. Catastrophics.

No droughts, plagues, floods, earthquakes, great fires, vic
or any other natural catastrophies affect either area sign
this category can almost be ignored. In the savanna, how
keets, cattle, and certain rodents sometimes do damage
These dangers are somewhat less troublesome in the fore
Canelas do not talk about this advantage of the forest
contrast the two habitats.

E. Flora.

This section of central Maranhão, which is part of tl
Meio Norte (Middle North), appears to be very interesting
because it is an area of competition between elements of t
biomes (I.B.G.E. 1957: 405). Amazonian *hiléia* (Brazil
rainforest) elements in northwestern Maranhão diminish i
eastward and southward across the state, essentially ter
the Mearím River on which Barra do Corda is situated. Ce
Brazilian "closed" savanna) types of cover (twisted low t
in grass-lands) come up from the high part of the Plan
over a 1,000 kilometers to the southwest in Matto Gro

1956: 410-413) and begin to blend into *cerradão* and dry forest elements (iilɔm: forest-thicket) some 50 kilometers south of Barra do Corda. Between the *hiléia* and *cerrado* biomes lies a transitional region of semi deciduous, dry forest (I.B.G.E.. 1962: 139-141), or *uxarandados* (I.B.G.E. 1957: 405), consisting of trees around 20 meters in height with leaves that fall off to about the 80 percent level by the middle of September. Apparently, the switch from cerrado[7] to dry forest is made possible by sufficient rainfall but is determined locally by soil quality or texture because cerrados can be found under far higher rainfall conditions (Reis 1971: 24).

The old pre-attack R-Canela village of Ponto was largely surrounded by sandy *campo cerrado* and *cerrado* countryside, as defined by Goodland (1971: 414). Eiten[8] calls this kind of countryside, "Low Woodlands" (1971:160). (See photographs of similar countryside in I.B.G.E. 1957: 78,284,310,312-3.) Ponto's companion village, Baixão Prêto, was partly in sandy soil but also on the kind of ground always found under the dense vegetation of a cerrado gallery forest (*Askew et al* 1971: 153). Between Ponto and Barra do Corda the cerrado[9] grows closer and taller, and changes to *cerradão* (Goodland 1971: 414), and finally turns into a relative low (3-5 meters), dense, dry growth (a?kʰet:

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7 I have used the word "savanna" up to this point in the paper because at least in English it is the closest term describing the Canela countryside, but this usage may give the wrong impression of this principal Brazilian Planalto vegetal cover. This is not a "savanna" in the African moving picture sense where clusters of tall trees appear occasionally over high yellow grasses and a person can spot animals at great distances. Brazil's "closed" savanna amounts to a sea of low trees (up to about six meters) standing somewhat apart from each other. The grass is short and the soil is low in nutritional qualities. A man on horseback, however, or maybe even in a jeep, can usually move freely between these trees but never for very far in a straight line. A party of Canela can be lost in such a countryside, as I have been with them, when it is flat enough so that no one can make out ridges or mesas through the branches of the trees. To regain their sense of direction, the Canela then climb the tallest nearby tree to sight some known landmark. In any case, this is a very extensive type of floral cover in Brazil and therefore should be referred to by its proper name, "cerrado," without underscoring in English, as do Goodland, Eiten and others in their professional publications.

8 Dr. George Eiten of the University of Brasilia Department of Vegetal Biology wrote me an extremely helpful three page letter on the soil factors determining cerrado versus dry forest occurrences and the local effects of topographic positions on daily relative humidity ranges. These are the central ideas of the Ponto-Sardinha environmental contrasts utilized in this paper, so very considerable thanks are due to Dr. Eiten.

thicket) even cow hands (*vaqueiros*) have trouble riding through and fully need the leather uniforms of the Brazilian Northeast to protect their skins and clothing. Fróes Abreu calls this "*caatinga*" (1931: photo op. p. 60) but it is more likely some sort of a very low dry forest.

Going up the Corda River from Barra do Corda, this low growth becomes developed and taller (10-15 meters) by Sardinha but still not a full-sized dry forest (hawen: dry forest, clear under foot). The old A-Canela cerrado village of Porquinhos and the current (1969-....) "Rancharia" village are some 50 and 60 kilometers further up the Corda River valley, south by southwest through these same woods. This dry forest grows taller reaching its full stature (20 meters) westward toward the Enjeitado and Mearím rivers. The Rancharia region is known locally by hinterlanders as "Boca do Mato" (the forest's mouth, or entrance).

The local naturalist, S. Fróes Abreu, describes the area for us in detail and furnished a map (1931: op. p. 46) with annotations on the nature of the flora. To the northwest beyond the watershed divide between the Mearím and the Grajaú rivers, he labels the flora "matta hygrophila", which can presumably be associated with a considerable degree of *hiléia* elements. Just to the northwest of the Mearím we find on his map "matta xerophila", or dry forest. The area southeast of the Mearím near Barra do Corda on the way to Sardinha is "caatingas altas (angicos)", which can be taken as dry, high shrub growth, while the region just above Sardinha between the Corda on the east and the Mearím in the west is "mattas (canelleiro, angico, catuaba, tamuaril, etc.)", which must be considered forests.

A third of the way, between Barra do Corda and Ponto, Fróes Abreu denotes the countryside as "campos cerrados com paty, faveira [hɔ̃ ʔhak] e barbatimão [kro-ʒĩn.lɛ : pig's-excrement, little]", maybe "cerradão" as defined by Goodland. At half the distance he has "campos cerrados com mangabeira, cajuhy, pau de leite, barbatimão, lixeira, etc.", which could be "cerrado." Around Ponto, he labels the kind of flora "campos com mangabeira, barbatimão, pequi e bacury", which Goodland might call "campos cerrados." This supports the point that the Canela love the relatively open cerrados.

According to the fine Service agent, Vergilio Galvão, beloved by the Canela and nicknamed "pɔɔ-vey-lɛ" (little old cerrado deer), the following trees were found around Sardinha, expressed in the language of the region: sapucaiéira (koykoy-pəl), cajaseira, jatobaseiro (tɛ.ʔti), angico, cedro (pĩĩ-yipɔɔ.lɛ), mirindibeira (intɔɔ-ɸ.ɔ :

eye-fruit), catingo de porco (amɉii-yɔ̃ɔ̃kʰɑ), caximbeiro (kohiɉut), pau roxo (kuuhe-ʔkʰa-yik: arrow-bark-black), caneleiro (pəl-gaa kʰšel.ti), mamuiseiro, aroeira (kʰɔp-gahəɲ), pau d'arco (lɔɔlɔk).

Turning from considerations of ground cover to floral usages, most of the Canela medicines come from herbal materials collected in the cerrado. For instance, ~~for~~ the bark of the sambaiba (kʰlɔə.ti) will loosen tapeworms, and a tea from its leaves is good for bleeding dysentery. They claimed these remedies could not be found in the dry forests. Consequently, the Canelas while in Sardinha, did not have the proper materials to undergo their traditional medicinal practices.

They also lacked equipment to keep up the various taboo type restrictions (aykʰli) in order to maintain human health and growth (Crocker 1971: 331). After a father has had sexual relations, he must be careful not to touch or go near his very young children for fear of making them sick or stunting their growth, but if tiny bands of tucum rastiro (Fróes Abreu 1931: 52), known as hɔnl.lɛ-yɔ̃, are kept tied above the child's ankles, on the wrists, on the waist, and around the neck, then the harm is warded off or the contamination prevented.

Certain materials for body adornments, such as headbands and festival belts were also lacking and could only be obtained by a trip to the cerrado. Team racing logs of buriti (krɔwa), which traditionally were always cut fresh for even daily sports events, had to be re-used a number of times (see Nimuendaju 1946: 136-145). Little girls held dolls of banana tree stalks instead of buriti (Nimuendaju 1946: 309). In 1966, the great drama of the ʼPələ.lɛ race of the Kʰeeʼtuwa.ye (Nimuendaju 1946: 177) Festival was spoiled because the novices had to run mostly out of sight of the villagers waiting in the plaza. Since they could scarcely cut a track in the forest just for this one race, they had to run on a largely concealed existing road through secondary forest growth tangential to the village circle. Traditionally, they charged straight in from a neighboring promontory through easily cleared cerrado growth to the center of the village, the progress of their gallant contest followed by all.

In the final analysis, as was so well expressed by the women's leader, Tɛl-kʰwëy (jussara-girl), 42, in August 1966, the Canela simply loved the cerrado and disliked the forest. The preference was surely enculturated into the children as they were growing up and was experienced in what they saw, felt, and could do. On the latter point, namely, on what women could do to provide things for their people, their families, or their husbands, these activities were severely limited by

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materials and circumstances in the forest. It was the women who traditionally went out in groups, or singly, to gather wild fruits in season, but in the forests around Sardinha there were no fruit palms such as buriti, babaçu (lɔ̃l), and buritirana (klɔwa-lɘɘ). Neither were there wild fruit trees coming into season at various time throughout the year such as cajuí (aʔkʰlët), pequi (pĩn), mangaba (pen-hok), bacuri (kũm-ɛe), puxá (kliitin.ti), bacaba (kaapel), and others. Nor were there any of the following flora, used extensively to put together items of material culture: the palms, buriti (klɔwa), inajá (awal), and pati (wooho.lɛ); the tiny grass-size palm, tucum rasteiro(hɔnl.lɛ); and the small tree used in body painting, pau de leite (alɘm-hok). Urucu (pi) the principal body painting material, was not available either, because they had not planted bushes of it in the forest and it takes several years to grow.

The closed woods and secondary thickets immediately around Sardinha created a health hazzard. In the semi-open cerrado, Canelas had to walk several hundred meters for concealment before taking care of nature's needs. In the forests, however, they only had to go 20 to 30 meters, or even less at night, before they would be out of sight. So, the density of the forest flora operated as a variable in the accumulation of human wastes near the village and therefore quite possibly to the spreading of certain diseases.

F. Fauna

The Canela terror of the forest was considerably increased by the fact that they thought jaguars (lɔp-kʰlɔl: jaguar-spotted) could spring upon a man and eat him. Jaguars did not roam the cerrado anymore so the habits of these animals were not well understood. Actually, they only attack adult human beings when cornered. Nevertheless, everyone "knew" that a jaguar had attacked Telen, 30, in the "winter" of 1964 while he was hunting in the deeper forests to the west of the two villages. Piʔto, 40, in April 1964, ordinarily one of the few rugged, tradition-oriented men, failed to bring back to town, after nightfall, three goats (kala-ʔyaloŋ-lɛ : lesser deer) on tether from Oriente, a few kilometers above Baixão dos Peixes. Two youths accompanied him, but they were all afraid of jaguars.

These days there is considerably more to hunt and far larger game animals in these dry forests (Fróes Abreu 1931: 211), where large forest deer (ŋiyaɛi) and even tapirs (kükʰlit) can be found. The presence of jaguars was no help because the Canela do not eat this meat. With the new roads, out-of-state tourists come to hunt these same forests, not the cerrado. Moreover, the Corda River holds

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larger fish (tɛp) in greater numbers and bigger alligators (mĩi) and anaconda snakes (lɔʔti).

In the savanna, the Canelas hunt the low woodland cerrados, the gallery forests surrounding the streams, and the occasional islands of dry forest (hawen). Their favorite game animals (Vanzolini 1956) in the cerrado are various kinds of deer (pɔɔ; kala); the South American ostrich, the rhea (mɔ̃ɔ̃); several kinds of armadillos (ton; awçet; tɔm.lɛ); and game birds such as partridge (peeket.ti). These they track down and shoot. Near the stream-forests, they wait at night in trees with flashlights to fire on pacas (kraa) and agoutis (kuukʰen), in the streams they catch small alligators and anaconda snakes as well as many kinds of small fish, and in the local cerrado forests they particularly like to encircle groups of wild boar (kro.lɛ). By 1963, game was scarce in the cerrado because of the constant attrition by both the hinterlander and Indian and because of the presence of cattle. By 1969 and the return to the cerrado, the game supply had largely replenished itself during the exile, but the Canela will surely cause a scarsity to develop again in the not too distant future.

It is certain that during the Ramokamekra-Canela exile, their available forest game animals were more varied and numerous than they had been in the cerrado. It was really the Canela cultural lack of ability and motivation in real forest hunting which prevented them from nourishing themselves in a satisfactory manner. The neighboring Guajajara Indian returned daily with sufficient game, while the R-Canela often came back empty handed. The aboriginally similar Apanyekra-Canela traditionally hunted in similar parts of the same extended dry forest some 30 to 50 kilometers to the southwest with great success. Apparently, some Gê-speaking Klĩkati, Gavião and Kaiapó groups live near or in forests and hunt successfully in them.

The denser characteristics of the forests severely inhibited the R-Canela ability to hunt wild game. In the cerrado the Canela find tracks kampɔɔ-ʄwa of certain animals and creep up on them for the kill or even run them down. The cerrado hunter is always on the move. For success in forest hunting, the techniques have to be considerably altered. The forest hunter waits in certain places known to have attraction for certain animals. The R-Canela did not generally have this kind of knowledge or patience.

During my 1964 five month stay in Sardinha, Canela men were lost three different times in the woods so that they had to spend the night without returning to the village. One midle-aged hunter, lɔ̃ɔ̃.lɛ-ʔho (toucan feathers), 52 was forced to spend two nights away

from home lost in the denser forests to the west without anything for protection except his machete and a box of matches. During the first night he sang to pass the time, made a clearing, and built a fire to keep off wild animals and dangerous spirits. He claimed jaguars were snarling nearby in the darkness. For the following night with his match supply exhausted, he enlarged an armadillo hole and crawled in. He then constructed a grid of poles over the opening and passed the night looking upward through the cross-bars ever ready to thrust his machete through any jaguar intent upon human consumption. At dawn he distinguished the faint sound of the distant waterfalls by the village and followed it home.

R-Canela find their way through the cerrado by keeping their bearings on ridges (k^{h}ɛn: rock, hill) and mesas (k^{h}ɛn-yawen: hill-forested). They had not developed techniques for maintaining their sense of direction in closed woods.

So, it seems that the nature of the forests, through enhancing fear and hindering movement, seriously reduced the Canela capacity to supply themselves with sufficient meat and therefore proteins. This certainly was one of the factors contributing to the general conditions of undernourishment and therefore to sickness and eventually death in some cases.

Turning to a different kind of animal, namely, germs which produce diseases, we must recognize a potentially far more significant role for such a contributing factor. These particular dry forests are not necessarily more disease-ridden than the cerrado, but illnesses were thought to have spread more rapidly in the Sardinha forest village largely because the Canela s cerrado style of living facilitated this. So, such a potential cerrado-forest contrast must be extensively investigated.

Between 1963 and 1968, the fine Service agent, Vergílio Galvão recorded 58 deaths for the village of Sardinha. From my census records of 1960, 1964, 1966 and 1969, I find that there were 69 ± 6 deaths. (The uncertainty comes largely from not being sure where a particular adult, child, or baby died between 1966 and 1968 — whether in the forest in Sardinha or in the cerrado communities of Escalvado, Arrodeador, and Campestre.) In any case, the Canela spoke very convincingly to outsiders that if kept in the forest, they would all die off. The first chief of the tribe, Pedro Gregório K^{h}ee̸gẽ, was particularly eloquent on this point both around the tribe and in more distant places such as São Luis (the State Capital) and Brásilia. In September 1971, during a serious discussion on this same point, the very intelli-

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gent head of the Service (now the Foundation) in Barra do Corda, Júlio Tavares, convincingly declared that the Canela would have died out if left in the forest. (He had held the same job and viewpoint in 1966.) Nevertheless, the census materials show that the Canela did not at any time over an extended period suffer from an excess of ordinary, disease-caused deaths over birth. The actual decline in their population figures was caused by a number of departures from the tribe, accidental deaths, and death due to a measles epidemic which struck equally in the forest and cerrado communities in 1967. With these losses accounted for, however, the deaths did not outnumber the births between either the 1964 and 1966 or the 1966 and 1969 censuses. Nimuendaju (1946: 33) reported the Canela to number about 300 in 1936 after a ravaging attack of smallpox. By 1960 they totaled 412, so their average increase over this 24-year period must have been about 4.7 per year. It is merely this increase which may have been lost because of a lower birth rate in the forest, but even this is uncertain because the death and birth rates during the three immediately pre-forest years resulted in almost a zero population growth just as in the first three years in the forest. So, no firm conclusions about population trends are possible other than that the cerrado-forest death rate differences, after accidentals, were equivalent. In any case, the tribe was *not* "dying off" to any extent in the literal sense of the expression.

Here are the more interesting population statistics from Table No. 1. During four approximate two-and-a-half year periods there were the following number of non-accidental deaths. A) July 1960 through 1962 (cerrado), 43 ± 3; D) 1964 to July 1966 (forest), 46 ± 2; E and F) July 1966 to 1969 (mixed), 32 ± 2; and G) 1969 to September 1971 (cerrado), 18 ± 1. (Probable errors lie largely in the difficulty of assigning deaths to 1962 or 1963 and 1968 or 1969, since the Canela are not accurate in remembering such time distinctions.) Note that 1963 has been isolated; it was not an ordinary year, with the messianic movement, attack, and relocation. Periods "E" and "F" might well also be omitted because of their mixed cerrado-forest nature. Period "G" differs in that the medical care was considerably better, coming first from the Summer Institute of Linguistics missionary, Jack Popjes, and later from a considerably improved Indian Foundation medical orientation. Moreover, morale was unusually high after the return to the cerrado. Periods "A" and "D", however, are quite comparable but show no significant differences. So, excluding 1963, the year of great shock, the cerrado and forest death rates appear to have been similar. Why, then, were the Canela so successful in convincing everybody, including themselves, that they would "die off" if left in the forest?

Table No. 1

Cerrado versus forest deaths

	A	B	C	D	E	F	G	H	I
b	20	2	5	15	6	5	7	26	34
c	5	1	1	12	3	0	1	16	7
y	3	2	0	5	1	3	6	6	14
m	6	1	2	3	1	6	1	6	14
l	1	0	0	3	2	0	2	5	3
"o"	8	1	0	8	2	3	1	10	13
L.C.	43±3	7±1	8±1	46±2	15±3	17±3	18±1	69±6	85±8
		15±2			32±2			154±10	
a	1	7	0	1	0	0	0		
e	0	0	0	0	7	4	0		

b: babies, under 2
c: children, 2-14
y: youths, 15-29
m: mature, 30-49
l: late, 50-59
o: old, 60 and over
a: accidental deaths
e: epidemic, measles

A: mid 1960 thru 1962, cerrado; 2.5 years
B: 1963 thru July 13, cerrado; 6.5 months
C: 1963, July 14 to end, forest; 5.5 months
D: 1964 thru mid 1966, forest; 2.5 years
E: mid 1966 thru 1968, forest; 2.5 years
F: mid 1966 thru 1968, savanna; 2.5 years
G: 1969 thru August 1971; 2.7 years

Coments: 1) The 1963 habitat-related deaths (15 ± 2) times 2.5 years makes 37.5, plus the accidental deaths (7) makes 44.5. The numbers 37.5 and 44.5 are really within the range of error of the deaths in A (43 ± 3), and therefore are roughly equivalent. 2) All the mid-1966 through 1968 (E plus F) deaths (32 ± 2) plus the epidemic caused deaths (11) make 43, which again is within the range of error for deaths in A and D. 3) The table serves to demonstrate that cerrado and forest deaths (A versus D, or A plus B versus C plus D) were essentially equivalent. Deaths in G (18 ± 1) in contrast to deaths in A (43 ± 3) and D (46 ± 2) are surely significantly different.

This question is not entirely answerable, due to a lack of full information. The Service personnel must have been quite concerned

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about the situation, both because of the actual loss of lives and because of the ever-existent danger that some Canela would make a fuss to a sympathetic national or foreign journalist. Hoy, 30, the greatest trouble maker, told me in 1966 he was going to do exactly this.

Looking at the figures to find a still better reason for Canela shock, the following comes to mind. During the 1963 attack one man over 60 and four heads of families in their fifties were killed. Besides this, somewhat earlier another man in his fifties and a youth in his twenties had been lost when a truck had turned over far away from the tribe. If we add these seven accidental deaths to the eight lost by illness in the second half of 1963, 15 deaths in six months might very well have left a psychologically crushing impression, especially since six were village grandfathers and leaders. If we take, moreover, the two three-year periods July 1960 to July 1963 (cerrado) and July 1963 to July 1966 (forest), and add the seven accidental deaths to the forest column instead of the cerrado one, we find the forest deaths (61 ± 3) quite exceed the cerrado ones (50 ± 4) but not by much. (Placing these accidental cerrado deaths in the forest column may be justified since the losses were surely *felt* in the forest.) To make it even worse, 17 actually died in the first six months of 1964, making 32 deaths for the first forest year, which is essentially double the amounts in "A" and "D".

Before 1960, the Canela used to travel all over Brazil for amusement and curiosity but they did not stay away to live. They were said by one Brazilian anthropologist, Dr. Eduardo Galvão, to be the most traveled tribe in the whole country. After 1960 and even moreso since the demise of the messianic movement, the relocation, and the forest demoralization of 1963, whole families left to go to other Gê tribes and many youths wandered around various cities to find patrons who would raise and educate them in return for menial work. Between 1960 and the July 1964 census, seven R-Canelas and one husband of A-Canela origin moved to Porquinhos, five youths left to live in various Brazilian cities, and two had jobs in families in Barra do Corda. By the 1966 census, four more R-Canela and another A-Canela husband had joined the A-Canelas in Porquinhos, four more youths had gone out into the world, two more were working in Barra do Corda, and one was away at a convent school in Montes Altos, two municipalities west of Barra do Corda. One youth had returned and one A-Canela had married a R-Canela woman in Sardinha. Between 1966 and 1969, five more R-Canela went to Porquinhos and two A-Canela spouses returned there. These were the only departures; the tide was

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turning. An R-Canela woman came back from Porquinhos with a new A-Canela husband, three youths returned from "the world" (mũn: *mundo*) and one from the convent. By September 1971, five more youths had come home, but the former convent student, Kapreeprek, 23, a son of the first chief, Khee/ë, had left to join the army in São Luis.

Including others not counted above who had gone and returned between censuses, twelve R-Canela youths have experienced the world (large Brazilian cities) extensively and returned. Beyond this there are six who are living permanently in cities (Recife, 3; Brasilia; São Paulo; and Rio) with three of them married to Brazilians (Recife, 2; Brasilia, 1), and two others who are in a special Foundation rehabilitation center (jail) in Minas Gerais.

The Canela reduction in population between 1960 and 1966, that is, from 412 to 382, can be accounted for largely through these emigrations and the accidental deaths. (See Table No. 2). The death rate improvement between mid-1966 through 1968 is eliminated if the eleven deaths by measles are included instead of being counted as accidental.

The Canela also claimed that the forest experience was killing off the older people. At first glance this must be doubted because for people 60 and over, there were nine cerrado deaths (five male) due to ordinary diseases between July 1960 and July 1963 and only eight more (five male) during the following three forest years to July 1966. Turning to living, 60-and-over people, however, there were 21 alive in 1959, 22 in July 1963 (cerrado), but only eleven in 1969 (post-forest). Four of the Canela lost in the attack would have been added to the 60-and-over list by 1969 if they had survived ordinary diseases, so the number might be revised upward to 15. This is still somewhat of a difference because the probable error cannot possibly be more than ± 3, considering the methods utilized in figuring ages.

In 1959, the 60-and-over male to female ratio was twelve to nine, but by 1969 it had been reversed and as such was four to seven. Looking around the cerrado Escalvado village, the Canela could find only half as many old people as they could remember for pre-forest Ponto, and one-third the number of old men, so it is not surprising that they believed the forests *had* killed them. The truth is, however, that the reduction in numbers was due only to some small extent to diseases of the forest. It is slightly more attributable to the attack but more largely the result of fewer people reaching the age of 60, and consequently to some earlier population pyramid irregularity.

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Table No. 2

Population after departures and non-habitat-related deaths.

Census years	Number of years	Cerrado/ forest ratio	Approx. census numbers	Departed/ returned tribe	Balance	Accident, epidemic deaths	Balance in tribe	Habitat deaths	Population increase/ decrease	Balance
Mid-1960 to Mid-1964	4	3/1	412 ± 3	−15/0	397	− 8	389	80/75 ± 5	+ 5	394
Mid-1964 to Mid-1966	2	0/2	394 ± 2	−13/2	383	− 1	382	29/29 ± 3	0	382
Mid-1966 to Mid-1969	3	1/1	382 ± 2	− 7/6	381	−11	370	62/35 ± 2	+27	397
Mid-1969 to Mid-1971	2	2/0	397 ± 1 436 ± 0.5	− 1/5	401	0	401	49/14 ± 1	+35	436

Comments: 1) The record of deaths is far more accurate than the data on births, so "births" were calculated indirectly by adding the population increase (accurate) to the deaths. (The number of deaths and the population totals are the relatively accurate census figures herein.) "Birth" figures derived in this manner are not to be taken seriously. As reconstructed, they absorb both death and birth rate errors. 2) It does not appear, however, that the forest stay affected the birth rate very much, though the figures scarcely allow such an observation. 3) It would have been ideal to calculate figures for mid-1963, the period of the switch from cerrado to forest living, but I was not there long enough at that time to warrent making a census, and the birth figures are not reliable enough to make such an interpolation. 4) The greatly lowered death rate from mid-1969 to mid-1971 is due partly to far better medical care and possibly also to higher morale. 5) There were 17 ± 1 deaths in the first half of 1964 (forest). Please note that these deaths are included in the first row which is three-quarters cerrado, otherwise this could be confusing.

The complaint that more babies and young children were dying off in the forest is not substantiated by the demographic data. The figures on premature, stillborn, and recently born deaths, however, are not reliable.

The common diseases in Sardinha in order of seriousness were tuberculosis, dysentery and vomiting, anemia from various causes, influenza, malaria, and infectious skin troubles such as athletes' foot and others. A March 1964 two-day tour of the tribe produced the following observations: 17 Canela "definitely" had tuberculosis, eleven more "probably" suffered from tuberculosis, and 17 were "suspected" of being tubercular; 45 displayed extensive skin diseases (seven of these athletes' foot); nine complained of serious stommach ailments, eight of worms, and four of critical dysentery; and six appeared to have vitamin deficiencies, eight malaria, and three advanced trachoma. (This study is admittedly merely the result of diagnoses by a layman, but there was some Service concurrence, and I had been a pre-med student years earlier.)

Most had worms to some degree. The 52 skin cases were surely a problem of the moment. They were easily cured and did not appear in such numbers in 1966. There had always been some athletes' foot even in the cerrado. Usually far more than four suffered from serious cases of dysentery. Malaria does not create much of a problem in the region because the *Serviço Especial de Saúde Pública* had arrived in Barra do Corda as early as 1945, but nevertheless, I believe, there were still fewer cases in the cerrado. Trachoma is far more common among the A-Canela.

The killer diseases were tuberculosis, dysentery, anemia, malaria, and various combinations of these four augmented by malnutrition, influenza, and serious colds. Many babies perished from the latter two, and from a combination of vomiting and dysentery. In the long run it seems to be tuberculosis which accounts for the highest percentage of the deaths. Between the 1969 and 1971 Septembers, 14 deaths occurred, six of them definitely from tuberculosis. Although comparable illness figures for the cerrado in 1960, or earlier, do not exist, it is my impression that the problem of tuberculosis was not as serious in those days. I had brought in medicines to treat most diseases in 1957 but found a great need for T.B. materials only by the "winter" of 1959-60. Baixão Prêto (pop. 143), which was a little more than half the size of Ponto (269) in July 1960, nevertheless, had more serious cases of tuberculosis. (Of the seventeen March 1964 "definite" tubercular cases, six had died of T.B. by September 1971, and three of these deaths were from the lower rim of Baixão Prêto). To me, this

could have been because the village of Baixão Prêto (meaning "black low area") was in a bowl between small hills as well as being right next to a stream-bordering gallery forest so that the humidity was higher and the breezes lighter. Moreover, one third of the village lay on hard ground and the rest in the usual sand. I used to feel that the micro-climate changed as I walked from the lower side (more closed) to the upper one (more sandy). The great old oral tradition historian of the Canela, Mĩĩkʰlo, 70, lived on the lower rim of Baixão Prêto and said in 1960 that there were more diseases in his village than in Ponto because there was "less air" (kʰok: wind). Ponto was built on a rise totally in sand and about 500 meters from the stream with a lesser gallery forest.

It was these same micro-environmental differences, but with a wider range of contrasts that was being hypothesized as having contributed to the somewhat higher disease rate in the forest: 1) lesser extremes in daily relative humidity, 2) slightly colder at night, 3) less air movement, 4) the hard and usually damp clay ground, 5) the proximity to a river and two sets of cascades, 6) the river valley bottom location, 7) the greater river-edge greenery, 8) the thicker forest canopy, 9) the closer surrounding secondary growth thicket, and 10) the small rise on the south side of Sardinha. These micro-environmental conditions, all of which could have been found in the lush cerrado gallery forests except the size of the watercourse, presumably were contributing factors in facilitating the spread of diseases in Sardinha or in making already contracted diseases more lethal. In the particular location of this village, especially during the "winter", the air did not become dry in mid-afternoon as it usually did in the cerrado, allowing materials to loose their dampness. (The smaller settlement, Baixão dos Peixes, was similar.) It was thought that the constant moisture and colder nights certainly must have aggravated respiratory diseases. The relative lack of air movement might have meant germs were not being carried away. The clay ground for paths or floors possibly retained sputum or other infectious materials better than sand, and clay used for walls confined germs unlike palm straw. The adjacent bush, the neighboring rise, and the Service houses on the road tangential to the village, were factors which served to collect and concentrate feces. These human wastes could then be walked on, carried by flies to food in the village, or washed with the first heavy rains from the village-edge rise into the community or into the river for possible consumption. It is known with certainty that at least hookworm and certain kinds of amoebae contributed to intestinal problems, and surely there were other parasites and diseases which could have been spread in these manners.

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Looking at the whole picture, however, the discrepancies wer still very puzzling. On the one hand, the Canela had claimed the; were dying off, the Service believed this, and the micro-environmenta conditions appeared to offer at least a partial explanation for theri being inferior health conditions in the forest. On the other hand, th figures demonstrated equivalent cerrado and forest death rates. In trigued by this divergeance between appearances and facts, I called a specialist in tropical medicine, Dr. Franklin A. Neva of the Laborator; of Parasitical Diseases, National Institutes of Health, for an opinion Apparently, the micro-environmental differences stated above woulc not affect tuberculosis. By and large, only closer personal living would cause its spread through near or actual interpersonal oral contacts. Similarly, we agreed that the condition of the earth around Sardinha, whether on the trails or in the bushes around the village, would not greatly enhance the spread of hookworm. The ground was hard rather than broken and in the dry forest shrubbery feces would be too quickly dried out. In any case, it was clear that only a careful on-the-spot, at-the-time study by a medical team could have really resolved these kinds of questions about the relationships between the habitat and the spread of diseases. It may be that there *was* a higher incidence of diseases during the forest stay. No data other than impressions are available on this point, but it did seem that the Canela were suffering from far more illnesses than in the cerrado. Unfortunately the only fact for which there is reliable data is that there were no more deaths in the forest than in the cerrado.

In summary, it appeared that certain of the above mentioned factors operated to collect and concentrate germs making them more available to infect persons, while other factors served to increase and buffer a steadier daily relative humidity level, which together with some colder nights, aggravated and lowered resistance to various respiratory diseases. Although the disease rate may have been slightly higher in the forest, there is no sure evidence for this and there were clearly no more deaths. Some other factors which might have affected the disease rate were surely Psychological, such as the general demoralization, and Sociological, such as the population concentration. Moreover, Fauna factors should have contributed to worsening the medical situation, quite indirectly, through the Canela inability to kill sufficient game and the consequent protein deficiency.

The Canela claims that they were dying off, the general acceptance of this idea, and the possibilities that the forest habitat enhanced the spread of diseases were all important factors which made it very necessary to study the relationship between the environment and the spread of diseases extensively and with great care.

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II — Dimensional Relations (Non-cultural *and* cultural).

G. Spacial (spacing, positioning, and shapes).

While in the cerrado the Canela were living near cattle ranchers and hinterland farmers who were not very sympathetic to the Canela way of life. To the west, north and south, numerous small farm settlements (usually only one to three families in size) ringed the Canela area no more than twelve to twenty kilometers from Ponto. To the east and northeast, the distance was more like 25 to 35 kilometers. The principal ranching communities of Resplandes[9] (pop. *circa* 500) and Leandro (*c.* 300) were located some 35 and 40 kilometers to the east by southeast and to the east, respectively, whereas Papagáio (*c.* 25), Bacabal (*c.* 50), and the Sitio dos Arrudas (*c.* 15) could be found between 15 and 25 kilometers to the west, generally speaking. All of this countryside consisted of various degrees of open to closed cerrados lined from north to south with seven stream-edge gallery forests, the former marginal for cattle raising and the latter fair for one-year slash-and-burn farming. Since Ponto happened to be situated on a major interstate cattle herding trail (from Goiás and Riachão to Presidente Dutra and eventually São Luis), hinterlanders of all sorts appeared daily in the village to sell goods, visit, or obtain medicines from the Service personnel.

To reach the tribe from Barra do Corda (80 to 85 kilometers by trail) it was necessary to go by horse for two days if traveling lightly, or for three days if carrying much equipment by mule. After 1956, Ponto could be reached in nine hours by truck on a cleared straight-of-way through the forest and sandy cerrado, but any vehicle had to pass through the unfriendly rancher community of Leandro, the detour making the trip about 125 kilometers in length. The new (1970) direct road from Barra do Corda along the old mule trail requires only two and a half hours by jeep, or less. Young Canela runners (mempral-tëy: those wanting to move rapidly), if properly motivated, cover this distance easily in less than eight hours.

While living in the forest villages of Sardinha and Baixão dos Peixes on the Guajajara reservation, the Canela were only a little over an hour from Barra do Corda by jeep or some four hours by walking. They were not surrounded by local hinterland farmers or small cattle ranchers, but were more fully exposed to the Barra do Corda city people themselves who often came to Sardinha on the weekends to see the Indians as a tourist attraction.

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9 The Vila of Resplandes is very incorrectly placed on several maps including the one found on page 402 of I.B.G.E. 1957. It should be located on this same map at about 6°05" S and 44°55" W.

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Contrasting the environments, the relocation to Sardinha meant that the Canela were far less in contact with the deprecating influence of the local hinterlanders because of distance and their relative scarcity, and far more likely to receive impressions of their own greater value from Barra do Corda people and regional tourists due to relative ease of access.

The proximity of the Sardinha Guajajara village, a third of a kilometer away, must not be underestimated since the Canela clearly learned a great deal from these neighbors.

Other Spacial factors are: 1) the difference in altitude between the cerrado and forest locations; 2) the distance along the dry-to-wet gradient from Bahia to northwestern Maranhão; 3) the crest-of-hill location of Ponto versus the bowl positions of Baixão Prêto and Sardinha; 4) the proximity to the river in Sardinha and Baixão dos Peixes compared with the greater distance to the streams in Baixão Prêto and especially Ponto; 5) the small hard ground rise on the southern edge of the village of Sardinha versus no comparable rises close to the perimeters of the other villages; and 6) the proximity to the Service Post houses and the Service road tangential to the eastern edge of the village. The first three items have been thoroughly discussed in another place, but in should be remembered that these are basically spacial factors in origin though certain of their other components may be more apparent.

Ponto and Baixão Prêto were some 500 meters from the Santo Estêvão stream, while Sardinha and Baixão dos Peixes could not have been more than 100 meters from the Corda River. On the south side of Sardinha about 20 meters beyond the cleared spaces behind the houses was a small elevation almost four meters above the street level. Because of the cover offered by the trees and dense shrubbery on this low ridge, its near side served as an excellent place for defecation, especially at night. This problem was compounded because of the location of the Post houses and their access road tangential to the village and the river beyond it, all on the eastern perimeter. This positioning left no ground cover in the eastern sector and necessitated that defecation take place only to the north, west, and south of the community. Canelas living in the eastern quadrant and especially to southeast, used the rise as did the southern edge people. This concentration of individuals walking in this wooded area combined with the possibilities of the rains washing feces into the village constituted what was thought to be at least somewhat of a health hazard.

A Spacial factor that is difficult to evaluate is the chance relocation distance, namely, only some 50 kilometers. If the Canela had been moved to a forest a 1,000 kilometers away, the attitude to return

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and the possibility of actually finding their way back to their home lands would unquestionably have been quite different.

In summary, two Spacial factors (elevation and climate gradient positions) contributed etiologically to slight macro-climate contrasts, two others (bowl positions and river proximity) were basic for producing micro-climates differences, and two more (the Sardinha southern edge rise, and the Post houses and road proximities) contributed at least theoretically to greater disease spread possibilities. The relocation to Sardinha exposed the Canela to different and more effective acculturative influences both from the city people and from the Guajajaras. The fact that the Canela were relocated only 50 kilometers away was crucial but difficult to handle as a factor.

H. Temporal.

If the messianic movement and the consequent Canela relocation in the forest had taken place several years earlier, say before 1955, there is little doubt that the ranchers could have taken over the entire Canela territory and that the Service would have been powerless to protect the Indians or their lands. In those days the arm of Brazilian Federal law was not strong enough to really defend the Canela except by speaking for them. By 1963, with the new airport (1962), the new truck bulldozer-cleared straight-of-way (1956) from the Brazilian Northeast (through Floriano, Pastos Bons, and Mirador), and certain changes in the nature of local politics, the traditional effective independence of the interior Brazilian from the national scene was fast disappearing in this region. Nevertheless, in 1963 there were neither sufficient soldiers nor enough political strength to do very much for the Canela other than spring them loose from the ranchers' trap and rush them onto the Guajajara Indian reservation.

The best time for the occupation of the new lands in such a region comes in June or July, just before the selection and cutting out of new farm plots. This is the time when the hinterland people are free from their various farming cycle labors and can move around to change locations. This is probably one of the reasons why the 1963 attack occurred in the first part of July.

After the attack, the ranchers and hinterland farmers must have been sufficiently unsure of how the Brazilian government would react so that only a limited amount of Canela land was taken over to be used as farms. If it had not been for the Brazilian Revolution of April 1964, however, it is quite probable that these same ranchers and allied farmers would have moved further into the Canela lands in June or July of 1964, taking them over almost completely. The Revo-

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lution, however, put great uncertainty and fear into the hinterland people of the whole region so that such a move seemed much more risky in 1964 then earlier. Nobody knew what the new military government might do, and since it *was* military, they suspected that soldiers could be dispatched much more easily.

The point to be stressed here is that if the 1964 Brazilian Revolution had occurred even four months later, the Canela might have found it considerably more difficult to return to the cerrado. Once hinterland farmers and ranchers had occupied most of the area, it would have been almost impossible to dislodge them without actual military intervention, an unlikely action. Besides, in five years time a considerable portion of the Canela gallery forests might have been cut down for farm lands. If this occupation of their ancestral territory had occurred, the Canela would have realized that they would have to adapt to the forest medium and that there was no alternative solution for their future.

Besides the timing of the Brazilian Revolution in relation to the hinterlander attack and the potential territorial takeover a year later, there are numerous other Temporal factors, but none that are important enough to mention here.

III — Cultural Relationships.

Extracultural (non-Canela).

I. Hinterlanders (kupẽ-gahàk: lesser non-Indians).

While in the cerrado, the Canela were surrounded by cattle ranchers and hinterland farmers. The ranchers wanted the Canela cerrados for grazing, whereas the small farmers needed the gallery forest for putting in farm plots. These farmers led a life that was technologically so similar to the Canela's that they were in fact only slightly better off economically. Considering the great cultural difference, the farmers needed to believe that they were superior and treated the Canela accordingly. As long as the Canelas were respectful and stayed in their places (for instance, not eating at the same table), the small farmers saw and treated them as human beings and even friends. The rancher way of life, on the other hand, was so much better off economically and so directly competitive over land and cattle stealing, that these community leaders could scarcely even be friendly and saw the Indians as *bichos do mato* (forest beasts). In the late '50's a rancher told me he would kill off the A-Canela if the opportunity presented itself, and take over their lands. In 1965, he did occupy their forest hunting

grounds. He felt that since they were lazy, produced nothing, and got drunk all the time, he deserved their lands more than they did. He was making a contribution to the national economy after all, and they were merely planting tiny gardens and begging all around the hinterland community in order to stave off hunger. This was generally the point of view of the economically middle and higher level hinterlanders.

The Canela frequently visited the homesteads of the hinterland farmers and often made friendships with them. During the sparse "winter" months, before the February to May harvest period, there was a lot of contact between the Canela and their simple neighbors. The former used to seek small jobs regularly from the latter, such as fetching wood and carrying water. They were paid in manioc roots, salt, and other things they needed. Often they were given shot, powder, and caps to hunt with and expected to divide the proceeds. A lot of hinterland culture was communicated to the Canela through this medium of interchange.

The Canela liked to have their children baptized and given Christian names. In 1959, after the itinerant friar had left Ponto on his donkey, I asked Kawkʰlɛ, 64, why he had had his grandson baptized. He said this was so he could have a hinterlander *compadre* who would now have to give his family meals and let them stay in his house whenever they visited his community.

During their forest exile, the Canela had considerably less contact with hinterland farmers and almost nothing to do with hinterland ranchers. This meant that the possibility of working for such farmers during the lean "winter" months was largely cut off. It had become very difficult to go back to the cerrado region and reestablish relations with hinterland farmers in order to work for various types of foods because of the serious enmity which had sprung up between these two peoples. Consequently, the Canela found an important source of food unavailable to them, and this certainly contributed to their difficulty in nourishing themselves while in the forest.

During the entire period of the Canela stay in the forest, vicious rumors were circulated by the cerrado hinterlanders about what they would do to the Canela if they returned as a group. For instance, they said dozens of machine guns had been purchased and truck loads of firearms had been distributed in Leandro and Resplandes. Moreover, the areas of the Aldéia Velha (Paglɛ: small scorpion), Brejo dos Bois (Pɔɔ-tik: black cerrado deer), and Dois Riachos were actually occupied. The Canela returned these hostilities by announcing they were looking forward to eating the liver of the head man of Leandro.

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In reality, the hinterlanders were more affraid of the Canela than vice versa. After all, five lives had been taken, and they did not know the Canela do not believe in revenge. When the itinerant friar tried to hold a mass in 1966 near the old Post in Ponto, a rumor reached the would-be worshipers that an armed Canela contingent had arrived in the Baixão Prêto area and was heading their way at a trot. So, the hinterlander group rapidly scattered in three directions and the friar rode away to his next stopover skipping the mass. Actually, the Canela are remarkably peaceful and do not harbor revenge. Problems between individual Canelas and hinterlanders could have erupted during this period because of hinterlander provocation or general misunderstanding, but the Canela would never have planned a deliberate attack on any hinterland farm settlement or town community.

The hinterlander rumors effectively served to keep many Canelas from returning to the cerrado. Particularly the women and older men were afraid to go home; they actually believed the rumors. This fear was eventually dissipated by the great longing for their homeland environment and by the fact that no real hostilities between individuals ever did occur.

J. Barra do Corda People (kupɛ̃-mpɛy: good non-Indians)

On the other hand, while in the forest the Canela experienced considerably greater contact with the dwellers of Barra do Corda. The people of this town, by and large, are in communication through radio, material goods, and education with greater Brazil, whereas the hinterlander maintains an entirely separate and "backward" subculture somewhat parallel to the Kentucky Mountain People in the United States before World War II. While the hinterland ranchers despised the Canela and the farmers deprecated them but behaved in a friendly manner, the Barra do Corda city people, though very paternalistic, treated the Canela in a far more humane way. There was no necessity for competition between the Indian and the town dwellers. The better educated city people viewed the Indian with considerable interest and wondered about the exotic characteristics of his very different way of life. They were ashamed of the 1963 attack. In any case, the Canela experienced less prejudice and discovered more desirable characteristics among the Barra do Corda people. These small city dwellers were more generous and certainly less mean and stingy with their foods and possessions. After coming to know some of the better city people, the Canela could not help being influenced by their more likeable ways and attitudes. This kind of contact clearly was a contributing factor in mitigating the Canela dislike for outsiders in general, and

consequently was effective in breaking down their traditionally strong self-esteem and their confidence in their own culture.

The Canela already knew that Barra do Corda people would buy certain useful traditional objects like mats, bags, and sieves and that big city dwellers far away from the area would purchase typically Indian artifacts such as war clubs, bows and arrows, and feathered headdresses, but it was in Sardinha that the Canela developed the practice of commercializing their goods and making them rapidly and in an inferior manner just for sale to various sorts of city people. In Sardinha, this new industry became really viable (some forest materials substituted) partly due to the great economic need but also because of the proximity of the market and the significant number of visitors. During their exile, the Canela learned a craft that was to partly replace begging and small jobs in hinterland communities when they returned to the cerrado.[10]

K. Indian Protection Service Personnel (mẽhĩĩ.t ɔ̃aypa-gatʸe: Canela, Indian-raising people).

Contact with other employees of the Federal Government in the Service beyond just the tribal Post personnel was probably more extensive while the Canela were in the forest than when in the cerrado. After all, it was considerably easier to get to Barra do Corda and the Canela certainly did this more often from Sardinha than Ponto. Nevertheless, for decades the Canela had been coming from Ponto to spend some time in Barra do Corda, and on these trips they had always been supervised by Service personnel. On the whole, the Service's treatment of the Canela was similar in both situations.

The outstanding factor of Service influence in the forest-stay cerrado-return situation was that while the Service personnel forbade the Canela to go back to the cerrado, they nevertheless, consistently promised that someday they would be allowed to return to their native lands. If it had not been for the Service prohibition, the Canela might have trekked to the cerrado in 1964 only to precipitate a massacre. On the other hand, without the Service promise that eventually they would return to their cerrado homelands, the Canela might have accepted more readily the challenge of forest problems and learned how to adapt to these conditions more succesfully.

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10 Most of the Barra do Corda historical information scattered throughout this paper was given to me in December 1970 by the illustrious Mayor of the Municipality, Snr. Lourival Pacheco, and by his assistant, Sr. Antônio Gomes. Their very kind help and gracious cooperation has been greatly appreciated.

L. Guajajara Indians (Tenetehara) (Plĩzĩĩ.lɛ).

These Tupi-speaking Indians, former enemies of the Canela (they fought each other in 1901; see Nimuendaju 1956:149), gave the Canela very little trouble during the first years of sharing their reservation. There is no question that there were enough forest lands and game to support both tribes. There were even some flirtations and one temporary "marriage" between the two peoples. Generally speaking, each tribe had previously viewed the other one as considerably more contemptable than local Brazilians, calling each other "bat eaters" (ɣeb.lɛ ʔkʰul-gatɛ: Canelas) and "frog eaters" (pol.ti ʔkʰul-gatɛ.ye: Guajajaras), but when placed close together, they recognized the problems they had in common as Indians (ampɔɔ-kʰla) and a lot of the hostility evaporated.

Difficulties between the two tribes began to arise only in 1967 and 1968 when it appeared that some Canela might actually want to stay in the forest. Evidently, the Guajajara were very much against this possibility and several near-riots occured. These troubles were certainly one of the factors causing the Canela group trying to stay in the forest to realize they really had to go back to the cerrado.

Sociologists say that American children today absorb more from their peers than their parents, and possibly for parallel reasons the Canela quickly adopted certain things from the Guajajara that they had resisted learning from the Brazilians for years. It was no longer possible for Canela males to go naked in their village, or even in their homes, because Guajajara girls might be wandering around and their customs were very different (Nimuendaju 1946:47). It even became necessary to wear shorts or pants instead of several folds of cloth tucked in front under a belt, as the A-Canela still are proud of doing in their village today. Beyond this, many Canela saw what it was like for Indians to work hard in their farm plots and to be reasonably well fed and enjoy certain surpluses. Several Canela developed a pride in offering hospitality while in the forest.

M. Greater City People.

In Sardinha, the Canela were much more accesible to tourists from other Brazilian States, who drove into this region of Maranhão in order to hunt game in the dry forests. The Canela also came more under the attention of administrators, scientists, and medical personnel from other parts of Brazil. They were even visited by several successive Service heads because they had become well-known disaster refugees. These contacts were superficial, but again, the recognition that even outsiders can sometimes be good people like the Canela, tended to

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undermine confidence in the unique rightness of the traditional way of life. Out of State tourists who drove into Sardinha sometimes were very generous with their funds, both because they gave in to persistent Canela begging for cash and because they were unaware of the monetary value of items they purchased. The fact that important outsiders valued them for being Indians certainly helped to rally the flagging Canela morale.

Intra-cultural factors.

N. Technological.

Techniques and equipment used in order to carry out effective slash-and-burn farming in the cerrado gallery forests and in the dry deciduous forests near Sardinha are essentially the same. Such farm equipment consists of axes, machetes, hoes, and digging sticks. By the time they had entered the forest, the Canela had lost most of their material wealth either from sale to support the messianic movement or in the attack and flight from their villages. Both the Service and the visiting anthropologist contributed towards supplying the needed farming equipment in 1964, but the Canela found it so difficult to obtain food that they usually sold their newly acquired metal implements.

There is no question that the Canela had less equipment while in the forest and that this factor could have contributed towards general discouragement. Each Canela likes to have his own implements because it is difficult to borrow such tools from others, though it is usually possible to do so from relatives. If you lend a machete to a non-relative it might be sold for food. The fact that the Canela had less equipment in the forest, nevertheless, cannot be considered of great significance in the total picture.

The same assessment can be made on the subject of hunting. There tended to be fewer shotguns in Sardinha because these weapons were repeatedly sold to obtain food. This factor combined with the greater Canela difficulty of hunting in the forest was certainly a deterrent to living there permanently, but should not be considered a very serious one. Some Canelas did become successful in forest hunting, so the real question is why others did not become proficient as well?

It appeared that more pharmacy medicine was available while the Canela were in Sardinha. The two Service agents assigned to them were quite adept at applying these medicines, but nothing could stem the

inexorible progress of tuberculosis, dysentery, anemia and other kinds of diseases. Consequently, although the Canela experienced this technological advantage while in the forest, this asset was not a significant gain for them.

O. Sociological.

Factors of a sociological nature, which may have contributed to staying in or leaving the forest, are difficult to evaluate. The social structure of the Canela in the forest was essentially the same as it had been in the cerrado except during the messianic movement. The chiefs were the same in both places, and the split between the two villages continued in the forest because the second chief, Kaapel-tik, 53, took most of the former inhabitants of Baixão Prêto to live with him in the new village of Baixão dos Peixes some eight kilometers up the Corda River beyond Sardinha. So, at least from a political point of view there was little difference.

Demographically, there were fewer elders and men in their 50's to lead the tribe. Five had been killed and others died. The role of being an elder, or councilor (prɔ.ʔkʰə̃mə̃ : in the ashes) in the plaza (kəə) (Nimuendaju 1946: 90), passed in the traditional manner from the age class of the deceased miĩkʰlo, who would have been about 73 in 1963, 20 years down [11] to the age class of the elder Kaapel-tik, 53. These changes tended to weaken the control of older people over younger ones, but this was not a matter of great comparative significance because this trend had been well under way for a

11 Old time South American ethnologists who are familiar with Nimuendaju's *The Eastern Timbira* might have quickly noticed an inconsistency when I wrote that the role of being a councilor jumps two age classes down (20 years) when it changes hands, instead of one age class (ten years) as is described in the text (1946: 90-2). About every ten years a new class of "novices" complete their puberty processing, and this precipitates an older age class into moving to the center of the plaza. This graduation takes place first from one moiety and then from the other one. The men of each side in turn become new members of the group in the center of the plaza, but only the "lower" (Nimuendaju's "western") age class moiety members are called "councilors" (prɔ ʔkʰə̃mə̃) and because of this name, it is they alone who govern the festivals and numerous rites. They hold this right for twenty years to the exclusion of the incoming senior "upper" (Nimuendaju's "eastern") age class ten years later. The "upper" age classes (below and/or above the prɔ.ʔkʰə̃mə̃ in age) are present at all the council meetings but take few initiatives or important stands. It would be possible to call *all* the older men in the center of the plaza "councilors", and in the typically cooperative Canela fashion, they all do carry out some of the "councilors" roles at certain times, but the Canela usage is to call only the "lower" moiety people, "prɔ.ʔkʰə̃mə̃", so I use the term "councilor" in the same way.

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considerable period of time in the cerrado. This loosening of the structure, however, made it much easier for young Canela males to leave the tribe to find work in Barra do Corda or further away in "the world".

Twenty youths did go to seek their livelihoods elsewhere temporarily or permanently, but fourteen returned later. After their departure, however, these younger people ceased to have much effect on the Canela community except that an entirely new possibility for a male course in life had made its appearance.

Although the slight weakening of the social structure, particularly with reference to generations, surely contributed to making it easier for the young to leave the Canela communities, nevertheless, it was really hunger and forest conditions that were the big factors contributing to these emigrations, and also to the increased scattering of Canela families into small job exchanges in Brazilian homes during the forest "winters." Since it was almost impossible, at first, to visit the familiar cerrado hinterlander homes, and since there were only a few forest hinterlander communities near Sardinha, the Canela were forced into greater contact with the local city people for similar purposes. In summary, hunger, hinterlander hostility, and proximity to the city caused this change, rather than the loosening of the social structure.

When eighty per cent of the Canela had finally moved to the cerrado by August 1968, leaving the younger Kaapel-tik, 36, with something like a fifth of the tribe hopefully remaining under his work-oriented leadership in Sardinha, it became very evident to his followers that they would be harming the social futures and the day-to-day pleasure of their children if they remained in the forest. Canela life presupposes a great deal of social contact at all ages. Nothing is more unbearable than to have to live in small groups working together for sustenance but with little group fun. The characteristic life of the isolated hinterland farm family is seen as being miserable and mean for this reason alone. So, the younger Kaapel-tik and his followers could not stay in the forest without depriving their children of an active social life and festival positions — chances to be selected and to perform in the various traditional pageants.

Whereas sociological factors cannot be considered highly significant in the over-all Canela return to the cerrado, this child socialization factor contributed to the return of the forest-adjusted minority group after the rest were already back in their homelands.

As shown earlier (see page 235), the population growth rate during the forest exile was approximately zero. Various factors in the spread

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of diseases in Sardinha have already been discussed, but there is an additional one of Sociological etiology. It seems that there were simply too many people living in one community for their traditional defecation practices not to be unsanitary in the forest. In the cerrado, 400 Canela could disperse themselves sufficiently to find cover, and the hot sun and sands, and appropriate insects would do the rest in a minimal time. In the forest, however, 400 Canela left unburied feces too close to the village, and the sun and winds penetrated the foliage to help in the decomposition of these human remains only to a considerably lesser extent.

The traditional forest Guajajara also left their excrement unburied, but they lived in smaller communities of 50 to 150 and were embarrassed to be seen obviously leaving for such purposes or returning. Consequently, they tried to wait until they were out on the trails and in the farm plots, or going into the woods for other reasons (Charles Wagley; personal communication). The smaller community size made for less concentration of feces near the village, and the greater modesty tended to disperse individuals further from the central settlement.

The Canela, on the other hand, instead of avoiding being seen leaving or returning from such activities, openly depart and come back when nature calls. A male will say, "wa ik^{h}wë" (I am going to defecate), and simply heads for cover. Others behave as if the person were invisible as he goes and when he is returning, and then they ignore him until he has taken up some other sort of activity. Only a "niece" (hapal-ǵwëy) might joke with an "uncle" (ketti), implying he was coming in from a quick sex encounter (Crocker 1964: 26), even though she knew otherwise.

This traditional Sociological factor of community size, coupled with little shame and non-burial of feces, created no sanitation problems in a cerrado habitat, but was hypothesized as contributing somewhat to the spread of certain diseases when practiced in the forest.

Another Sociological factor of a similar nature is the traditional proximity of individuals during certain activities and their body contact practices. Canelas work, eat, and sit around very close together. They sleep in nuclear family clusters, almost piled on top of each other. They use anybody's utensils, rub saliva-based urucu paint of relatives' bodies, and are little concerned about coughing, blowing noses, or spitting close to someone else. The traditional extramarital sex practices necessitate that numerous intimate contacts are being made daily outside the family circle. It was hypothesized that all of these activities would tend to spread certain diseases.

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These social practices, however, were carried out in the forest in much the same manner as in the cerrado. The differences lie in the more constantly high forest humidity, the non-porous mud houses, and the damp earth floors, all of which, it was hypothesized, tend to enhance contagion. Assessing these differences, it can be said that a traditional Sociological body proximity factor, which created few health hazards in the cerrado, might have contributed more to the spread of certain diseases in the forest due to facilitating factors which were micro-climatic and Mineral in nature. In reality, there is no proof, however, that these factors did actually enhance contagion in the forest.

P. Psychological.

I have questioned more informants about the Psychological factors involved in the study than about the contributing factors in any other category. It became evident quite early in the research that the key factors to the balance in the stay-or-return process were to be found here.

Psychological factors as a whole often appear to be on the other side of the coin from factors of other categories. They often are the particular Canela emotional reactions to Climate, Fauna, or Extra-cultural factors, or elements of any other categories.

Like any people who are happy and successful in their adaptation to their particular ecological niche, the Canela loved the cerrado countryside. It provides great satisfaction merely in its visual appearance. They prefer the more open *campos cerrados* characteristics to those of the taller and more entangled *cerrados* and *cerradões*. From the typical low mesas of the region a person can see long distances. The elevations just to the north of the old Ponto village were considered very beautiful. In the forest, however, there were no vistas of distant views. Nor were there the small, picturesque trees standing uncrushed and well appart, displaying their wholeness and uniqueness for all to see. When the observer knows the Canela personality, he is tempted to perceive a relationship between their focus on imagination, independence, and individuality and the particular beauty, charm, and separateness of many of the trees of this Canela ideal, Eiten's (1971: 162-3) "Low Tree-Tall Shrub Savanna (*cerrado aberto*)", his class "3B." Actually, Eiten's "Low Woodland" (*"cerrado de árvores, quase-fechado"*), his "2B", is more frequent than the Canela ideal "3B" throughout the Canela region. I have almost never felt greater enchantment than when riding through this cerrado countryside, from rise to rise, by the light of a full moon.

The Canela love to make clean, straight (ku?tak) lines in nature. They rejoice in the arrow straight paths built by the Pep-gahäk troop during their great festival by that same name (see Nimuendaju 1946: 214). Such roads would be difficult to construct in the forest. The "paths" cut in the hair of adults or babies as the traditional style must be absolutely straight and neatly groomed. Men report favorably on the pubic hair of a girl they have "seen" (iitɛ?hɔ̃ɔ̃puŋ), saying that it is sparse (galã) and not tangled (a?kʰet pïlɔk : thicket-like) comparing it to beautiful, semi-open stretches of cerrado (pɔ̃ɔ̃ galã).

I could go on for a number of pages contrasting the two environments from the Canela perceptual point of view. Let it be sufficient to emphasize that the differences are highly significant in furnishing psychological gratifications.

During an exciting discussion in the Barra do Corda Indian Foundation headquarters in September 1971, Júlio Tavares, the thoughtful chief of the Foundation for the area, stated that the primary reason why the Canela had to return to the cerrado was one of "amor da pátria." His second reason was that they felt that they had to return merely because they had been forced to leave. This latter point I support to some extent but not completely because the Canela are not very resentful about being pushed around. They are easily led, are not compulsive about following out certain courses of action, and are more practical than vengeful in making long trend choices. The Canela individual is actually not very "free" because he is always being dominated by a chief, a group, or a relative. He is politically malleable and used to being forced into doing what others want him to do. He might want to go back to the cerrado to some extent because he had been driven out, but I would not assess this point as an essential factor. Moreover, no informant has ever brought up this idea as a reason for returning.

The local Foundation chief's other idea, however, I think is absolutely fundamental to the Canela need to return. They simply loved the environment in which they were raised. Careful and intensive work with the younger Kaapel-tïk in September 1971 brought out the Canela fixation on thinking about the cerrado in the quieter moments of the late afternoon or the early dawn. This "thinking" was expressed in his use of the Portuguese terms *imaginando* and *lembrando*, possibly "imagining" (ay.kʰə̃m pa: listening to oneself), and "remembering" (amži-yapak-kʰlɛ: one's ear cavity). Evidently the life experiences of the cerrado would negatively affect the feelings of a Canela when he was inactive, and the circumstances of the forest were simply not

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gratifying enough to replace or reduce this compulsive "thinking." Evidently, this continual mental rumination about the lost cerrado beauties and pleasures was completely demoralizing and demobilizing. Kaapel said they felt weak and could do nothing but sit and continue to "think."

The Canela interpret the difference in relative humidity between the forest and the cerrado in terms of sensation of personal weight: "I am heavy" (iibiîii) versus "I am light" (iigaykug.lɛ). In the cerrado, the Canela simply feel better. In August 1966 I traveled on horseback with a group of Ramkokamekra-Canela to the Porquinhos cerrado village of the Apanyekra-Canela. The joy the group experienced when they entered the cerrado was too convincing to not consider it very significant. At least one youth propositioned a girl to express his delight. To be living in the forest was depressing in itself. Forest earth was "cold" (kʰli) and unhealthy whereas the cerrado sands were "warm" (gakrɔ) and activating.

Although disease was not devastating the tribe while they were in the forest, it was certainly demoralizing them. Moreover, the Canela had a tradition of leaving village sites where a number of deaths had occurred. In 1951-52 a group of Canela constructed a small village (Arrodeador) on an extension of cerrado countryside surrounded by forest. It was expected that the soil would be good and the agricultural products abundant. Actually, the farming was very successful. Nevertheless, several Canela died there that winter, so the village was abandoned. The drive to leave Sardinha for this traditional reason must have been strong and compelling. The ghosts of departed relatives (mɛgalɔ̃) were too much around them, presumably seeking to enlarge their membership.

What probably can be assessed as the most crucial Psychological factor was the Canela interpretation of the Service attitude to the forest stay. The Canela were so adamant and outspoken about returning to their cerrado habitat that the Service personnel almost had to make promises that someday they would be allowed to return just to keep up the general morale, and this they did from time to time. Consequently, the Canela saw their stay in the forest essentially as being temporary. If the Service had persisted in the policy first announced when they had arrived in the forest, namely, in the advantages of remaining, the Canela attitude toward agricultural work and learning the hunting techniques of the forest might have been significantly different.

It takes a farm plot of some eight to twelve *linhas* (6-9 acres) to support the family of a hinterland Brazilian, according to the res-

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ponsible Service agent, Vergilio Galvão. Some farmers will rely on from four to six *linhas* but supplement their harvests with daily job work on larger farms. The Canela traditionally have put in farm plots ranging between two and four *linhas* (0.6-1.2 hectares) in size. While in the forest, however, they were consistently making plots that ranged from one half a *linha* to two *linhas* at the largest. Sometimes they cut out the farm plot and simply abandoned it, planting nothing. Others erected fences cattle and horses could push over with ease, and so lost their crops. These points were investigated carefully, so it can be asserted that these deficiencies can be attributed mainly to demoralization and possibly to the realization that they would loose what they had planted if they were suddenly allowed to go back to the cerrado. This behavior might be interpreted as a kind of unorganized slow-down strike to force the hands of the Service personnel.

It is also curious that the R-Canela did not learn to hunt forest game while in Sardinha. After all, the A-Canela were successful hunters in the same forest further to the south and other Gê-speaking tribes have hunted their forests as well as their cerrados. It would seem that this was another aspect of the "slow-down" strike. Unfortunately for them in these circumstances, the energetic, athletic Canela were accustómed to eating great quantities of meat. The ordinary phrase to express hunger, is iiĩ́mɔ̃ pɔ̃m, or literally, "in me need," but hunger for meat has a special term, iiyate, "I am hungry-for-meat." So, not learning to hunt in the forest might well have been a result of some sort of strong complex of inhibitions and must have caused considerable suffering and demoralization besides malnutrition and especially a protein deficiency.

The personality pattern of withdrawal when refused or hurt was well established for the Canela back in 1958 and 1959 during the period of my basic field work with this tribe. I can well remember when Tɛlen, 25, came into my house and insisted that I trade with him, giving him an axe in return for some material artifacts. I had to refuse him because the evening before, the tribal council had agreed to my plan of one axe per house to spread the benefits evenly. Since his father-in-law (pɔ̃yket) had already contracted to trade for an axe, I could not give another one, even in exchange for artifacts, to the same domestic group. He understood this but nevertheless kept insisting, and when continually turned down, he retreated to his house to sulk for the rest of the day. He did not become aggressive nor did he dry to obtain an axe again in some otherway. He just withdrew. I can also vividly remember back in those days the time when I was being hard pressed by the tribal council to provide two head of cattle

instead of one for a Baixão Prêto festival. The chief of the village, the elder Kaap[illegible]-tíjk, 49, was really trying to publicly shame me into this extensive support. So, remembering the withdrawal pattern, I closed my face and walked back slowly to the house of my Canela maternal family, entered my partitioned area, and closed the door in a deliberate sulk. My "consanguinal relatives" (mẽ hũũkʰ ʒe) soon entered the room to discuss my observed mood and spread around the news of how I felt, supporting me completely. It worked! The chief had pressed me too far, and I had reacted in an appropriate Canela fashion. My relatives spoke for me in the council and the matter was not brought up again.

In 1913, the Kénkateye (see Nimuendaju 1946: 30), in those days the third Canela tribe (Kʰen-gatye: hill people or rock people) were attacked by the rancher family living in the Sítio dos Arrudas and were either killed or dispersed. Some joined the Apanyekra-Canela about 50 kilometers to the north by northeast and others traveled some 240 kilometers to the southwest to live with the Kraho (Kraa-ho: paca's hair) Indians. An interesting result of this massacre is that neither the R-Canela nor the A-Canela carried out any sort of revenge or maintained any hostilities other than withdrawal when coming into contact with members of the Arruda family. This was still evident in 1960 when I spent the night at the Sítio dos Arrudas with two Canela companions. This pattern, of course, as highly adaptive to the situation because almost any hostilities could quite possibly have been used as an excuse for another massacre.

My point is that the R-Canela reacted in a similar manner to the cerrado-to-forest relocation. They did not like the forest, but nevertheless, they were forced to stay there against their wishes. So, they simply withdrew, not back into their maternal homes, but to within themselves — inactivity. This can be seen in their letting horses eat their crops close to the village plaza in plain view of the elders; in their putting in very small farm plots, and in often not planting crops in these prepared areas; in erecting weak garden fences; in not caring to learn to hunt; in not keeping the taboos on food and sex restrictions; in making little effort to carry out the festivals in the traditional manner, and in countless other examples of demoralization.

When the Canela needed herbal medicines or any cerrado materials associated with the restrictive taboos and the festivals, these could have been found in Arrodeador, some six kilometers to the east by southeast. This was no further away than many of their farm plots have been traditionally located. Women could have walked to Arro-

deador after sunrise, collected their materials, and returned before noon, or in the cool of the evening. Runners sent to obtain a specific medicine could have been back home in two hours. Another cerrado spot called Azique was similar in floral cover and even closer to Baixão dos Peixes, but when two Canela women (Kuwlë, 17; Lɔ̃ɔ̃.ti, 38) went there to gather buriti fruits late in 1963, they saw two large anaconda snakes fighting in the pond. This observation was translated into a prediction of mortal danger by an important tribal curer (Crocker 1963: 166), and the warning was spread around that anyone visiting the Azique area was sure to suffer dire consequences. This may have been an unconscious way of eliminating an effective aid to successful forest adaptation. Quite clearly, however, cerrado materials were easily obtainable not very far away from Sardinha, so the "unavailability" of these materials while in the forest, must have been the way the Canelas wanted it to be, at least at some level of consciousness.

There is some evidence that the Canela felt guilty for all the cattle they had stolen during the time of the prophetess and the messianic movement, which had become completely discredited. They often spoke of the ranchers coming to attack them in Sardinha (an absolute impossibility) because of the cattle they had eaten. There is also the likelihood that they were enjoying their suffering too much to care to do anything about it. The hinterlanders characteristically behave as if life were nothing but troubles. When you ask them how things are going, they are likely to answer, "estou pelejando," meaning, "I am struggling." Living out the same spirit, certain of the more begging-oriented Canela have adopted the hinterlander mannerisms of eternal suffering. Maybe their claim of being wiped out by forest diseases in a few years can be interpreted in the light of such masochism and can also be seen as a symptom of guilt. It would seem wisest, however, in the absence of formal psychological tests, to lump all of these negative reactions into one general category we can be more sure of and call it "withdrawal."

Another examples of demoralization, which could be seen as masochism, self-depreciation, or simply not caring, was that the youths were breaking their puberty food restrictions by eating certain small animals instead of the larger, stronger creatures of the forest or the cerrado. They claimed they did this out of hunger and the lack of the appropriate kinds of meat, but they could have gone to the nearest cerrado where they knew the hunting if they had really wanted to do so. Whatever the real reasons may have been, they were not living up to their traditional belief that only through the maintenance of severe restrictions against certain foods and sex was it possible to become a

strong, able man who could hunt well and bare up under the normal hardships of life (Crocker 1971: 327). Breaking such taboos weakened their confidence in themselves. Apparently, youths were so shameless on one occasion that they even at jaguar meat, which to several informations was an incredible horror.

Turning to another example of the effects of demoralization and hunger on the social structure, back in the cerrado free girls (mɛnklɛɛklɛɛ.lɛ; see Crocker 1971: 327) and even mothers with children used to give fully of themselves to please desiring men as well as for their own satisfaction, asking only for an occasional present as a token of special affection, but in Sardinha it became hard for a man to win extramarital sex without arriving with a substantial portion of meat to give the girl "strength" before she could bear up under the experience. This change was striking at the heart of the Canela goods and services distribution system which operated on a free flow of assets along certain lines to all members of the tribe without immediate payments. The highest Canela virtue had been generosity (hə?gaylɛn).

In summary, a study of the Psychological factors is like reviewing all the other categories of factors from a different point of view, namely, the Canela's reaction to his physical and social environment. Basically, his adaptation to the physical habitat in which he had been enculturated was so gratifying that another setting could not be substituted without causing significant demoralization. This paralysis of ordinary activities was enhanced by the Service promise that they would someday return to their lands and by the Canela tendency to withdraw when a situation was not to their liking. These three points are sufficient to explain in a very general manner why the Canela did not learn to hunt well or farm adequately while in the forest, and to some extent why they believed they were dying off. (My criteria for adaptation to the forest were principally economic viability and psychological wanting to stay). Since about eighty percent of the Canela could not be characterized in this manner, it is clear why the tribe had to return to the cerrado, but the adaptation of the remaining twenty per cent was excellent.

In 1966, heads of families like the younger Kaopel-tīk, 34; Yɔ̃ɔ̃kʰɛn, 29; pi?to, 40; Həwmlɔ̃ ; 43, Hək-tɔɔkɔt, 36; and Tɛb-hɔt, 53, put in very extensive farm plots of up to four *linhas* and helped by the fertility of the soil, experienced an affluence they had never enjoyed before. In October 1969, the very modest and reliable Yɔ̃ɔ̃kʰɛn described many of the bitter manioc roots left behind in Sardinha as being from ten to 15 centimeters in diameter. Of course, the rest of

the Canela begged, borrowed, or stole most of this surplus, but nevertheless, this achievement gave these work-oriented men a yearning for greater affluence and economic independence. They had adapted successfully to forest living. By 1968, relatively speaking, so had Mõõkʰlɔ, 28; Xɔmtee, 43; Tɔɔmi, 34; Kʰeefë, 33; Hakʰɔ, 39; Kʰlɔ̃-nkwɛ̈n (head down-covered), 55; Kalɔ-ʔkʰlɛ, 45; and the elder Kaapel-tik, 58. There is some evidence that the women liked the forest less than the men. As an aspect of the enjoyment of affluence, the younger Kaapel-tik used to love to entertain hinterlanders and Barra do Corda people in his house, serving them coffee (kafɛ) and manioc bread (kʰwël.tɛ-ʔplɔ: manioc-covered), offering them cigarettes (si'gahus), and sometimes even undercover *cachaça* (koʔë.?ti: very bitter water or really raw cane alcohol). The prestige and social importance derived from being a continual host to others appealed strongly to several of these forest-adapted Canela. Very clearly, it was city materials and economic affluence as well as an ability for hard agricultural work that distinguished the forest-stayers from the cerrado-returners. Except for the 60-and-over men, some heads of families of all ages had adjusted to life in Sardinha.

Analysis and Development

Whenever an analysis of materials of this sort is attempted, there is always the difficult question of the level of generality that should be probed for the various possible factors? In this study it was obvious from the start that a certain combination of factors overwhelmingly caused the return to the cerrado (Brazilian "closed" savanna). The stay-return balance was not a delicate one. Consequently, I feel that an examination in great depth is not warranted and would become laborious and boring to most readers. A well-objectified investigation might indeed sharpen the methodology, but such a step should more properly be taken if there ever are a number of case studies of this sort prepared similarly for cross-cultural comparison.

The search for the significant factors of the logically all-inclusive categories, as a methodological procedure, could have been pursued much further. Many more subcategories and sub-subcategories could have been derived from what is known about the structure of the natural world and their effects could have been examined with care to test for sufficient significance, but such a very extensive search seemed unnecessary for the purposes of this particular study and the factors discovered in this manner would have been increasingly insignificant as the level of generality was reduced. In addition, the various factors within each subcategory could have been

identified as to their stay-return vectors and assessed quantitatively according to their approximate relative strengths. These identifications and assessments with vectors could have been presented as a long list of factors to be tallied somewhat quantitatively, a procedure which would have objectified my mental processes to a considerable extent. Again this seemed pointless considering the obvious outcome of the forest-cerrado balance and the very overriding roles of just a small number of essential factors, namely nine. It should be sufficient to say that many more subcategories, their factors, and the relationships between these factors in the consequent stay-return process were taken into consideration than have been discussed herein, but only the factors at the more general level have and will be handled because only these were seen to be sufficiently significant.

After clearing the methodological deck, it seems best to begin this analysis by discussing the categories of factors that quite obviously contributed very little to the total picture in order to get them out of the way as quickly as possible. The easiest category to eliminate is Catastrophies, though Technology in almost equally insignificant in its effect one way or the other.

Lesser categories that operated against returning to the cerrado were Hinterlanders due to their threats, Barra do Corda People with their town attractions and amenities, and the Greater City People because of the added interest they furnished concerning Brazilian cultural life. Of these, only the Hinterlander threats were sufficiently significant to be considered in a minor way. Similarly, there was also the memory of the traumatic and forced removal from the cerrado, operating, at least at first, to keep them in the forest. The one really big factor, however, keeping the Canela in the forest was unquestionably the Service order that they stay in Sardinha and not venture forth into the cerrado. This will be discussed later. These five factors were the only ones worth mentioning which operated to maintain the stay-in-forest balance in the forest-ward direction. Without them the Canela would have promptly returned.

The role of the Guajajara Indians in making the Canela feel they could not stay on the Guajajara reservation had strong effects during the last few months in the forest, but were not significant in the total picture.

Minerals, Water, Climate, Flora, and Fauna as a complex were of note to the extent they facilitated the spread of diseases in the forest. Minerals were the key cerrado-forest differentiating category here because the richer soils made possible the fuller forest flora

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with resultant micro-climatic differences (greater relative humidity daily ranges; which in turn, to some small extent, may have enhanced the spread of disease, as was locally thought. But since diseases did *not* cause significantly more deaths in the forest and since a study of the mechanisms of spread of the particular diseases in question showed that greater humidity did not necessarily facilitate their contagion we cannot claim that this forest habitat complex of factors, at least in this disease contrasting context, contributed, very significantly to the stay-return process.

The effects of Spacial and Temporal factors are somewhat more interesting, in part because of their fortuitousness. Spacing factors in relation to the Hinterlanders, Guajajaras, Barra do Corda People, Service Personnel, and Greater City People have already been taken into account through the assessment of these Extra-cultural categories. Spacing becomes significant in connection with Climate and Sociological factors, and in both cases in relation to the potential spread of diseases. Nevertheless, since the cerrado and forest death rates were equivalent, these factors contributed very little to the total picture and therefore do not need to be considered further in this context. The Spacing fact that the forest Sardinha village was only 50 kilometers from the old Ponto community in the cerrado, instead of some great insurmountable distance, is of course absolutely crucial.

As for the Temporal factor considered in the study, namely, the coincidence of the 1964 Brazilian Revolution with the Canela removal into the forest and the consequent fact that the ancestral lands remained relatively unoccupied, this relationship is very hard to evaluate and interrelate. This difficulty, nevertheless, shoul not prevent the mentioning of such a factor nor cause the abandonment of the study on the grounds that a certain significant factor cannot be satisfactorily handle. I should simply point out that if my assumptions are correct and the Canela lands had been irrevocably occupied by hinterland ranchers, the Canela would have had to remain in the forest and this Timing factor would necessarily have to be considered absolutely crucial to these results. The alternative situation, namely non-occupation of the ancestral lands, is therefore equally significant; though considerably less obvious, it cannot be discounted since until the time of the Revolution, this is what most likely would have happened in my estimation.

Sociological factors were of little significance in the total picture since the only context in which they might have contributed to a

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cerrado-forest contrast, namely, in the spread of diseases through closer human contacts, need not be considered seriously because the death rates in the two places were almost the same. The 1968 compulsion of the forest stay die-hards to join the rest of the tribe already in the cerrado in order to give their children the traditional advantages in social contacts and festival-pageant roles is again not important in the total picture because it was only a significant force for a minority group during the last few forest months.

Turning to just the "significant" factors, those important enough to be utilized in the final analysis, a reconstruction of the on-going forest-stay temporary balance of factors will first be presented and then the cerrado-return process can be described as the outcome of the upsetting of this balance.

As we discussed in the last section, it would be difficult to underestimate the significance of the call of the cerrado, their beloved homeland, to the Canela while living exiled in the forest. The reverse side of this love-attraction was their distaste for the forest environment, which brings the forest habitat complex of factors into the equation again in another context. This emotional pull to the cerrado and push from the forest were apparently the basic factors in the overwhelming drive to return to the ancestral lands. The carrying out of this great desire, however, was being frustrated by the very effective Service order to stay in the forest, the fear of hinterlander threats, and the memory of forced removal, but being kept alive by the Service promise that some day the Canela would be allowed to return, by the proximity of the lands, and by the fact that their territory remained relatively unoccupied so that returning was actually a possibility. The above described set of opposing "significant" factors came into operation and balance with each other early in the forest stay, certainly before the beginning of 1964. Because of this early timing, they are also being defined as the "primary" factors. Stated more concisely, they are: (1) cerrado habitat complex, (2) cerrado love, (3) forest habitat complex, (4) forest distaste, (5) the Service order, (6) hinterlander threats, (7) forced removal, (8) the Service promise, (9) availability of the ancestral lands, and (10) proximity of these lands. Of these ten significant, primary factors only three operated to keep the Canela in the forest (Nos. 5, 6 and 7), and of these three only one (the Service order) operated with sufficient strength to be labeled "essential"; that is, if the factor were removed, the forest stay balance would become terminated. The remaining seven factors all operated cerrado-ward and were considered essential factors in the primary forest stay balance.

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Now moving on to the significant secondary factors we come to the most intriguing factor of them all.

The withdrawal from activity factor was accelerated during the forest stay as a characteristic and traditional response to situations where the Canela were being treated in an undesirable manner. This reaction as directed principally to the forest habitat complex, their distaste for a multitude of forest elements. To a lesser extend I believe it was also a response to the loss of lives in the recent "battle", the disappointing outcome of the messianic movement, and the purportedly greater number of forest illnesses and deaths. It may also have been a response to the forced removal to the forest. It is then through this withdrawal response that most of the other aspects of non-adaptation to the forest can be understood. Not farming effectively, not learning to hunt, not maintaining proper food restriction, and not obtaining the proper medicinal herbs and festival materials are all examples of the withdrawal posture in operation. Furthermore, the Canela success in convincing the authorities that they were dying off when this was not at all true, is a stunning example of the effectiveness of the withdrawal syndrome.

Although the figures show that the death rate was no greater in the forest than in the cerrado, the Canela believed that forest life was killing them off, especially the babies, young children, and older people. Only with the latter group, however, was this claim to some small extent true. They themselves attributed the "fact" that diseases were more lethal in the forest to the "hot and cold" soil and its dampness, the unavailability of herbal medicines, the bad smells from defecation near the village, and the near absence of winds to take the diseases away. Some thought the greater illnesses were due to thinking about things too much. It was these factors onto which the Canela projected the blame of their healt "demise." These Canela "disease causing" factors did not in actuality contribute to more deaths in this forest so they can only be reconstructed in our analysis as operating in a cerrado-forest contrastive way in relation to the Canela interpretation; that is, since they believed these factors were causing them to die off, it was actually these beliefs which were causing demoralization and withdrawal. The withdrawal syndrome was the principal, essential secondary factor and almost the only secondary factor because it was constructed to be all-encompassing.

The next step is to turn from handling just *factors* to considerring the ecological *categories* of these factors in order to assign these categories relative degrees of significance in the forest-stay cerrado-return question so that this case study can have comparative and cross-cul-

tural implications. This time I will bring in only factors that have been considered "essential". At first glance it is obvious that the Psychological category has contributed in a basic and preponderant manner to the outcome through the cerrado love factor and its reverse image, forest distaste. (Both factors, as Canela reactions, are Psychological but the bases against which the reactions were responding were the complexes cerrado habitat and forest habitat, both composed of the Mineral, Water, Climate, Flora, and Fauna categories). This drive to return was blocked by the Service personnel order to stay and ways kept alive by the Service promise of eventual return, both Extra-cultural factors. The hope of returning was also kept alive by the proximity (Spacial) and availability (Temporal) of their lands. In summary, in the primary balance of factors there were two essential factors in each of the following categories: Psychological, Physical Environment, Extra-cultural, and Dimensional (Spacing and Timing). Going on to the secondary situation, the withdrawal factor (Psychological) emerged as time went on and came to operate with increasing strength and in more sociocultural sectors. It began to assume the appearance of societal malfunctioning in the form of poor food and material support, and purported dying off. So, with the Service personnel "blackmailed" by apparent Canela suffering, the Service's prohibition (Extra-cultural) was rescinded and their promise fulfilled. The Service personnel gave permission in 1966 (Extra-cultural) for the return. Consequently, the stay-return balance was upset and the Canela trekked back to their homelands (completion of the process).

Next, to clarify the longitudinal aspects of the return process, we need to examine relationships between certain factors in the time sequence, as reconstructed in my utilization of the concepts "primary", "sencondary", and "tertiary". The Service personel, not being in good control of the earlier cerrado population data, had no way of knowing that the cerrado and forest death rates were equivalent, so they believed the Canela claims that they were dying off. The Service personnel, however, scarcely needed the Canela explanation. They were aware of the illnesses and deaths, and could see only too well that the Canela were not working and were letting their tribal life fall apart. It became quite obvious to them that the Canela could not adapt to the forest habitat. To the extent that his inabiliy to adjust to the forest made sense to the Service personnel and moved them to action, their 1966 permission-to-return-to-the-cerrado factor can be understood to have operated *directly* in relationship with the forest habitat complex, making return permission a secondary factor. But if it is held that the permission to return could only have been granted after the Canela societal malfunctioning had become obvious to them, the permission factor must be called "tertiary" since a secondary (withdrawal) factor

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activated it. There is every reason to believe that both sequential relationships occurred. So, it can be said that the forest habitat (a primary complex of factors) was effective in destroying the primary balance in the forest stay indirectly, by working through the Canela withdrawal response (a secondary factor) to bring about the Service permission (a tertiary factor here), and directly, by the forest habitat's immediate impact on the Service personnel producing the 1966 Service permission to return (a secondary factor here).

Thinking further about primary, secondary and tertiary relationships and how they are distinguished, we must certainly allow that since the two physical habitats are fixed geographically and environmentally, they must be primary factors in cause and effect time sequences. The Canela cerrado love factor develops in individuals as a result of growing up in the cerrado and therefore is secondary to the cerrado habitat complex. This relationship, however, should really be seen as a chicken-and-egg problem that achieved a balance in the past and since we are considering balances of the present and not how things came to be as they are, the cerrado love factor must be held to be primary also.

The Canela distaste for the forest is more questionable as a primary factor. Did it originate as a result of moving into the forest? No, its existence had been latent as the other side of the coin from cerrado love and has even been expressed at various times in connection with the Guajajara Indians and the partial forest living in Arrodeador. But forest distaste did become activated by the move to the forest. Similarly, the withdrawal factor had also been latent and surfaced when conditions warranted the reaction. Are these then both primary factors like cerrado love because they had existed before the forest balance became established? In a sense yes, but they differ in the degree to which they were intensified after the forest contact commenced. Forest distaste was strong to begin with and remained relatively stable. The withdrawal factor, on the other hand, grew and spread immensely throughout the sociocultural system as the months and years went on. So, to the extent that it existed full-blown at the beginning of the forest stay (somewhat so) the withdrawal factor is primary, and to the extent that it grew as a reaction to the forest contact (much more extensively so) it must be secondary.

Cause and effect relationships (primary, secondary, tertiary, etc.) are hard to isolate and describe because cultural-environmental relationships are inevitably functionally interrelated. This is, especially true of complex relationships once a balance of factors has been established and maintained in an equivalent form over a considerable period

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of time as in the forest stay. So, I am suggesting the definition that all the factors in existence at the beginning of such a balance are "primary", even those factors which are non-essential to the balance, like the hinterlander threats. This beginning point of such a system, being in relative balance instead of flux, and having considerable time ahead in an equivalent balance before a significant realignment, is an advantageous cross-section in time for arbitrarily designating every factor as "primary". If resultant factors appear later in time (Service promise), or if any of these primary factors grow very significantly (Canela withdrawal), these discrete later additions or significant progressive increments can be termed "secondary" factors, and so on. Causation being reticulate and multi-channeled in nature, its resultant factors will always diverge to produce multiple effects but these, in turn, may sometimes converge to help bring about one effect (the Service permission).

It might be helpful for us to test certain of my assumptions theoretically by removing or changing (in our imaginations) one variable at a time in order to assess the effects. In this way we might also develop perspectives on the operational relationships between certain factors and most of the other factors in the total system. I will call these relationships, "roles".

If we ask what would have happened if the Canela had been resettled in a distant but comparable cerrado area, I think the answer is that they would have adjusted more easily and that they would neither have felt the antipathy for the new but similar cerrado area nor developed withdrawal behavior, at least not to any significantly damaging degree. This way of manipulating the future would be called only "guessing" by some people, but I think that it is possible to reduce the elements of chance by drawing upon the large store of past and present facts and their relationships. My thinking is as follows. The Canela attachment is more to the cerrado type of environment than to any particular region, unlike with the Australian aborigines for whom certain precise spots in their desert environment were necessary facets of their religious cosmology. The Canela lack of close attachment to specific topographical items of their ancestral lands is exemplified in their indifference to their cemeteries and old village sites, which they seldom visit. Moreover, their relationship to their supernatural does not tie them down to specific features of their home country. Ghost relatives can follow them long distances and into any environments, as in dreams, and therefore be effectively summoned to any place and utilized to the extent that they are needed to support curers and curing. Moreover, this prediction of easy adap-

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tation to another cerrado habitat seems quite consistent with their likely former meandering way of life.

If relocation to another cerrado environment would not generate distaste and withdrawal reactions in the Canela psyche, the relocation process itself or the mere removal from their ancestral lands are also unlikely to be negative factors. The elimination of these possibilities suggests that what is left, namely, the forest habitat complex, is primarily responsible. If this is accepted, the forest habitat complex can be assigned a special role in the forest balance and cerrado return process. It could be called the "initial imbalancing" factor. After all, the non-acceptance of forest living seems to be the cause of the whole problem. But let us continue this "experiment" and theoretically modify some other variables to see if the relationships and roles of any other important factors become apparent.

If the hinterlanders had fully occupied the Canela lands or if the Service had prevented the Canela from ever returning or had never extended the promise of return, then it must be clear that the Canela would have *had* to adapt to the Sardinha forest setting or actually die off. Some twenty percent of the tribe did adjust satisfactorily so this was not an impossible solution. In fact, I think that if the Canela had actually been convinced from the start that the return was absolutely impossible, they would have exhibited fewer withdrawal responses and far more adaptation. Moreover, we know that the Western Gaviões (see Nimuendaju 1946: 19-21), cultural first cousins to the Canela, did adapt to what was a considerably wetter forest habitat 150 kilometers further west near the Tocantins River during the last century. If the fate of the Canela had been similar, I think more young men would have adapted than older people, more men than women, and that considerably more youths would have left to find patrons and work positions in the outer world. After ten years, nevertheless, that is by 1973, the adjustment would have been all but complete.

Viewed from this perspective, it seems that the Extra-cultural role of the Service in temporarily preventing the Canela return to the cerrado was almost totally determinative of the maintaining and breaking of the forest stay balance of factors. Without it there would not have been a forest stay at all of any length. Similarly, the Timing factor (the 1964 Revolution), with its probably consequent non-occupation of the Canela ancestral lands, was equally critical, as was the Spacial proximity factor. Anyway, considering its great importance, the Service's order prohibiting return could be called "process blocking," or "counter-balancing", depending on the perspective, or simply the "con-

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troling" factor, since of all the forest stay essential factors, it was the most flexible and powerful. It could easily be continued (maintenance) or not (cerrado return); it alone counter-balanced the cerrado-ward thrust of all the other essential factors. The Service promise of eventual return, the non-occupation of their lands, and their proximity could be referred to as "balance tension maintaining", since they kept the other cerrado-ward factors activated. Without them the Canela would simply have accepted the new forest conditions, and there would not have been a three-year forest stay balance of factors in which tension still existed because of the possibility of return. The 1966 permission to return could be called "process precipitating" or "balance terminating" since repeal of the order to stay in the forest broke the forest balance and started the full movement of the return process.

While we are still playing the theoretical game of controled comparisons by changing various variables in order to think about the results, we must certainly consider removing the element of force from the territorial relocation. It is hard to imagine why the Canela would move voluntarily from their ancestral lands to either another cerrado region or to the forest Sardinha area, so let us just have them run out of their supply of good gallery forests to cut down for farm plots (a future probability) and consequently suffer for five years from drastically low harvests. Under such circumstances, if they were offered other cerrado lands with excellent gallery forests, I believe they would willingly leave their ancestral home and successfully adapt to their new but similar habitat, but they still might not be willing to move to the forest. But if the Sardinha region forests were to be the only solution the Service could provide after the economic disaster, and if in addition a plague wiped out a third of the tribe in their ancestral spot, I do think the Canela, practical as they are, for the sake of their children, would have chosen to move to Sardinha voluntarily and that they would adapt there in time with far fewer withdrawal symptoms than in 1963-8 to complete the picture.

Nevertheless, these hypothesized circumstances of the Canela removal to the forest would not exactly be free of all elements of force. The Canela would have been compelled to move by the development of understandable but inexorable difficulties, but they could have traveled at a moment of their own choosing, not losing most of their possessions. So, to the extent that there was compulsion in this hypothesized voluntary relocation, this mental experimental was not a good test for the effects of non-force on forest adaptation, but it did bring out some other interesting potential factors in adjustment after relocation. The hypothesized situation calls the voluntariness of the move to our attention as well as the tribal need to attribute the necessity

to relocate to inexorable, non-precipitous events. It would seem that if the environment (or possibly even extra-cultural circumstances) absolutely requires an irreversible move and the tribe understands this inevitability and is allowed to make its own decision about the manner and timing of the relocation, the new environmental conditions might be accepted with greater ease. This would possibly be true because the leadership and major elements of the tribe would have committed themselves to active, positive roles in relation to facing and resolving the problems of the new environment. This reminds me of the issues in Margaret Mead's (1956) *New Lives for Old*, where a Manus community[9] (New Guinea) chose to face the onslaught of Western Civilization by voluntarily changing their old way of life and actively seeking out a new adjustment.

So to my mind, though the Canela apparently did not do much thinking or talking about the role of force in their relocation during their 1963-68 exile, the compelling and precipitous nature of the removal probably was to some extent a factor in the unsuccessful adaptation to the forest, as was claimed by the Indian Foundation agent, Júlio Tavares. This factor would have operated first to keep the Canela in the forest through fear, and later, like the forest habitat complex, to help bring on the withdrawal syndrome. This factor is Extra-cultural (Hinterlander) in origin but Psychological as operating in the forest stay balance to help develop the withdrawal syndrome. Here we have a significant, but non-essential factor, first primary and later secondary, derived somewhat from weak evidence collected in the field but also to some extent further supported from reasoning drawn from understanding the background and logic of the forest relocation circumstances.

Summary

In 1963, the Canela were forced to move from their ancestral cerrado (Brazilian "closed" savanna) habitat into a deciduous dry forest some 50 kilometers away where they were required to stay until 1966 when the Indian Protection Service gave them permission to return. By the end of 1968, all groups of the tribe had gone back to establish a new village in the cerrado.

Very soon in the course of the forest stay it became apparent that the Canela were not adapting to the forest environment. It even seemed that this maladjustment was psychological in nature because the climate and habitat were not so different as to offer serious social, technological, or medical problems. This failure to adapt appeared

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in the form of conspicuous inactivity in hunting, farming, festival performance, herbal curing, and maintenance of the traditional taboos. This might be called societal malfunctioning, at least as seen from the perspective of the past. They maintained very convincingly to outsiders that they were dying off from the forest diseases. Twenty youths left the tribe for the outer world, six staying away for good and others returning after six months to two years. These various socially "sick" manifestations finally convinced the Service that the Canela had to be allowed to return to their cerrado ancestral lands, and this was still possible because their fields and gallery forests had not yet been occupied extensively by neighboring hinterland farmers and ranchers due to Indian Service pressure.

The research problem was to reconstruct the interrelated system of factors influencing the Canela to stay in the forest or return to the cerrado. It was soon obvious that there were two periods or related facets of the reconstruction: the forest stay temporary balance between 1963 and 1966 and the return to the cerrado from 1966 to the end of 1968. The methodological approach was first to identify the factors in the forest maladjustment which maintained the temporary forest stay and then required the return to the cerrado. The next step was to group these factors into ecological categories. Another step was to interpret the relationship of these factors to the on-going process in terms of "roles". These categories and roles were developed because they are likely to be more comparable cross-culturally than raw factors.

Recapitulating, the set of ecological categories was constructed to include all logically possible factors affecting the forest maladaptation in order to help prevent the overlooking of any possible factors. Each factor identified in this manner was then described and discussed to bring out its relationship to the forest stay temporary balance and the cerrado return. Ten factors were included in the reconstruction of the initial forest stay balance, and only three of these were seen as operating to keep the Canela in the forest. Eight were defined as "essential" to the maintenance of the balance, that is, if any one of these eight were removed, the forest stay balance would have been drastically changed. Factors were "significant" if besides being mentioned in the body of the paper, they were assessed as being important enough to be included in the forest balance or the cerrado return reconstructions.

Turning to the handling of cause and effect relationships, all of the factors composing the forest stay balance when it first became established, were termed "primary", by definition. Consequent factors

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appearing later in time were called "secondary" and "tertiary". Utilizing this kind of thinking, namely, reconstructing the balance of primary factors establishing the forest stay and describing the maintenance and upset of this balance resulting in secondary and tertiary factors and the consequent return to the cerrado, the essential factors and their ecological categories and roles were identified and described. One secondary factor turned out to be "essential", so there were nine essential factors in the forest stay and cerrado return reconstructions combined, that is, in the entire study.

The complex category, the Physical Environment, contained the most important imbalancing factor, the nature of the forest habitat, though forced removal from the cerrado (Extra-cultural in origin) was also an imbalancing factor, but considered non-essential. Reactions to these two imbalancing factors were found in four Psychological factors (cerrado love, forest distaste, withdrawal, and memory of forced removal). These could be termed "cerrado-ward stress" factors. Other factors of the same cerrado-ward orientation were the Service promise of cerrado return (Extra-cultural), the continued relative vacancy of their ancestral lands (Timing), and the proximity of these lands (Spacing). The only essential "counter-balancing" factor keeping the Canela in the forest was the Service order to remain in the forest (Extra-cultural). This was the "controling" factor because it was overriding and yet flexible, being maintained arbitrarily. When this factor was withdrawn and Service permission to return (Extra-cultural) substituted, the 1963-6 forest balance became upset and the Canela returned to their cerrado homelands.

Viewed on the general level of categories and roles, and dealing only with "essential" factors, one factor external to the Canela socio-cultural system (Physical Environment) caused the imbalancing (the maladaptation). Three factors within the forest stay balance (in this case all Psychological) reacted to the imbalancing by exerting stress (not movement) produced in the direction of the cerrado. Three other factors (Extra-cultural, Temporal, and Spacial) also enhanced this cerrado-ward stress. One powerful factor alone (Extra-cultural) counterbalanced all these cerrado-ward stresses and maintained the forest stay balance for three years. When this factor was removed, the forest balance collapsed and the cerrado return process was completed in two years.

Observations

1. As would be expected, the physical environment was one of the causes of the forest maladaptation. It is a surprise, however, that

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so narrow a cerrado-forest contrast in climate and subsistence technology apparently made so much of a difference to the Canela. Actually, it did not in a physical sense; they could have adjusted if there had been no other alternative. The real reasons for the maladaptation lay in psychological responses to other kinds of factors: cerrado love, forest distaste, the promise of return, and the near-at-hand ancestral lands remaining unoccupied. Another particular reason can be found in the peculiar withdrawal psychology of the Canela. Another people with a different tribal personality might well have accepted the situation and adjusted successfully, especially since the forest economy offered far greater advantages. So, the Canela maladaptation to the forest came about not so much because of necessary difficulties in adjusting to the forest environment, but because of the availability of another alternative, namely, returning to the cerrado. The Canela then proceeded to make this alternative a "necessity" through *appearing* to be unable to cope with the forest habitat.

2. It was surprising to me that the climates in the Canela cerrado village of Ponto and the dry forest community of Sardinha were so similar, when the composition of the flora and the soil and the feelings about the atmosphere were so different. Apparently, the daily micro-climatic humidity ranges were probably the only significant climatic differences. It is also surprising that this contrast, and the obvious flora and soil differences (sand versus clay), apparently did not make the forest a much better place for the spread of diseases like tuberculosis, hookworm, etc. This point, however, still needs further clarification before it can be resolved in a final manner.

3. It is astonishing that the Canela could have so successfully convinced everybody who had anything to do with them that they would eventually die off if not allowed to go back to the cerrado, when this was simply not occurring. In the same vein, the extent to which they carried out their activity slow-down, to their own detriment and suffering, is a psychological phenomenon of great interest.

4. The great role attributed to psychological factors in the analysis is just as curious as the lack of significance given to sociological and technological factors.

5. Psychological factors appear herein to have been reactions to Extra-cultural, Dimensional, and Environmental factors, and as such must be understood as always being coupled or related to factors that are external to the sociocultural system.

6. A point that was not stressed in the analysis but which, nevertheless, is of interest to ecologists is that in this part of Brazil the

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critical factors determining whether a region becomes cerrado or dry forest with respect to its floral cover are, (1) sufficient precipitation, and (2) soil quality or soil texture. If the annual precipitation is above a certain critical level, both cerrados and dry forests can exist, as they do in the Canela cerrado area where there are occasional islands of dry forest. Consequently, it was the soils of the Ponto and Sardinha areas which determined cerrado habitat versus forest habitat contrasts. Considering this fact, instead of utilizing the forest habitat complex as a principal concept in the study, I could have employed just the Mineral category which contained the "essential" soil factor of the cerrado-forest contrast. This choice, however, would have been less understandable for the reader, from page to page, and might even have been partly erroneous because after a time, forests may enrich their own soils. So, it was safer to utilize the over-all forest habitat complex rather than the individual soil factor as being most significant in the cerrado-forest contrast.

7. Considering methodology and conceptualization, the tools and devices of this nature employed herein might well be further developed and standardized to handle ecosystem problems of larger dimensions: a) A set of ecological categories was developed to make it a little more certain that most or all of the logically possible factors would be discovered for inclusion in the study. This approach could be considerably improved and sharpened by more subdividing and searching within each subcategory for additional factors. b) The employing of the categories of factors instead of just raw factors, and also the utilization of terms describing relational characteristic ("roles") of factors, make cross-case and cross-cultural comparision more possible, but this approach must be better developed, tested, and standardized through examination and study in many examples. c) An attempt was made to view a synchronic sociocultural system diacronically as well, through the use of an understanding of the cyclical nature of causation and the reconstruction of relationships in terms of primary, secondary, and tertiary factors to express this nature. d) An approach similar to the method of controled comparisons was carried out in the imagination instead of concretely and its therefore easily subject to criticism. This approach, nevertheles, has served well herein as a device for testing the probable significance and "roles" of certain factors, possibly because it was utilized in a gross and limited manner.

8. It is not possible at this time for me to understand with sufficient satisfaction of certainty just how Spacial (Spacing) and Temporal (Timing) factors should really be handled in such an analysis (see page 59). It would seem possible to me that they are so poten-

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tially crucial that every case analyzed would be fully determined by such factors, and no others, if they were exhaustively searched for, properly assessed, and reconstructed correctly in the analysis. If this is the case, is it meaningful to include them in such studies or rather to even attempt to carry out such analyses? The real question here has to do with the nature of chance, its frequency of occurrence, and its relation to causation. This is the structure and flux of existence.

Recommendations

The following ideas come directly or indirectly from this particular study, and though they may have some general applications, this is not always certain. Consequently, they should only be take as generalizations, that is, as applicable in most but not all cases, and then only after considerable testing in other situations.

1. If a tribe *must* be relocated, move it to territory that is closely similar in flora, fauna, climate, and water course characteristics. This is probably the most important idea that can be derived from this study.

2. A tribe that has cosmological connections with very particular physical features of its home lands will probably suffer more in relocation than one attached only to the very general characteristics of the habitat. It would be important to determine this point before attempting relocation, since if this particular cultural characteristic of the tribe has been ascertained, this point many be a factor in the decision whether to relocate this tribe or another one, or neither.

3. It would be better to try to somehow bring it about so that the tribe wanted to relocate itself (presumably a decision by the tribe's effective leadership) rather than forcing it to move. There may be gradations here, such as letting it choose its own moving time and mode of travel rather than hauling if off in trucks with little or no warning.

4. If a tribe *must* be moved and for some reason can never conceivably be allowed to return, make this absolute impossibility very clear to the tribe, or the tribal preference, conscious or unconscious, might favor waiting to go home rather than seriously attempting to adjust to the new conditions.

5. Relocating tribes is not like moving urban peoples or even rural farmers. The latter peoples have probably learned to rely on the more general aspects of their environment and may even have

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traveled to some extent. Tribes are far more certain to be dependent on their particular type of environment and more likely to be religiously attached to certain precise physical features (hills, lakes, rock outcroppings, etc.) of their ancestral lands. Their emotional connections with these general environmental aspects or the particular physical features are almost certain to be deeper than the feelings of the rural farmers and may even be absolutely unseverable in a religious sense.

6. Apparently, some tribes can do themselves extensive psychological damage to the extent of losing their desire for working, and even living, if they do not have the traditionally needed environmental raw materials and pleasures with which to complete certain physical, esthetic, or religious requirements. This is a problem that could slowly grow so that even though a tribe may appear to have accepted the relocation as an accomplished fact, some time later the tribe may still be discovered to be malfuctioning when it is almost too late for outsiders to really help.

7. Obviously, if there is a choice, it is easier on the human beings concerned to move rural farmers rather than tribes of Indians, or partly acculturated Indians rather than recently contacted ones. The more aboriginal their condition the more likely tribes are to be in such close harmony with their habitats that relocation will damage them severely.

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2.2.3.4.2.2. Comentário do Prof. Charles Wagley à comunicação do Prof. William Crocker: O Prof. Wagley tece comentários sôbre a sua experiência de campo entre os Tenetehara e os Canelas estudados por Crocker, o primeiro grupo Tupi e o segundo grupo Gê, porém ambos localizados no Maranhão.