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The Amerindians of Guyana: A Biological Review

ALTHOUGH SOME INDIGENOUS populations of South America have received fairly intensive study in recent years, other regions have remained surprisingly neglected. Human biological knowledge of the Amerindians of Guyana (formerly British Guiana) is extremely scattered, and the sum total far from satisfactory. There would thus seem justification for a review of the information so far at hand, and the problems and potentialities of field-work among these people in the future. This review would also seem pertinent in view of the present stocktaking policy of the IBP as regards human populations (for a general review of South American Amerindians, under the auspices of this international endeavour, one is referred to Baker and Weiner.[1] The information presented results from a study of both published and unpublished data, and a short field visit I undertook during the latter part of 1966.*

Like other parts of the Amazonian tropical zone, transport is minimal to the interior of the country, and progress by boat or on foot is slow, particularly when there is a need to sample communities in widely differing parts of the country. During the rainy periods of course, communication becomes even more difficult; similarly, at other times a group may be dispersed for reasons of balata bleeding, or when the village school is closed families may be scattered on their cassava plots in the forests. It is thus understandable that data tends to be restricted to specific tribes or regions and that no traits have received attention on a country-wide basis.

In area, Guyana is some 83,000 square miles (slightly less than Britain), but only 0·5 per cent is cultivated land. Most of this is related to feeding the 199,830 Negroes, 320,070 East Indians, 8,800 Europeans, 3,910 Chinese and 75,990 hybrids,[14] who mainly inhabit the coastal region. The 30,000 or so Amerindians are mainly situated in the interior of the country.

With the exception of an eastern coastal area of poor savannah around the Berbice River, and the economically more important Rupununi savannahs in the west, 83 per cent of the country is forested.[33] The Kamoa, Acarai, Kanuku and Pakaraima highlands (Figure 1) are part of the Guiana Highlands system which extends into Venezuela and Brazil. These would not, however, appear to have been important barriers to Amerindian population movements between Guyana and these two countries. Soils for grazing and for cultivation are variable. In the Rupununi savannahs the soils are poor, and plant growth is not helped by alternating seasonal flooding and drying up.[40] However, some areas in which Amerindians live may well have better soils, and Knapp[58] for example, points out that some forty miles of good forest soil exists between the villages of Waramadong and Paruima. Nevertheless, whatever soil variation occurs, the intensive cultivation of cassava by the indigenous population in general has determined the need for a periodic shifting cultivation.

The general environment in which the Amerindians live is thus one of moderate heat,

* The field-work was of an exploratory nature, to look into the possibilities and problems of a more detailed survey at a later date. The data collected on this occasion were specifically pertinent to my methodological work related to the I.B.P.[86]

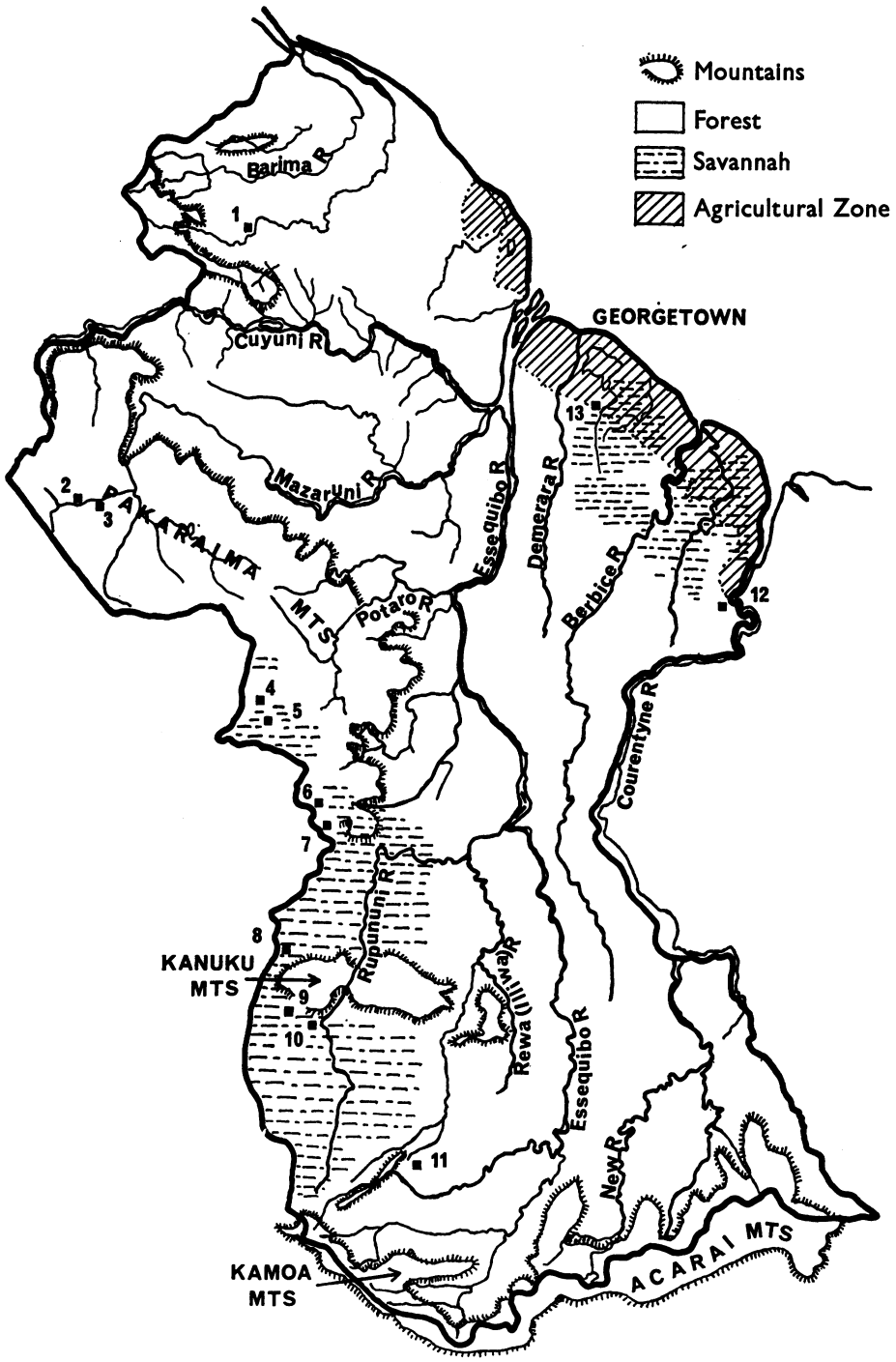


FIGURE 1

The general geography of Guyana. Settlements mentioned in the text are numbered as follows: 1. Towakaima; 2. Paruima; 3. Waramadong; 4. Kurukabaru; 5. Kato; 6. Tipuru; 7. Karasabai; 8. Lethem; 9. Mauriru; 10. Wichabai; 11. Waripuow; 12. Orealla; 13. Pakuri Landing (St. Cuthberts).

high humidity except in the mountains, considerable forestation through which there is a network of fairly navigable rivers, and moderate to poor soils which will support for a time a simple slash and burn economy.

Settlement

Form of settlement and nature of the housing is still basically of pre-contact type, although modifications have occurred, and wall-less houses are far less common. In certain villages, for instance Waramadong and Pariuma, wooden "self-help" mission or government houses have been constructed of a modern bungalow design.[91, 93] Availability of water is a primary determinant of settlement positioning, though not the only consideration, and the women may still have to carry heavy water containers 500 yards or more.

Houses may be restricted to compounds or spread over a mile or more. House type varies to some extent, within a village as well as inter-tribally. Size of each dwelling is determined to some extent by the size of the family unit, which may be eight or more, but is usually less (see Table 1). Contrast in dwellings is illustrated in Plate 1 (a and b); where

TABLE 1

Analysis of a Barama River Carib settlement, by numbers of individuals per house, and numbers of younger children.
(From data by Gillin, 1936.)

	Number of Individuals									
	0	1	2	3	4	5	6	7	8	9
Dwellings related to numbers of occupants		2	2	3	3	1	1			1
Number of houses with pre-adolescent children	3	4	4		1	1				

although both villages use palm leaves for roofing, the Arawak house walls are of "closed" or "semi-open" wooden slats or planks, whereas the Patamona house has an elliptical adobe wall. Of these, the thick adobe type offers much better protection against the sun.

The number of houses per settlement varies considerably, from two or three to over fifteen. With the increasing control of disease, and resultant changes in Amerindian life expectancy, marked increases in settlement size (or village segmentation) may be expected in the next few decades. From the point of view of land cultivation, relative to population increase, village division and re-settlement would seem the only answer in some areas.

In the past, defecation would seem to have been anywhere in the vicinity of the settlement—an ideal situation for the spread of intestinal parasites. In recent years, however, some attempt has been made by the missions and school teachers to establish nearby dry latrines (where soil conditions permitted). So far, this has not been altogether successful, and perhaps as in so many other ways this reflects the Amerindians reluctance to acquiesce in anything which is rather thrust upon him—albeit for his benefit.

Population History

Evidence for the Pleistocene movement of people into South America is still poor, and there is a special need for more chronological data on preceramic sites.[64] Considering the distribution of sites in relation to Pleistocene glaciation, it seems unlikely that many Palaeo-Indians had penetrated into South America before about 11,000 years ago.[51]

Stone projectile points, representing a Preceramic Lithic Horizon in Guyana demonstrate that at least a small population was established some millennia ago, although a time range is not yet fixed.[28] However, looking to the north into Venezuela, from which the early Guyanese populations moved, the evidence suggests probable occupation south of the

Orinoco by 5000 B.C. For the sake of brevity, a summary of bio-cultural changes which occurred in the Venezuela-Guyana region are given in Table 2.

TABLE 2

The bio-cultural background to population change in Guyana. Chronological divisions have been tentatively made relative to certain sequences established in Venezuela. (Adapted from Evans and Meggers[28] and Rouse and Cruxent.[85])

Epoch	Venezuela	Guyana	Remarks	Dates
Indo-European			Use of Metal Introduction of various epidemic diseases	
	Arauquinoid Series	Phases: Wai-Wai, Rupununi, Taruma, Abary, Koriabo	Movement of Abary people from Trinidad (?)	1,500
Neo-Indian		Mabaruma Phase	Plant cultivation	1,000
	Barrancoid Series		Ceramic evidence suggests population movement	
		Alaka Phase	Shellfish important in some areas.	300 A.D.
				B.C.
Meso-Indian	Manicuaroid Series	? Palaeo-Indian Survivals	Possibly slower cultural advances south of the Orinoco.	1,000
Palaeo-Indian	Joboid Series	Preceramic Lithic Horizon	Large mammals for hunting. Temperature lower. No evidence of fishing	5,000 15,000

In Guyana, as probably elsewhere in the eastern tropical region, the largest population concentration has, until the past three or four hundred years, been restricted to the coastal region. Amerindians of the Alaka Phase may have been mainly concentrated north of the Essequibo—at least the shell middens suggest this. Contact of the Alaka people with others is indicated by the late intrusion of pottery into the initially pre-ceramic culture. Even at this early stage, therefore, changes in the gene pools may have resulted from culture contact—at least I think it important to remember that population mixture is by no means a phenomenon of recent populations.

With the advent of the Mabaruma Phase, plant cultivation replaced intensive shellfishing as the focal point of subsistence,[28] and it seems highly likely that as a result of this, considerable population increase took place between A.D. 500 and 1500. With the elaboration of different, and in some cases contemporary, phases after about A.D. 1000 (Mabaruma, Koriabo, Abary, Rupununi, Taruma, Wai Wai) it again seems reasonable to suggest increased tribal differentiation at this time. Just as in recent years, tribal depletion has resulted in some coalescence, so this earlier period was probably one of efflorescence. Some population movement into the country is also postulated during this period. Evans and Meggers[28] suggest that the Abary Phase people moved into the North-west District from

Trinidad, and that their living descendants are the Arawak. Similarly, the Koriabo Phase pottery might also be indicative of population intrusion about A.D. 1200–1300.

Until late in the seventeenth century, there is no indication of pottery-making groups in the interior, but some time after A.D. 1670 Taruma Indians moved into Guyana from the lower Rio Negro in Brazil. Further movements of Amerindians from Brazil are documented as moving into the Rupununi area during the eighteenth century, and finally, during the past century, the Wai Wai have trickled across the Acarai Mountains into Guyana. Yet other movements have probably occurred from Venezuela across the Pakaraima Mountains. An attempt to reconstruct changes in the population pattern of Guyana in the past are shown in Figure 2, with the major areas surveyed archaelogically also being indicated.

With all these population intrusions and expansions, the Amerindians in this north-eastern area maintained a simple pattern of agriculture, continued to live in semi-permanent villages, and retained fairly simple socio-political systems. As Evans and Meggers justifiably point out, the marked contrast between such back-water cultures and the centres of New World civilization may well be explainable in terms of the considerable environmental differences.

Skeletal Remains

Tropical soils and climates are among the worst for the preservation of human remains. Adding to this the fact that the Amerindian in Guyana has not buried in compact cemeteries, it is no wonder that skeletal material is scarce. Indeed, parts of no more than twenty-five skeletons are available for all the tribes, being recorded as in museums in Georgetown, London and Berlin.[8, 32, 47] The very limited conclusions which can be drawn from such material are given in Stewart and Newman[102] and Tacoma.[104]

As regards human bones from earlier periods, even less is available. My efforts to locate all the skeletal fragments described and figured by Brett,[5] which were excavated from shell mounds, have so far failed. However, some additional fragmentary remains have been found in recent excavations by C. Evans, B. Meggars and E. A. Goodland,* and would seem to indicate slender, short-statured people.

Population, Tribe and Family

Various attempts have been made during the past century to determine the total of Amerindians within Guyana. All are open to doubt, and even the most recent figure of 30,000 is unlikely to be a precise enumeration. Schomburgk,[88] in 1840, gives a figure of 7,000, which was later published as the census figure in 1878, but Walker[109] notes that estimates as high as 24,000 had been made at that time. Jones[55] considered the enumerated figure of 10,299 in the 1946 census to be too low, and Swan[103] gave 17,000 as a more likely figure. At present, it seems highly probable that the Amerindians are contributing to the Guyanese population explosion (see Appendix in Bertram[4]), so that numbers may increase markedly in the next few decades.

No critical attempt has been made to determine what Amerindian groups warrant tribal or sub-tribal distinction. There is, however, general agreement as to the tribal distinctiveness of most communities, and these are listed according to their linguistic grouping in Table 3. In order to give some idea of past tribes, small intrusive elements, and major groups, I have tentatively subdivided the tribes again into four columns. Furthermore, in order to reduce description to a minimum, but nevertheless illustrate the complexities of tribal distributions and changes through time, the two maps in Figure 2 tentatively reconstruct the modifications which have gone on during the past two hundred years. In terms of

* This material was kindly made available for study in Washington and London.

modern tribal spread and population concentration, Knapp[58] gives a total figure for the coastal people of 6,500; in the North-West District some 12,000 Indians; the Rupununi area has approximately 10,000; and the Upper Mazaruni some 2,500.

TABLE 3

Tribes at present or previously living in Guyana. (Compiled from various sources.)

Large tribal groups	Small intrusive or nearly extinct groups	Tribes now elsewhere	Extinct tribes	Linguistic group
Warrau				Warrau
Arawak Wapishiana	Taruma Maopityan		Amariba Atorai	Arawak
Carib Acawaio Macusi Patamona	Arecuna Parukutu Taulipang Wai-Wai Camaracoto	Paraviyana Serecong Yao Waica Pianocoto		Carib

Within the past two centuries no indication has been given in the literature of more than low fertility in Amerindian groups. The small numbers of young children per family unit enumerated by Gillin[37] for the Caribs (Table 1), would seem equally applicable to other tribes in the past. However, recent age analyses suggest that both fertility and life expectancy may now be improving (Figure 3). Disease and very late weaning were clearly contributing

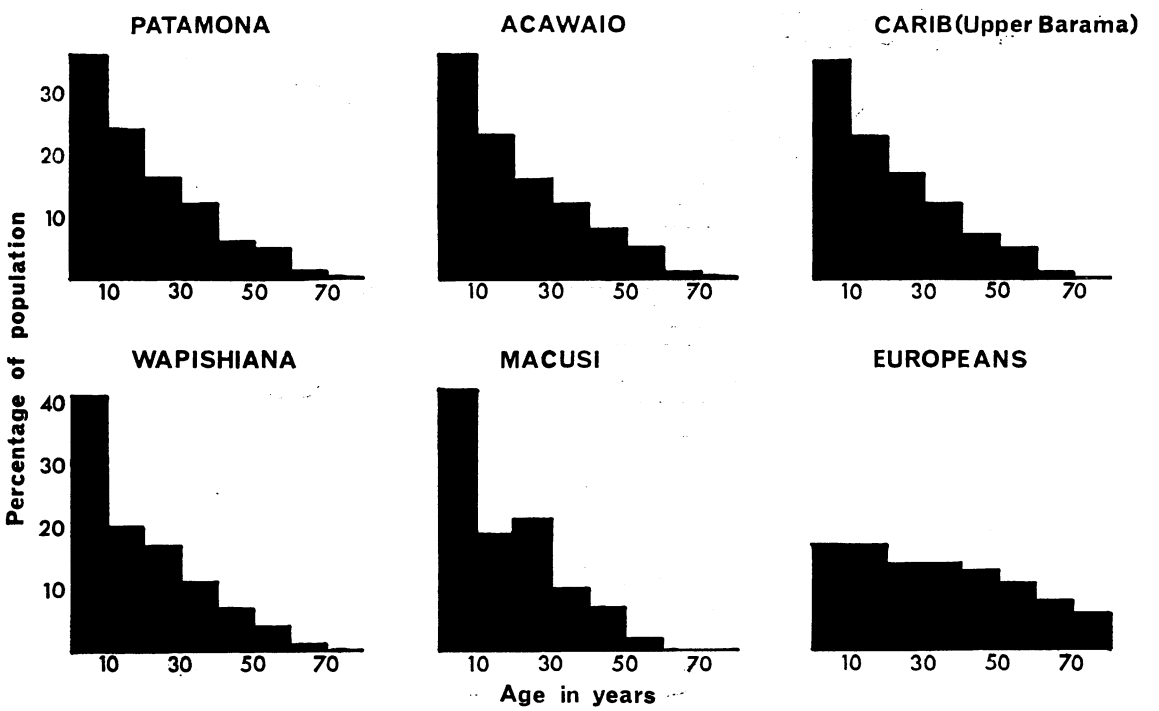
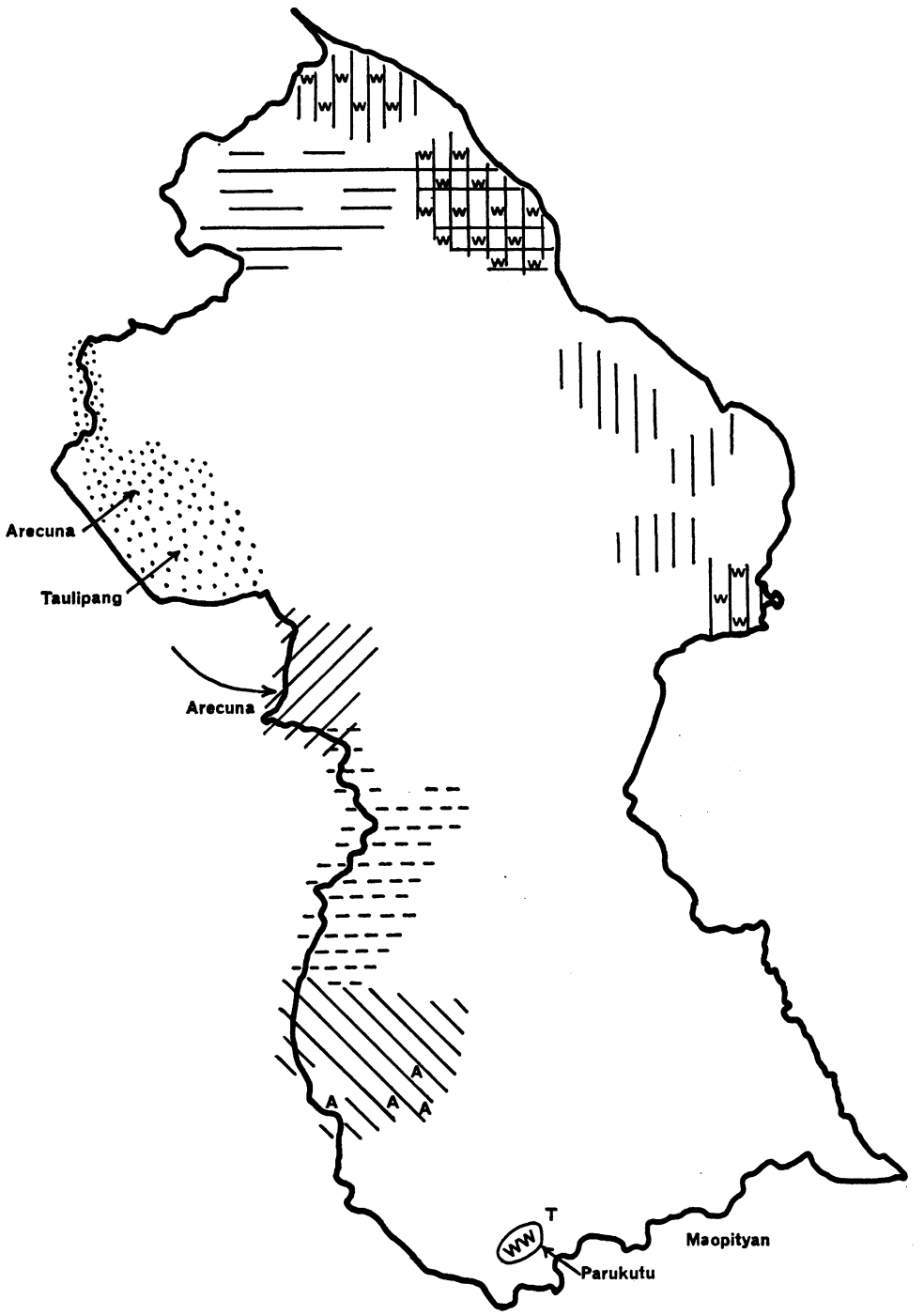


FIGURE 3

Age composition of five Amerindian tribes in Guyana and a European series. The noticeably high percentages for under ten year olds in the Wapishiana and Macusi series are probably the result of the intensive anti-malarial campaign in the Rupununi prior to the samples being taken. Histograms for the Amerindian groups constructed from data by Jones (1952).


Arecuna
Taulipang
Arecuna
T
WW
Maopityan
Parukutu

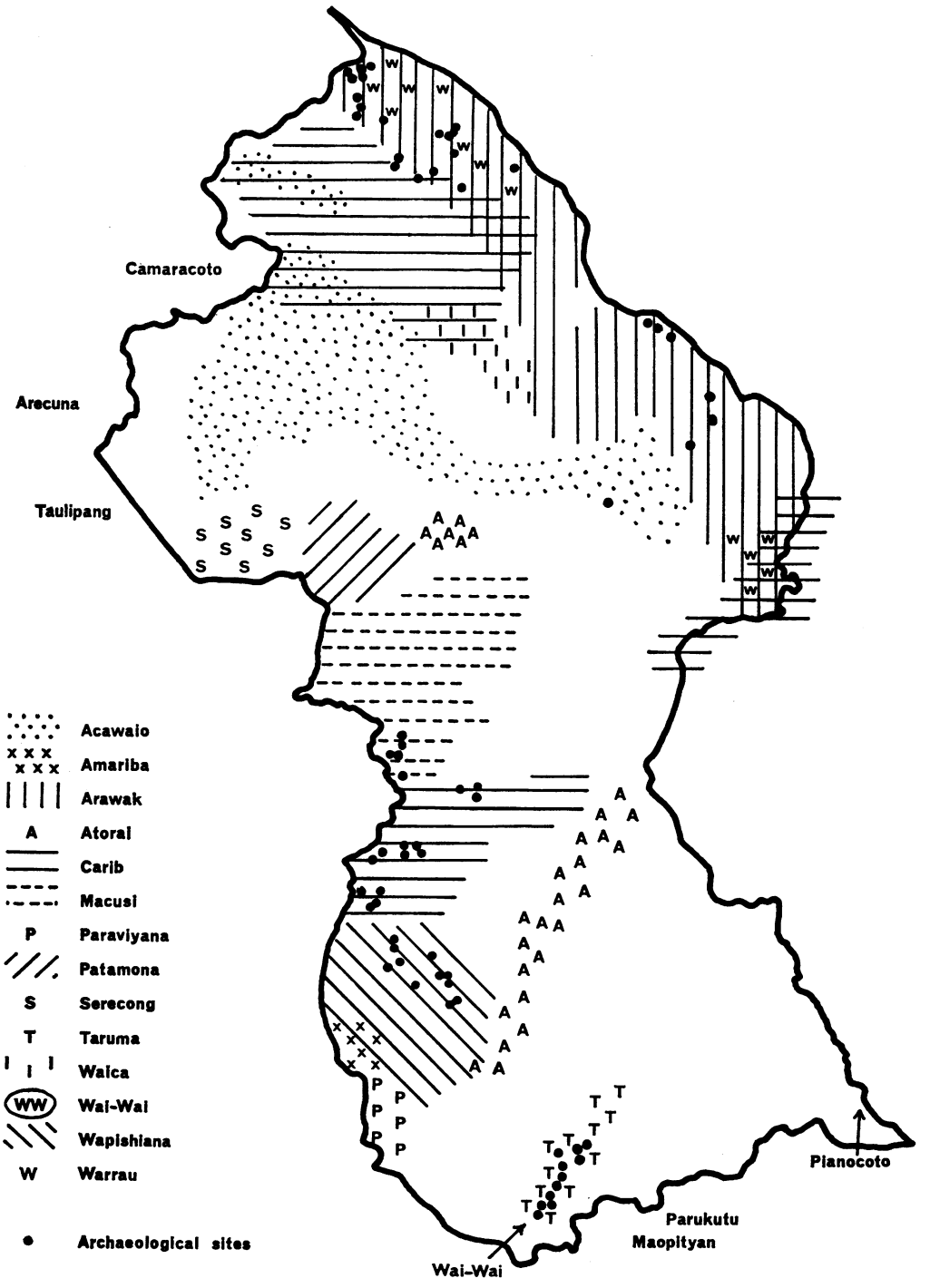


FIGURE 2

Tentative assessment of tribal distributions and probable changes during the past two centuries. Left: the Amerindian communities today. Right: tribes noted *circa* 1750-1850. Also noted are sites which have received archaeological study.

factors to this low fertility. Attempts to limit child numbers have also been noted. Infanticide of babies has occurred.[29, 42] Gillin[37] was informed that abortion was induced by older women—usually by a combination of herbal infusions and manual assistance, but how often this occurred was not established. Contraceptive methods were restricted to bush medicines and ritualistic treatment by the *piaiyen* (medicine man). As far as I can ascertain, the plants used have not been collected and studied.

Inbreeding, Tribal Crossbreeding, and Racial Admixture

An accurate assessment of mating patterns among the Guyanese Amerindians is by no meanseasy—particularly if temporal as well as spatial differences are taken into account. Moreover, although anthropologists have studied certain groups, there is still little information. Most tribes are patrilineal in descent, but matrilocal in residence. In the case of the Arawak, however, there is a history of matrilineal exogamous clan structure.

Cross-cousin marriage, and certainly polygamy, were far more common prior to the intensive missionary work of the past fifty years or so. Farabee[30] notes that incest occurred —though not without tribal misgivings—and I was informed that this still occurs even to-day in nominally Christian villages. Although within tribal localities marked inbreeding could, and probably has, occurred at times, the population history of this area would suggest that extreme isolation has not been possible. Population movement and intrusion must have resulted in a mosaic of inter-tribal admixture. The German naturalist Schonberg notes Carib-Acawaio crosses in Akawabi village 200 years ago.[58] Brett[5] mentions Carib/Negro crosses on the Courentyne River, and Im Thurn[53] both Amerindian/Negro and Macusi/ Brazilian crosses. Much more recently Guppy[42] has pointed out that the so-called Wai-Wai of one locality he visited were, in fact, predominantly Parukutu in origin. Similarly, Jones[55] mentions a few Maopityan living with, and speaking, Wai-Wai.

Another factor which has contributed to tribal admixture has been the considerable tribal warfare and slavery which occurred prior to colonial development. Such Amerindian slaves became a part of the breeding population of the captors.[82]

Racial admixture has been mainly with Europeans and Negroes.* Precise assessment is still needed, and is likely to vary considerably depending upon region. Brown[11] notes the Atorai village of Waripuow had two Negro/Amerindian hybrids, and Seggar[91] notes the adoption of a Negro girl into a village in the Mazaruni District half a century ago—and the resulting hybrids.

Probably the Morawhanna District of the north-west—originally Carib—now shows the greatest degree of miscegenation.[103] This mixing diminishes westwards, and in the upper reaches of the Barama River, beyond the Towakaima Falls, the Carib stock is more intact.

However, I do not wish to suggest considerable miscegenetion in most areas. Some groups are clearly "untouched" by any Old World population. On the other hand, there is sufficient intermixture in some villages to permit future field studies to include aspects of race crossing (e.g. pigmentation, hair form, anthropometric variation, dental traits).

Finally, it is worth mentioning here, from the point of view of potential gene intrusion, that contact and trading between tribes is probably of considerable antiquity. Even in the case of Old World goods (including plants), some have gone in advance of the immigrants into the South American interior. Populations which have continued to enjoy isolation from the Negro and European until very recently, such as the Wai Wai, Roucouyennes and Mawayan,[42, 87] nevertheless cultivate the banana—a plant of certain Old World

* The Negro "pork-knocker" (prospector) and trader of recent years is mainly responsible. Although, originally, escaped African slaves were regarded as "Bush Negroes",[110] the Amerindians were employed as interior police to recapture them, with the result that the present-day Bush Negro situation as found in Surinam is not present in Guyana.

origin. If nothing else, the chain of contacts between foreigner and Amerindian groups which has led to the transmission of plants and some trade goods, would have been quite sufficient for the spread of certain epidemic disease.

Diet

The detailed assessment of diet is perhaps one of the most difficult aspects of a human biological research programme, Generalizations can mislead more than they can inform, and yet, in the case of the Amerindians of Guyana, one is left with only this type of data to work on. Farabee[30] was, in fact, well aware of the need for detailed nutritional studies, which were beyond the scope of his own work, and this is becoming increasingly urgent.

Considering the total food potential for the Amerindians as a whole, a considerable variety of plants and animals are available. However, this varies quite markedly, depending upon the closeness of the villages to good fishing rivers, how supplied or exhausted the forest is of animals, proximity to savannah and so forth. Although the still small proportion of Amerindians with fairly regular work can hope to purchase rice, sugar, protein foods, etc., in the coastal region, air freight costs to the few interior stores is still a deterrent to spending in this way. The majority may therefore still be considered to be living on a pre-contact type of diet, although there is the growing, but still unassessed problem of diminishing animal numbers in the interior.*

A further complication to unbiased assessment of food intake is that few villages are completely unacquainted with the different food habits of the "civilized" coastal population, and, for instance, in my own questioning of Patamona Indians I found that they were reluctant to talk about eating insects and such "inferior" foodstuffs because their dietary yardstick is the food of the missionary, teacher and Georgetown populace.

It is not possible here to do more than summarize foods normally used by the Amerindians, and for further information, one is referred to Im Thurn,[53] Farabee,[29, 30] Gillin,[37, 38] Lowie[65] and Kirchoff.[57] Certain plant foods form by far the most important everyday constituent of Guyanese Amerindian diet. In particular, bitter cassava (*Manihot utillissima*) is the staple crop in most villages. It is by far the best tropical food plant, the roots extending deep into the earth and the leaves giving good protection against the evaporation of soil moisture (Plate 1c). It is mature in ten to twelve months. The Amerindians are extremely versatile in its use, making various drinks† and different types of bread (usually plain, but it may be mixed with another plant "flour", such as Mora seed, Brazil nut or Dacumballi seeds). Considerable reliance on this plant, does, however, raise an important health question. Gourou[41] has recently discussed the protein deficiencies of cassava and the likelihood of kwashiorkor occurring where too much reliance is placed on this food. However, no cases of this disease have been reported among the Amerindians, and clearly sufficient in other foods is eaten to increase the amino-acid content of the diet as a whole.

Other plants farmed are generally secondary to this basic crop. Some, such as the papaya, pineapple, limes and guava, have probably limited food importance, when considering yearly food consumption. Others are more regional, such as sugar cane, pumpkins, beans, yams, deer callaloo (*Phytolacca*), sweet potato and palms (for drinks and the edible heart). Sweet cassava (*Manihot palmata*), plantains and maize may be more commonly cultivated, though not in large quantity. Some of these crops are more sensitive to climatic fluctuation than others, and certain ones may at times be threatened by animal pests. Peppers are in demand for the occasional meat stew, and, in fact, pepper-pot might be

* Bertram[4] discusses this problem further.

† The method of eliminating hydrocyanic acid from the cassava juice by heating, is likely to be considerably pre-contact in date.

regarded as an indigenous national dish. Seeds and nuts (Brazil, cashew and palm nuts, seeds of *Mimusops belata*) are of seasonal value.

A variety of drinks are prepared, some having considerable food value. Names vary according to tribe, and only one need be used here. The most common one is cassiri (unfermented cassava). Other unfermented liquids include pyuwa (using baked cassava), cane juice, atnike (maize) and a number of palm drinks. Fermented beers include paiwarri (cassava), oüicou (cassava and potato) and belteerie (Ita palm).

Animal protein is clearly an important but by no means regular part of the diet. Fish are probably the most commonly available animal protein source, but in some parts of the mountain ranges these are not easily available. About twelve varieties seem of special importance.* Fishing methods include the (officially prohibited) use of a variety of plant poisons[43] permitting the rapid collection of large numbers. Other vertebrates can only be said to provide periodic food, and although the list of animals eaten is considerable,† it is important to remember their restricted availability. Insects are still eaten, and include bee larvae, *Atta cephalotes*, the larvae of *Calandra palmurum*, and Coleoptera such as *Phaneus* and *Copris*; but to what extent they may have dietary significance is not known.

Growth and Physique

Before any consideration of body size and shape in the Guyanese Amerindians, it must be remembered that the full growth potential of these individuals is unlikely to have been attained. Three factors may here be particularly important in retarding growth, and thus influence to varying degrees some anthropometric dimensions. These are: (*a*) the poor protein diet; (*b*) severity of intestinal parasites; [19, 81] (*c*) tropical climate.[68]

Information on child development is as yet very limited, and metrical comparison is not made easier by the unknown factor of age in many instances. In Figure 4, data collected on 546 boys and 474 girls by C. R. Jones is given in comparison with figures for London schoolchildren. In the case of both height and weight, the Amerindian children are consistently less than the London children—a reflection of genetic and environmental differences. A particularly marked contrast in the London and Guyana trends is suggested in the 14–16 year period, where height and weight increase falls off more rapidly in the Amerindians. Such variation, and reported differences between tribe and ecologically divergent populations[30, 53, 84] clearly deserve further study.

From the point of view of maturation and ageing, Schomburgk[88] recorded "premature" development and puberty in the Warrau, whereas my own impression of adult Arawak and Patamona women was of early ageing (a finding also noted by Neel[73] on the Xavante).‡

Anthropometric data, for the most part limited, are available for a number of tribes, and for individual measurements and means one is referred to Farabee,[29, 30] Gillin[37] and Newman.[76] Prior to this, only Ten Kate[105] had measured a few Arawak and Macusi in Guyana.

All display rather "lateral" body builds, with generally well-developed shoulders (Plate 2c). Mean body weight would seem to be moderately high in comparison with other indigenous New World samples,[76] that for male Wai-Wai being 56·6 kg. (mean age 30 years).

* Pacu (*Myletis*), pirai (*Pygocentrus*), gilbacker (*Sciadeichys*), lukunanni (*Cichla*), haiamara (*Hoplias*), querrimam (*Mugil*), arapaima (*Sudis*), low-low (*Silurus*), yarrau (*Hypostoma*), cartabak (*Tetragonopterus*), aimara (*Eryhtmus*) and electric eel (*Gymnotus*).

† Various monkeys, labba (*Coelogenys*), opossum, armadillo, agouti, accouri (*Dasyprocta*), bush-cow (*Tapir*), other, bush-hog (Dicotyles), rats, several varieties of turtle, land tortoises, varieties of savannah deer, manatee, river and land crabs, and Iguana. Of the birds, the most hunted are the mamm (*Tinamotis*), maroudi (*Penelope*), powis (*Crax*), trumpeter (*Psophia*), scrub-turkey (*Tindmus*), cock of the rock (*Rupicola*), whistling ducks (*Anas*), the muscovy (*Cairina*) and jabiru (*Mycteria*).

‡ This may, in part, be illusory, in that men can marry women much older than themselves.

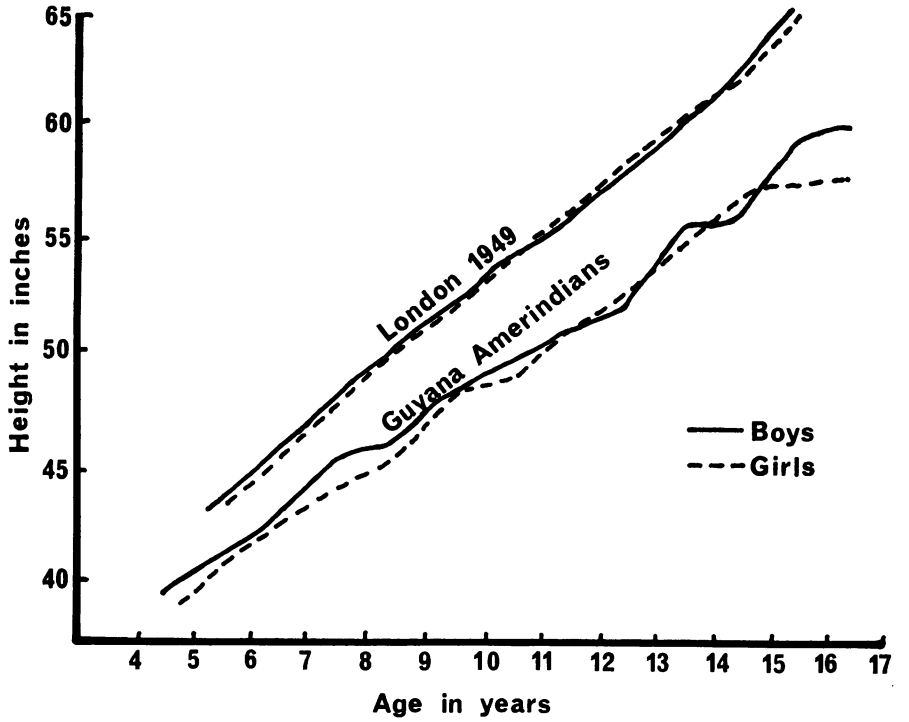


FIGURE 4*a*

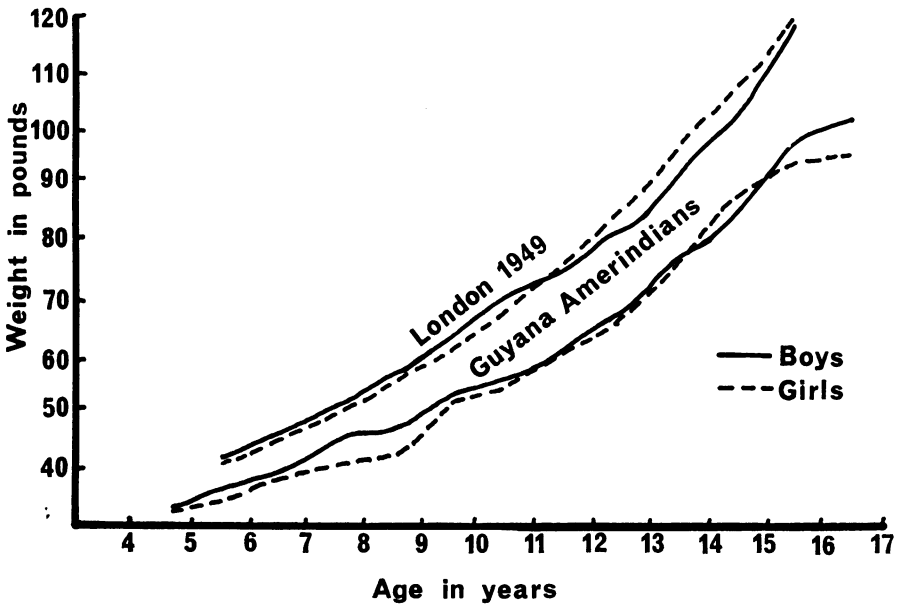


FIGURE 4*b*

Height for age (*a*) and weight for age (*b*) in Amerindian and London school children. The Guyana sample is for 1020 children, being a pooled series from various tribes. Modified from Jones, 1952.

Stature means for tribes of Carib and Arawak stock in South America tend to cluster about 158–159 cm. for males,[98] although the Central Caribs of Guyana have a mean height of 157·4 cm. (for males).[30] However, in reviewing the anthropometric data so far available for Guyanese Amerindian tribes, Gillin[37] found but few significant differences between them, although sample sizes are far below those desirable for useful comparisons. To summarize, the Barama River and Central Caribs show more significant differences than do the Barama Caribs in comparison with the Arawaks. Even so, the differences are not great. It is interesting that a number of facial dimensions have been used to demonstrate significant biological divergence in these tribes, and I feel that new or more precise methods of recording facial variation may be particularly useful when studying populations at a tribal level.[10] Certainly considerable facial variation occurs in the Amerindians (Plate 2a, d, e), but it is questionable whether the "classic" measurements always record the most significant differences.

Physiological Variation

Very little data on physiological variation is available for the Guyanese Amerindians, or for that matter for any of the idigenous groups of South America.[1, 113] Holden (quoted by Guppy),[42] recorded blood pressures for individuals from a number of tribes and found no evidence of hypertension.* Farabee[30] gives pulse rates for a series of Macusi, the average rate being 69·7 (range 46–96). Rates for the Central Arawaks were even higher (range 62-116).[29] Although a number of the individual pulse rates are low, the means are high compared with eighteen others given by Wilson[113] for various South American populations (mainly of "mixed" ancestry). Haemoglobin levels were determined for various tribes by Jones[55] and in an Arawak village by Chan (Chin, *et al.*[16]) Average levels, divided by region, sex and age, and expressed as grams per 100 ml., were low. The means ranged from 10·73 (Coastal Arawak boys) and 10·88 (Wai-Wai women) to a maximum of only 13·41 (Macusi and Wapishiana men).

In terms of physical endurance, some of the Interior groups would seem particularly worthy of study. By canoe or on foot, they still cover long distances, and packs of sixty pounds or more may be carried over twenty miles a day. In the Pakaraima Highlands heavy loads of cassava are taken in warishi (carrying baskets, see Plate 2f) up long steep slopes with apparently little physical stress—at least no more than I experienced unloaded!

Pigmentation

Although pigmentary studies have still to be undertaken with a reflectance spectrophotometer, there is nevertheless a certain amount of data on skin, hair and eye colour which is unlikely to be greatly contradicted by more precise data. Skin pigmentation in the majority is "light brown",[37] probably more so than North American populations.[30, 99] Weiner, Sebag-Montefiore and Peterson[111] have questioned whether tropical forest groups are lighter than other populations more exposed to direct sunlight, and in fact Farabee[30] has already suggested that the forest Carib are lighter than the Savannah Macusi and coastal Arawaks. This would seem worthy of more precise investigation in view of the environmental and pigmentary variations, although there are complicating factors. In particular, amount of exposure to sunlight may not be so easily equated with Savannah or coastal settlement, for the Amerindian may spend much of the day well protected inside the house. It may be pertinent to question here whether variations in baby-carrying may not have also acted as a differential selective factor in determining skin colour differences. A child slung at the front of the mother is more protected from heat and long exposure to sunlight than the child

* Up to the date of submitting this manuscript to press, I have not been able to locate and study this unpublished data.

carried high on the woman's back. It is thus interesting to note that in much of South America (and including Guyana) the small child is generally carried sitting in a broad strip of cloth slung from one shoulder.[77]

The sacral pigment "spot" occurred, though I did not establish a frequency. In view of the high incidences found in other indigenous South American groups[48] it is very likely to be high in Guyana also.

Hair colour is predominantly black, but brown and very occasionally lighter hair may occur. Gillin[37] uses "black" hair as one criterion of "purity" for the Barama River Caribs, a method which seems open to considerable doubt. Probably lighter degrees of hair pigmentation can be a characteristic of these southern Amerindians in an unmixed state, and it is significant that Sausse,[87] in his study of the primitive Roucouyenne Indians of French Guiana, noted some children with blonde hair.

Eye colour is predominantly dark brown.

Dermatoglyphics

No data has yet been collected in this field. In view of the relevance of such information in determining population movements and relationships in the New World,[75] Guyanese samples are clearly needed.

Serology

Blood group data on tribes are both direct and indirect, that is, on samples from Indians now living in Guyana, and from other samples taken from adjacent territories on tribes which have been or are represented in Guyana. For the sake of brevity, the country in which the tribal sample was taken is given as G (=Guyana), V (=Venezuela) or S (=Surinam).

ABO System. As expected, samples for the Acawaio (G), Macusi (G), Waica (V) and Warrau (V) were 100 per cent group O.[61, 62, 63] However, a Venezuelan Carib sample had 0·62 per cent group A[59] while Arawak and Carib samples from Surinam had 2·2 per cent and 1·1 per cent respectively of group B and 2·2 per cent of group A (Carib only). Miscegenation would seem the explanation in the case of group B occurring, but the situation is no longer so clear for the occurrence of group A, which may be a pre-contact characteristic of some South American groups.[75]

MNSs System. Gene M was high, compatible with other Amerindian data, with the highest figure so far (79 per cent) being for the Waica.[63] In contrast, the two Warrau (V) sub-tribes tested had noticeably low M frequencies (36–50 per cent).[61]

Rh System. All samples so far tested are Rho (D) positive. The chromosome DCE(Rz) was variable but relatively high (Macusi, 10 per cent; Acawaio, 8 per cent; Warrau sub-tribes 1–7 per cent; Waica, 18 per cent.)[61, 62, 63]

Kell and Lewis Systems. All so far are K(−) and Le(a−).

P System. The gene P varied from below 40 per cent in the Waica (V) to 46 per cent in the Guyanese Acawaio.[62, 63]

Duffy System. Variation in frequency from an Fy^a incidence of 58 per cent (Waica.V) to 98 per cent in a Warrau (V) sub-tribe.[61, 62, 63]

Kidd System. Jk^a ranged from 56 per cent in the Waica (V) to 48 per cent in Acawaio (G), comparable with other South American frequencies.

Diego System. Relatively high figures have been recorded in some tribes for Di(a+) (28 per cent, Macusi; 41 per cent Acawaio; 3 per cent Guayo Warrau; 0 per cent Waica.[61, 62, 63.])

Gm System. So far frequencies have been obtained for only a Carib (S) and a Waica (V) sample. Gm(x+) incidence is 52 per cent in the Caribs[100] and 31 per cent for the Waica.[34]

Clearly much genetic variability can be demonstrated in the Guyana tribes by serological work, and further tribal samples need testing in the near future. In combination with other data, these traits promise a more accurate assessment of the biological distances of the various groups from one another.

Anthroposcopic Variants*

"Non-metrical" morphologic differences have long been recognized in physical anthropology, and have similarly long presented considerable problems in methodology and quantification. Nevertheless, they may provide valuable indications of population variability, and it is encouraging that Neel and his colleagues[72, 73] applied a number of such traits with success in their study of the Xavante Indians.

Mainly head variants and hair form, quantity and pattern have so far been studied in primitive groups, but other characters such as the distal hyperextensibility of the thumb and hand clasping differences would be worth further exploration in South American populations.

As I have already mentioned, facial variation is considerable. Eyelid morphology has received special attention in some populations, particularly the development of the epicanthic fold. However, the application of eye-fold classifications worked out on Asiatic populations to New World series is not altogether satisfactory,[52] and there is a need for a re-study of this character in Amerindians.[9] Well-defined epicanthic folds (completely covering the inner margin of the lachrymal caruncle) are not common in the Guyanese Amerindians, although Gillin[37] considered that 13 per cent of the Barama River Caribs were in this category. Published evidence of eye obliquity is rather contradictory, Farabee[30] reporting it as uncommon, whereas Gillin[37] records 33 per cent (♂) and 48 per cent (♀) for his medium category alone. The nasal bridge is moderately high (an Amerindian feature contrasting with Asiatic mongoloids), and the nasal profile is variable, with some indication of tribal differences. The ear is relatively long in relation to facial height, thinness of helix and antihelix being common.

No dental surveys have yet been undertaken except in terms of caries incidences. Shovel incisor variants occur, and from the evidence of Peruvian and Venezuelan Indians[13, 39] this and other dental traits are likely to produce valuable evidence of inter-population differences. Malocclusions are also worthy of further attention, and Gillin[37] records the surprising figure of 9·2 per cent under-bite in Barama Caribs (? the result of in-breeding).

Head hair is abundant, and baldness very uncommon. The hair can be wavy, and I am satisfied that this is not the result of race-crossing, but a pre-contact trait with possibly tribal differences.† Eyebrow concurrency has received statistical analysis by Gillin,[37] but the results would seem questionable in view of the practice of brow plucking (in their opinion an aid to vision). Facial hair is limited in spread, but can be well developed at lip and chin (Plate 2d). Neither in the Arawak or Patamona Indians I observed, or in previous reports, has chest or back hair been noted, although pubic hair is present. In males, sparse leg hair also occurs.

The Disease Spectrum

Before discussing the possible human biological significance of Amerindian diseases, it is necessary to review the range of disease and abnormality which has been reported. Much of the information on recent Amerindian groups results from the efforts of Dr. Cenydd Jones—often, I suspect, working in far from ideal circumstances. In overall health, the tribes would seem to show some variation, even at this late date. Thus, for instance, the

* Some aspects of this Section will be covered in detail elsewhere.
† Of course in villages with Negro/Indian crosses, this hair trait is affected.

tuberculosis mortality rate for the Amerindians in the North-west District is about 40 per 10,000, which is highest in the country,[56] whereas the Wai-Wai were reported to be free of this disease—although displaying high malariometric indices.[55]

Diseases may be spread from the coast (gonorrhoea) or mining areas in the Interior (tuberculosis). Epidemic infection has also spread from other countries, as instanced by the measles outbreak of 1950 on the Rupununi Savannahs which spread from Brazil,[56] and the infection of Amerindians with chickenpox through contacts with Venezuela.[92]

The reception of the medical ranger, and occasional medical officer, is improving, whereas the witch-doctor no longer has importance. The large number of previously used medicinal plants[107] are now but occasionally used.

Smallpox. Schomburgk[84, 88] notes a severe outbreak amongst Arawaks in 1830. Similarly, Brett[5] records further epidemics in 1841 and 1854. In recent years, this disease has not been a threat, although the possibility of its spread from Brazil and Venezuela has stimulated vaccination campaigns.

Measles. Schomburgk and Brett again record epidemics, resulting in frequent mortality.

The Macusi were decimated by such an epidemic in 1930, and the Rupununi area had a further outbreak in 1949.[55] Jones notes that thirty deaths occurred in settlements lying between Lethem and Wichibau Pau, and that in this locality 10 per cent of all cases developed broncho-pneumonia (with a total measles mortality of 6 to 7 per cent). This epidemic had spread into the Patamona during 1950, but died away without reaching the Acawaio.

Cholera. Brett notes that much of the colony was affected in 1857 and estimates that mortality among some Indians was as high as a third of the community. It has therefore contributed to population reduction in the past, although of no significance to-day.

Malaria. The reference by Schomburgk to frequent "fever", "inflammation of the abdominal organs" and "liver complaints" amongst Amerindians, would seem to indicate considerable malarial infection by the early nineteenth century (in the absence of other infection to-day which would explain these fevers and spleen enlargements).

Studies of *Anopheles darlingi* incidences and malariometric rates have been undertaken by G. Giglioli, L. G. Eddey and C. R. Jones (see Jones[55] for a review of their findings). As *A. darlingi* favours sheltered low-acidity waters for breeding, the banks of the Rupununi have been particularly favoured by the mosquito, but on the other hand, the more acid waters of the Upper Mazaruni and Kamarang are not suitable. As a result of such environmental factors, malariometric indices have varied considerably from tribe to tribe, high values being noted in the Rupununi Savannahs, the Caribs of the lower Barama River and the Wai-Wai, but only slight malaria occurred amongst the Acawaio of the Upper Mazaruni area[55]. As a result of the anti-malarial campaigns of recent years, few cases of malaria now occur on the Coast, and in the Interior yearly numbers only ranged from 220 to 670 from 1960 to 1964.[6]

Tuberculosis. Death rates for this disease are considerably higher than in the other Guyanese racial groups (26·2 per 10,000 in 1949, according to the Registrar General's report). Sanatorium admissions between 1960 and 1964 for Amerindians averaged about 49 per year, which is about 27 per cent of all admissions.[6] The majority of cases are adult males, who contract the disease during a period of employment in mining communities or towns. Mantoux tuberculin surveys have been undertaken on samples representing most tribal groups, and a more limited BCG vaccination campaign initiated.[55]

Chickenpox. Mild epidemics occur, but are not serious.

Whooping cough. This is a serious disease to the Amerindian, with distressing results and high mortality. Jones[56] notes that it caused numerous deaths in the Savannahs in 1953.

Influenza. As regards the marked decimation of Amerindian numbers, the pandemic of influenza following World War I, would seem to have hit these people severely.[56]

Pinta. Only one Wapishiana family has been suspected of having this disease.[55]

Unsheathed Microfilariae. Giglioli[36] noted in a sample of 274 Patamona Indians, 19·7 per cent infected with *Filaria ozzardi* and 11·6 per cent with *Acanthocerlonema perstans.*

Eye Diseases. Schomburgk noted that the "majority" of one Warrau group he saw had "inflammation of the eyes", and in a group of twenty-three Arecuna, most had "bad eye disease" and two were blind. Both Roth[84] and Jones[55] also state that blepharal conjunctivitis is common, and to a lesser extent corneal ulcerations.

Yellow Fever. Jungle yellow fever is endemic in certain areas of the Interior. Data showing regional variations in immunity rates has been collected by a number of workers[55] Immunity rates vary by as much as 50 per cent.

Leishmaniasis. This has occurred in the Interior (see map in Garnham and Lewis[35]), but apparently not in recent years.

Intestinal Worms. In the small samples which Jones[55] studied for these parasites, the Patamona/Acawaio/Macusi ranged from 95 to 100 per cent for hookworm (? all *Necator*); 42 to 86 per cent for *Ascaris*; 14 to 48 per cent for *Trichuris*; and 0 to 3·5 per cent for *Strongyloides.* Chin and colleagues[16] also note anaemia resulting from *Ascaris* infection in an Arawak village. Geophagia is common in infected people.

Dysentery and Diarrhoea. These conditions, especially gastro-enteritis, are still serious child-killers in Guyana as a whole[6] but available evidence suggests that the Amerindians have the most resistance to these conditions. Outbreaks have occurred however, and Schomburgk (Roth[84]) notes a Macusi group hit by these infections, and Brett[5] a dysentery outbreak amongst the Warrau. In recent years, the only instance recorded of considerable dysentery was at Orealla in 1949, though mild diarrhoea occurs not uncommonly early in the rainy season.[55]

Skin Conditions. Schomburgk, and later Barrington Brown,[11] both state that skin disease was common. Considering the various signs of nutritional deficiency outlined by Jones,[55] including dry skin and keratosis, it may well be that these earlier authors were also noting the results of dietary inadequacy.

Multiple bites from the various species of *Simulium* fly can be painful and cause much skin irritation,[96] but are seasonal in nature.

The jigger (*Tunga penetrans*) is usually removed by the Amerindian before it becomes a health threat, although Schomburgk notes children with badly affected (septic) foot jiggers. In the past, settlements have actually been abandoned as a result of intense jigger infestation.

Malnutrition. Assessment is difficult, especially in the absence of precise dietary information. Jones[55] considers that generally malnutrition is low, but Chin[16] reported that in a sample of 55 pre-school Arawak, there was clinical evidence of malnutrition in most, and four with advanced manifestations of protein deficiency. A recent contributing factor to protein deficiency in the case of some Amerindians is the prohibition of certain meats by Seventh Day Adventist missionaries.[12, 92, 103] Waterlow (quoted by Jones[55]) undertook a nutritional survey of the Acawaio, noted the children were somewhat "skinny and pot-bellied" and suggested that deficiencies probably lay in the fat soluble vitamins and calcium.

Oral Health. Nineteenth-century comments on dental health vary from Schomburgk's assessment of Warrau teeth as "entirely bad",[84] to Brett's on the healthiness of the Acawaio dentition.[5] In recent groups, advanced caries is well in evidence, and although suggestions have been made for an Interior dental service,[58] for the present advanced caries remains a chronic threat to health. In view of the variations in caries prevalence in Amerindian groups[13, 74] it is interesting to note further possible differences in the Guyana Amerindians. As yet the statistical data is crude, and does not include proper allowance for missing teeth in caries assessments. However, considering the extent of the differences between three regional groupings, Coastal Arawak, Patamona and Acawaio of the Pakaraima Highlands,

and Macusi and Wapishiana of the Rupununi Savannahs, by far the highest decay percentages are for the Savannah people, and the lowest for the Pakaraima region.[55] This is likely to reflect mainly differences in diet, including its inadequacy, although variations in the fluorine content of ground water cannot yet be ruled out for some areas.

Congenital Defects. Assessment of the survival of congenitally defective individuals in pre-contact cultures—from the evidence of mission influenced Amerindians—is difficult. Abnormalities have certainly been noted; Schomburgk met an imbecile Wapishiana boy, and Farabee[30] mentions instances of feeble-mindedness, a mute, and a female with only one breast. A review of Amerindian attitudes to defective children has yet to be made, but Farabee states that amongst the Macusi at least, the baby with marked deformity was eliminated by strangulation. Other small indigenous populations in South America are no less presented with the alternative of destroying or "carrying" severe abnormality, and in the Xingú/Xavanite tribal areas, for instance, club-foot and mental defect may be "relatively common problems".[73]

As a result of a relatively high degree of inbreeding, there is evidence that deaf-mutism has an abnormally high frequency in some Guyana Indian groups (though precise statistics are not available). Jones[55] notes seven cases of deaf-mutism in three Macusi villages (Karasabai, Tipuru, Mouriru), three in Wapishiana villages, and one Acawaio case. Earlier, Farabee[29] noted seven other instances of deaf-mutism in the Wapishiana tribe.

Diseases and Amerindian Micro-evolution

There is now sufficient evidence to demonstrate that diseases may at times have been powerful selective forces in human evolution,[45, 71] changing the genetic mosaic of earlier populations in varying ways.* At a recent IBP meeting on "Natural Selection and Transmissable Disease" some possible correlations were considered and, more important, the complex nature of the problems occurring in this field were acknowledged.[3] Certainly much of the literature on human polymorphisms and differential susceptibility to diseases is rather speculative, although nevertheless worth while, and the following comments referring to Amerindians simply pose further questions or re-cast previous ones.

I think at the beginning of any such consideration of Amerindians, the conception of a modern but biologically pre-contact population must be accepted as mythical however pre-Columbian in nature a particular tribal economy and culture might appear. Reluctantly, Neel and Salzano[72] concede this point in their review of "surviving primitive" Amerindian groups. Even where Europeans and Africans have not penetrated into an area, inter-village and inter-tribal contact has been sufficient to provide the necessary bridge for the transfer of a variety of epidemic diseases. In other words, mortality and genetic variation to-day is most unlikely to reflect accurately pre-Columbian populations.

In considering disease and the genetic make-up of Amerindian populations, it is important to remember that, unlike Old World peoples, there are two well-defined disease strata. I say well-defined in that the period after A.D. 1500 was certainly one of heavy disease intrusion, although possible early trans-Pacific and Viking contacts may have formed additional, though probably minor, avenues for disease. Which diseases fall into which disease stratum is by no means clear in some cases, and further discussion of this problem must be restricted to the spectrum of disease in the region of Guyana. Before doing so, however, there is a further point of general relevance. This is the question of how important diseases which are not killers might be in determining genetic changes in populations. Disease which can kill at or before reproductive age may be of primary importance, but due

* Nineteenth-century anthropologists were aware that disease patterns should be considered within the realm of human biology, and noted racial differences in susceptibility. All too often we do not give them credit for this.

consideration must be given to the possible additive effects of less fatal conditions. In particular, moderate debility from a disease, in a population with a hunting and collecting economy or at a primitive agricultural level, may be a death sentence—even if lack of nourishment is the only other factor involved.

Probable pre-Columbian Diseases

As Hare[46] points out, some parasites have enjoyed a comfortable relationship with man throughout his evolution and are unlikely to have exerted at any time a strong selective pressure. Considering, therefore, transmissible infections which could be pertinent to human biological studies, one is left with surprisingly fewer than the post-contact list.

In the case of treponemal diseases the temporal status of syphilis in the New World is still in dispute. The palaeopathological evidence can still be used to argue both ways[54] Neel and his colleagues[73] suggest that laboratory findings on some modern Amerindians are in favour of a post-contact date, though Vogel's (Barnicot[3]) claim of high A and AB frequencies in persons with advanced syphilis might be used to argue to the contrary. A better case has been made for pinta as pre-Columbian in date,[44] and although only one Wapishiana family has displayed evidence of this in recent years,[55] it may have considerable antiquity in the area.

To my knowledge, intestinal worm load as a selective factor, has not received the consideration by human biologists which it deserves. These parasites are not direct killers, but in populations with a minimal nutritional level, resistance to heavy infestation has distinct advantages. Noticeable frequencies of intestinal helminths have been recorded in Middle and South American groups,* though in no case have we the degree of statistical detail which is desirable. At least some of these parasites are likely to have considerable antiquity in their association with man in the Americas. Allowing for differences in economy and culture, there would still seem to be evidence for racial differences in resistance to helminths.[20, 80] Otto[78] claims less susceptibility to *Hymenolepis nana* in Negroes than in Europeans; similarly, Smillie and Augustine[97] claim that hookworm larvae less readily penetrate Negro skin. Similar conclusions as to differential resistance to filariasis were reached in a study of different groups in Surinam.[27] While being critical of these early findings, it must be noted that recent work on host-parasite relationships and immunological aspects underline the long—and, no doubt, regionally variable—adaptive relationship of man and helminths.[2, 22, 23, 24, 66]

Regarding the Amerindians in Guyana, with very high infestation of *Necator* and *Ascaris*, one is struck by the apparent lack of symptoms—strongly contrasting, for instance, with findings on certain Chinese groups, where general weakness, flabby muscles, heart palpitations, etc., were common.[15] Also, unlike the Chinese samples, there is no evidence that such parasite loads result in retarded puberty, menstrual upsets, and partial impotence. Unfortunately, in the absence of larger samples, egg counts, and a more precise assessment of worm load per individual in the Amerindian group, such comparisons must remain tentative.

Although onchocerciasis has not been reported in recent years in Guyana, its presence in Venezuela[35] and Surinam[67] suggests that other eastern regions may have been involved at an earlier date. It is most unlikely that all five species of *Simulium* present in Guyana[96]

* Costa Rica, 77 per cent hookworm in rural groups;[80] Mexico, over 50 per cent infected with *Ascaris*, *Hymenolepis*, and *Trichuris* in one locality studied;[89,90] Columbia, *Ascaris* causes child ill-health, though hookworm is uncommon;[112] Chile, *Ancylostoma* frequent in some areas, *Taenia* has about 1 per cent frequency;[50] Xavante of Brazil, *Trichuris*, *Necator*, *Enterobius* and *Ascaris* present, but frequencies not established; Oyampis of French Guiana, evidence of noticeable hookworm infection;[87] Guatemala, *Ascaris* in over 80 per cent of the children;[31] Quechua Indians of Peru, *Trichuris* in 51 per cent, *Heterodera* in 32 per cent, Taenia in 2 per cent and *Ascaris* in 82 per cent.[79]

would be unable to transmit this infection. My reason for mentioning it here is that this helminth may provide evidence of a very different selective process operating on man—perhaps including Amerindian communities. Choyce,[17] in considering possible population differences in susceptibility to this disease, points out that degree of iris pigmentation appears to be correlated with degree of ocular onchocerciasis (from iritis to secondary glaucoma and complicated cataract).

Post-contact Diseases

A number of these intrusive parasites have had profound effects upon the Amerindian tribes, even to the point of causing extinction. Malaria, which has made spasmodic progress in Guyana for well over a century—and may not have reached some parts of the Interior until two or three decades ago—has been a major debilitating condition. Dunn[26] has recently reviewed the problem of malaria in the Western Hemisphere, and presents further evidence to support the view of a post-contact date. Malaria may therefore only have been a health threat for about two centuries, and for much of this time only the coastal groups would seem to have been severely hit. Yellow fever virus, on the other hand, may have a longer and more widespread history in the tropical region, although the evidence is indirect. Between 1508 and 1655, a number of yellow fever epidemics occurred in the Caribbean area,[95] and it is reasonable to suspect that about this period it became established with its vector *Aëdes aegypti* on the mainland of South America. In view of the high immunity rates which have been recorded for some Amerindian samples in Guyana, it raises the question as to what extent "subclinical" infection results from reduced virulence, and how likely genetically determined host resistance might be in this instance.

Tuberculosis is another disease which is controversial as regards its establishment in the Americas. Morse[69] in reviewing early Amerindian skeletal evidence remains unconvinced of a pre-Columbian date, but accepts its prehistory in the Old World.[70] For the Guyanese Amerindian, this is a continuing—if not increasing—threat. Contrary to the opinion of Neel and Salzano,[72] I think Jones has good grounds for considering that nutrition, home environment, and changes in the pace of life, cannot be used to argue away their pronounced susceptibility to this disease. By this argument, one would certainly expect some of the poorer coastal non-Indian communities to display higher frequencies. Admittedly, the question of inherent differences in response to tuberculosis, is a complex one.[94] It may be significant to this argument that the North American Indian, with a much longer recorded history of high tuberculosis rates may now be moving towards greater resistance to the infection.[25]

Smallpox is another disease which had penetrated the Caribbean area by 1507, and had probably reached epidemic proportions in Mexico by 1521.[46] As in the North, South American Indians could well have been affected by the seventeenth century, although it may be significant that there is no good evidence in Guyana before early in the nineteenth century, when the epidemics were devastating.* The claim that ABO polymorphism is related to a differential susceptibility to smallpox[108] underlines the possibility that it determines some micro-evolution in the indigenous communities of the New World.

It is still very debatable as to what extent mortality from measles may be related to inherent factors or purely the result of nutritional and psychological changes. Brett[5] noted in the measles outbreak of about 1854, that lack of food enhanced the severity of the condition. Inability to collect food or culturally determined restriction on eating during

* Some time prior to 1854, vaccination had already been undertaken on some mission Indians,[5] and it is thus possible that in later epidemics of smallpox there was a strong differential survival in favour of the mission settlements—with perhaps genetic consequences for the more recent generations.

sickness have also not helped even in recent years. Nevertheless, it would seem premature to dismiss possible genetic factors when, even in modern Amerindian villages with medical aid at hand, severe epidemics can occur with a mortality of 6 to 7 per cent.

Psychological Factors

In their recent study of the Xavante Indians, Neel and colleagues[73] regret the lack of information regarding the psychology of such primitive communities. Indeed, survival may at times be a matter of mind rather than body. Psychological studies would be of value in Guyana no less than elsewhere, and in view of ever-increasing contact and European-style education, has become urgent. The Amerindian's traditional composure, resistance to directives and commands, and his placid view of time passing, are personality traits which must have greatly assisted his adaptation to the tropics.

Future Development and the Amerindian

The present government of Guyana has stated its intention to continue developmental aid to the Amerindians. The intensive health surveys of Dr. C. R. Jones between 1949 and 1951 and the establishment of medical rangers in the Interior has enhanced the health status of these people. The periodic distribution of milk, and vitamin capsules at school is a further beneficial innovation of some years standing.[93] A special Department of Amerindian Affairs was set up under the late Mr. Stephen Campbell, a Parliamentary Secretary and an Amerindian, with a view to their better participation in Guyanese society.[14] Mr. Campbell has now been succeeded in Parliament by Mr. Philip Duncan, also an Amerindian, who is well aware of the doubts and problems of his own people. As a result of recommendations made by Mr. S. C. Knapp,[58] Indian Affairs Officer to the Canadian Government, the Guyana Development Programme accounts nearly three million Guyanese dollars for future land, road and building development, water supply, health and education, in Amerindian areas.[7] How fast these plans will come into effect would, however, seem debatable.

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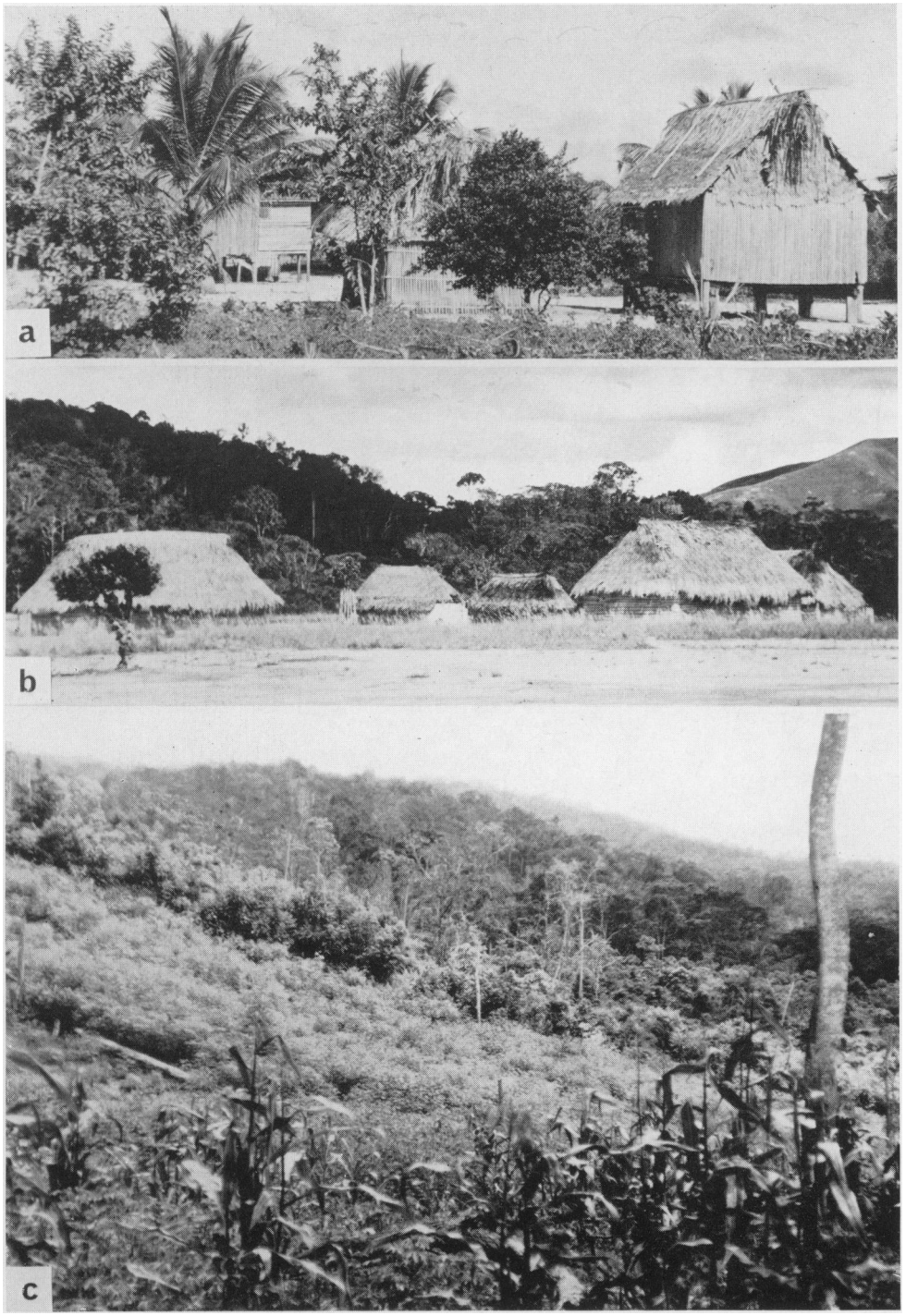

PLATE 1

(*a*) Part of the Arawak village of Pakuri Landing (St. Cuthbert's Mission).
(*b*) Typical adobe houses at Kato (Patamona village).
(*c*) Cultivated plot deep in the forest near Kurukabaru. In the foreground is scattered maize, beyond which is cassava and then forest.

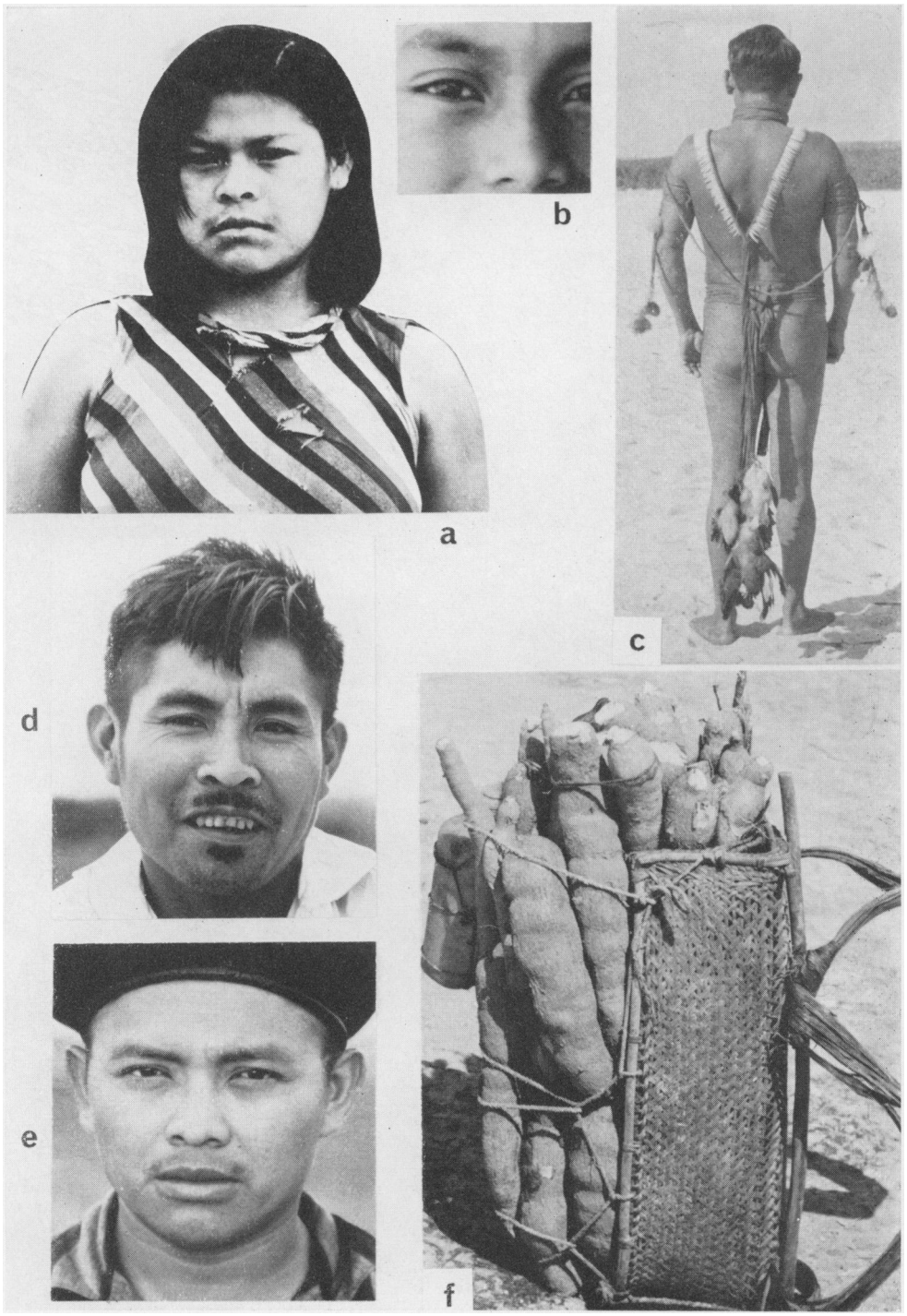

PLATE 2

(*a*, *d*, *e*) Amerindian facial variation

(*a*) Patamona female; (*d*) Man of Arecuna stock, but now regarded as Patamona; (*e*) Macusi male.

(*b*) Close-up of the eye region, showing a common variant with no epicanthic fold but an exposed lachrymal caruncle.

(*c*) Posterior view of an Acawaio male, displaying a short and rather lateral body build. Photo by courtesy of Dr. A. J. Butt.

(*f*) Patamona warishi with a substantial load of cassava. Such heavy packs are carried long distances by both sexes.

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