MALE ABSENTEEISM AND NUTRITION: FACTORS AFFECTING FERTILITY IN MATAWAI BUSH NEGRO SOCIETY

In Matawai society children are highly valued and large families are desired by most people. The fertility level, however, is notably low compared with similar societies. The purpose of this paper is to present and analyse Matawai demographic data in order to understand this discrepancy between motivation and actual reproductive performance. We put forward some hypotheses which relate nutritional deficiencies to reproductive instability, considering the role of men in the agricultural and ecological cycle as an intermediate variable.¹

The Matawai

The Matawai is one of the smaller tribal groups of Bush Negroes, descendants of escaped slaves, who settled along the rivers of Surinam in the 17th and 18th centuries. The Matawai occupy a territory along the Saramacca river in the heart of Surinam's tropical rainforest. The runaways founded the first villages along the Toekoeemoetoe, a tributary of the Saramacca river (see map). They later moved to that part of the Saramacca river which is situated between the mouth of the Toekoeemoetoe and the rapids which divided the Matawai from the plantation colony. After the middle of the 19th century more Matawai gradually settled downstream. During the last few decades a large scale migration to Surinam's capital, Paramaribo, divided the Matawai population into those people residing in the tribal area and those residing primarily in or near the city. The upriver villages are less affected by the move...
LOCATION OF MATAWAI VILLAGES

1: 40 000
to the coast than the downstream villages. Only 14% of the four most upriver villages, 30% of the next six villages and 63% of seven downstream villages have migrated.2 The total population of the 17 villages is 1,570, consisting of 777 males and 793 females, of which 356 males and 275 females are migrants. The villages Paka Paka and Pikin Paka Paka belong to the Kwinti Bush Negroes who had joined the Matawai around 1860.3

A remarkable feature in the history of the Matawai is the early introduction and adoption of Christian religion in the second half of the 19th century. The Matawai prophet Johannes King played a major role in this development. Long before 1900, several mission posts were established in the downstream area and after 1919 also in the most upriver villages.

Traditionally, the Matawai economy was based on the exploitation of resources within the tribal area. It could well be characterized as a delicate balance between subsistence activities (shifting cultivation, hunting, fishing and collecting) and market oriented activities (lumbering and balata bleeding).

Villages in the upper river region consist of one or two related matrilineal descent groups. The structure of the downstream villages is more complex; they include people who choose to live in their fathers’ village and their matrilineal descendants. Conjugal pairs primarily reside in the wife’s homestead while the man frequently visits his own village for a couple of days. Occasionally, the whole household moves to the village of the man to attend ceremonies or simply to consolidate the bonds between the two families or matri-segments. In other cases the woman comes alone to clean the house, to wash hammocks or to clear the yard. The time that both husband and wife spend in her village exceeds in almost all cases the time in his village. Fields are usually cultivated in the domain of the woman’s descent group.

The strong tendency to local endogamy facilitates the roles of men in their own matrilineal group. Adams & Kasakoff (1975) introduced a standard to compare the level of endogamy in different societies, by determining the ‘group’ size in
which 80% of all marriages take place. The size of the Matawai '80% group' is very small (660 calculated for the 10 upstream villages), particularly when we take the high mobility and the importance of migration into account. In comparison, for the Tiwi of Australia, a tribe of hunters and gatherers, which is considered an extreme case, this value is 500 (1975: 153).

Girls are considered marriageable after they have left school (at the age of 16 years) and usually they will begin their first marriage relation one or two years later. For men, who are expected to have worked a few years after leaving school, the age of first marriage is four or five years higher. Age differences at second and following marriages, however, often increase to a maximum of 25 years.

It has been observed that marriage among the Bush Negroes is a rather loose relationship which ends as easily as it is formed (Hurault 1961: 157). Price (1975: 102) describes Sarakawa marriage as a frequent shifting of partner. Matawai society is markedly different in this respect. In most cases, marriage is a permanent relationship. More than 60% of all married women of the upper river region are involved in their first conjugal relation. However, data on the marital history and data from the downstream area indicate that marriage relations are becoming less stable. Besides, almost all Matawai marriages are nowadays monogamous. Divorce is relatively easy when both partners agree and the relationship has not been confirmed by the church. When one of the partners disagrees with the separation, his or her lineage members will make all possible efforts to settle the dispute in order to bring the couple together. Separation is often a means to make a conflict public by the partner who supposes to have the right on his side, with the expectation that the other will plead for reunion. Certainly, temporary separations ranging from a few days to several months are not uncommon events in marital history. Relatively early after the ending of a union by divorce or death of a partner, women and, more frequently, men remarry (usually within one or two years). Nowadays, divor-
cees in their twenties are often unable to find a new partner; the migration has led to a shortage of marriageable men.

Research methods and data collecting

Collecting quantitative data in a Bush Negro society is not an easy task as Köbben (1967) has pointed out. Three conditions favoured the research on population characteristics in this Bush Negro society. First, there were written records available. The registration of church members proved to be helpful, especially for the exact birth dates of the majority of the Matawai. The local parish registers of the E.B.G. (Moravian Brethren) contained files of church members with information on vital events such as birth, baptism, marriage and reproductive history. Unfortunately, with the exception of the birth dates of the present population, these data were very incomplete. Moreover, the files of deceased members were destroyed a few years after death. The Roman Catholic church register in Paramaribo provided us with birth dates of Matawai belonging to this church. Secondly, the marriage system is fairly closed; that is to say, there are very few marriages with members of other tribes. Under such circumstances the independent collecting of data through interviews with both males and females provided us with possibilities to discover discrepancies in the data. And finally, this is one of the smallest of the Bush Negro tribes (population about 1,700) so that we did not need to work with samples and all the risks such procedures introduce.

To compile census lists we used genealogies of all descent groups in Matawai society. Most population data in this article are based on the genealogies of the ten upper river villages. As part of a larger survey, marital and reproductive histories were collected for all adult males and females, in this same group of villages.

Material obtained from the survey and genealogies was constantly checked against the information that became known to us through some standard anthropological techniques, such as participant observation and the use of key informants.
We had to be on our guard against the distortion of demographic data that resulted from migration. The move of Bush Negroes of all tribes to Paramaribo has presently reached a massive scale. However, the recent nature of this phenomenon for the upstream Matawai and the fact that most of the collected demographic data are retrospective in nature makes it unlikely that this will prejudice our results. The data on seasonality of births include a number of births of mothers who recently settled in the downstream villages as well as of mothers who migrated to Paramaribo. Yet, the number of children born in town is small.

Information on mobility was collected for all females, males and male affines of the four most upriver villages over a two year period (1973-1975).

Low fertility and the desire for children

Children are highly valued in Matawai society. People are seriously concerned about the continuity of the matrilineal descent group. People belonging to the same descent group are referred to as du wan bee (of the same womb). Their involvement in the continuity and welfare of the lineage is expressed in ancestor cults and in the ceremonies related to rites de passage of its members.

At the occasion of a da koosu (the giving of a skirt to a girl to mark her social maturity) a short speech is given by her paternal aunt in which her reproductive capability is stressed: 'you must wear this koosu on top of another and give birth to lots of children. Don’t look at me, I am a poor example'. Other women of the girl’s father’s lineage enter the scene trying to touch the pubic hair and breasts of the shy, naked girl, cheerfully shouting ‘man or no man, you have to give birth to children for your bee’.

People generally agreed that ‘mii na gudu’ (children mean wealth), referring to their helpfulness and companionship. Both men and women who have many children enjoy prestige. People without children are pitied and traditional medicines to improve fertility are used by women who do not readily conceive.
Characteristics of Matawai society which are often related to a high level of fertility are the existence of corporate unilineal descent groups as basic units of social organization, high child mortality and the absence of modern contraceptives.

Traditionally, few effective devices to avoid pregnancy are known. Some men are said to prepare medicines (obias) which they drink to avoid the pregnancy of women with whom they have extra-marital relations. As in most other societies coitus interruptus is sometimes practised to prevent conception. Abortifacients prepared from herbs and lemons are traditionally known. At present, anti-malaria pills of the government are occasionally saved to be used as abortifacients in the downstream area. The thought of practising abortion horrified people. In fact, there were only a few accusations against women who were said to have practised abortion. Our impression is that abortion is not practised frequently and does not substantially decrease the fertility level.

Recently, doctors of the clinic of the Moravian Brethren (located opposite Posoegroenoe) assembled the villagers to discuss the possibilities of birth control. These attempts were met with little resistance because most people could imagine that women with large families and difficult deliveries wanted to avoid further pregnancy. This attitude changed when it became known that some young women had begun to use contraceptives. This came to the surface during our short visit to Boslanti in the summer of 1976.

Sunday morning after church, the village headman called for a meeting in the council house (kusu gangasa). Such meetings were regularly held to regulate village affairs. This time the main issue was puu bee (abortion). The headman had been informed by the schoolteacher that young single women were using pills to avoid childbirth. He called this meeting to warn these women and their mothers to give up these practices. If not he would call their names in public. He noticed that he, returning from a stay on the coast, had passed a village which was, for the time being, completely deserted and he pointed out that the same fate would strike one of the neighbouring villages where no children had been born during the past few years. Loudly shouting men started to inveigh against the women, who were blamed for depopulation. Should a woman not desire a child, there were always enough women who wanted to foster one. The reaction of the women was laconic since 'if they had pills they were given them by men.'
Afterwards we heard that labourers of the Geological Service had supplied contraceptive pills to young women with whom they had initiated sexual relations. However, the accusation at the council was also directed to the doctors who had prudently informed people about the possibilities of birth control. On this meeting as well as on other occasions it was clear that Matawai worried about depopulation and that they desired large families.

### TABLE 1

**Marital status of women in ten upstream villages according to age**

<table>
<thead>
<tr>
<th>age-group</th>
<th>never married</th>
<th>ever married</th>
<th>total in age-group</th>
<th>% married in age-group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>currently</td>
<td>widowed</td>
<td>divorced</td>
<td></td>
</tr>
<tr>
<td>15—19</td>
<td>25</td>
<td>8</td>
<td>6</td>
<td>39</td>
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<td>20—24</td>
<td>4</td>
<td>16</td>
<td>7</td>
<td>27</td>
</tr>
<tr>
<td>25—29</td>
<td>1</td>
<td>15</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>30—34</td>
<td>3</td>
<td>17</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>35—39</td>
<td></td>
<td>26</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>40—44</td>
<td></td>
<td>26</td>
<td>1</td>
<td>32</td>
</tr>
<tr>
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<td>1</td>
<td>39</td>
</tr>
<tr>
<td>55—64</td>
<td></td>
<td>30</td>
<td>5</td>
<td>39</td>
</tr>
<tr>
<td>65—74</td>
<td></td>
<td>12</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>75—</td>
<td></td>
<td>1</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>totals</td>
<td>36</td>
<td>183</td>
<td>26</td>
<td>283</td>
</tr>
</tbody>
</table>

It is amazing, however, to see how low Matawai fertility is. Compared with another tribal society in Surinam, the Carib Indians of Galibi with a total fertility rate of 10,400 (Kloos 1971: 102), the comparable Matawai rate is very low at 3,953. Also, the birth rates are considerably lower than the figure which Romaniuk (1968: 214) considers as ‘normal’ crude birth rates for African societies.9

In the following part we will consider social and ecological factors which may reduce the level of fertility.
As marital status is an important determinant of fertility, we will consider some characteristics of the Matawai marriage system which are relevant for the fertility level.

Table 1 gives the distribution of the women of 10 upstream villages according to age and marital status. The percentages of divorced women in the lowest age classes is high. Despite the fact that these divorced women conceive in extra-marital relations, their fertility is considerably lower than that of married women. The high percentage of young divorcees causes a drop in the level of fertility in the lower age classes. The high number of married women, however, in the last ten years of the reproductive span, will promote the fertility level in the highest age groups.

In figure 1 we present three variations of age-specific fertility based on different calculations. The first is based on all
adult women, the second on women with a completed or almost completed reproductive history (45 years and older) and the third on births in the period 1966-1974. A remarkable feature in the first two patterns is the rise of fertility from age category 30-34 to 35-39 and in the recent pattern of high fertility between ages 40-44. These patterns of age specific fertility deviate from the normal pattern by the relative high concentration in the higher age classes.

The percentage of women older than 45 without live births is large at 14%. Moreover, the number of women with a completed reproductive span who have a low number of births is considerable (see table 2). Accordingly, the women who contribute to the fertility level are relatively few. Women with a large number of births have longer (actual) reproductive spans. Logically, this will influence the contribution of the higher age classes to the total level of fertility.

**TABLE 2 Number of births by age of woman**

<table>
<thead>
<tr>
<th>age-group</th>
<th>number of children</th>
<th>mean number of births per woman</th>
</tr>
</thead>
<tbody>
<tr>
<td>15—19</td>
<td>31 9 1</td>
<td>0.27</td>
</tr>
<tr>
<td>20—24</td>
<td>10 12 4 1 1</td>
<td>0.96</td>
</tr>
<tr>
<td>25—29</td>
<td>7 2 6 8 1 1 1 1 1</td>
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<tr>
<td>30—34</td>
<td>3 5 6 4 2 3 2 2</td>
<td>2.89</td>
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<td>35—39</td>
<td>3 4 1 8 2 2 2 3 2</td>
<td>4.17</td>
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<tr>
<td>40—44</td>
<td>4 5 6 2 3 5 2 1 2 1</td>
<td>4.35</td>
</tr>
<tr>
<td>45—49</td>
<td>3 2 1 3 5 7 2 2</td>
<td>4.20</td>
</tr>
<tr>
<td>50—</td>
<td>16 13 15 8 11 8 6 9 3 4</td>
<td>3.90</td>
</tr>
<tr>
<td>totals</td>
<td>77 52 40 34 24 23 22 14 17 11 6 1 1 322</td>
<td>3.08</td>
</tr>
</tbody>
</table>

Total number of births (993) of 322 adult women in ten upstream Matawai villages

Cultural norms and institutions play a distinctive role in lengthening the birth interval. The Matawai are fairly explicit about the time between a birth and a next conception. While regular sexual relations of a pregnant woman with the future father are believed necessary for the growth of the foetus, after
delivery these relations are seen as harmful for a period of 9 to 10 months (the child would be retarded in its walking development). It seems that norms of women and men here diverge; some men restricted the taboo on post-partum relations to 3 or 4 months. Breastfeeding is continued as long as the child can not walk great distances. When the child begins to walk (from 11 to 14 months), it is desired that the mother will become pregnant again.12

Matawai women usually have a lactation period of about fourteen months. From birth, breastfeeding is supplemented with water. After about four months some additional food is given in the form of manioc flour diluted with water, and at weaning the food consists of soft cooked rice with water.

Looking at the actual birth intervals (see figure 2) we can infer that sexual relations after child birth are often resumed earlier than the 9 months term. In fact, the range of the distribution of birth intervals is large, beginning at 11 months and showing a peak around 24 months.
A variable which is complementary to birth intervals is the actual reproductive span. Long birth intervals combined with a short reproductive span will cause low fertility. The average reproductive span in Matawai is rather short at 10 years calculated for women with a completed reproductive span. This period is reduced by the relatively large number of women with few or no births. The shortness of the actual reproductive span in Matawai is crucial in the understanding of low fertility and we will return to this in a later section.

A frequently used explanation for infertility is the incidence of venereal diseases. According to the Matawai, venereal diseases began to spread in their territory when large groups of men started to work outside the tribal area. An early source, a government document written in the middle of the nineteenth century, said that venereal disease did not exist in Matawai society (Corsten 1849). It is difficult to evaluate these findings but we have evidence that in the late 1940s, a healer in one of the upstream villages was specialized in its treatment, using traditional medicines. Men now prefer to go to the clinic where antibiotics offer a more effective treatment. A clinic official estimated that about 50% of the registered men had been treated in the past eight years. Additional medical research on the causes of infecundity is required before we can evaluate the contribution of venereal diseases to Matawai’s low fertility level.

Male absenteeism and the ecological cycle

Matawai men spend a considerable part of their time away from their families. In the following sections we will review the ecological determinants of male absenteeism and its influence as a direct factor on the regularity of sexual relations and the probability of conception. Secondly, we will explore male absenteeism as an indirect factor on the level of fertility.

Matawai are similar to most populations in South America’s rainforests in that they are to a large degree economically dependent on the horticultural system known as ‘shifting culti-
vation,' which is based on the rotation of fields instead of the rotation of crops. The labour organization is characterized by an interplay of different activities connected with horticulture, wage labour, hunting, fishing and gathering. For food the Matawai are largely dependent on their subsistence economy. Regular communication with the coastal area had not led to the cultivation of cash crops. Only a few food products are imported from the coast. Salt is needed in large quantities for the conservation of fish and hunting game. Sugar, flour, dried fish and salted meat are occasionally bought in small quantities. In years of scarcity some rice is bought. More money is needed for other essentials such as hammocks, clothes, kitchen utensils, outboard motors, fuel and even for luxuries as radios, rum, beer, etc.

Before 1960 the focus of money earning activities was located within the tribal area. Men swarmed in groups of twenty or more to the tributaries of the Saramacca river to log wood. The timber rafts were floated to the downstream post of Kwa-koeugron where they were sold to traders. The incomes acquired with these activities were quite stable, ranging from Sf. 200 to 600.\textsuperscript{13} The major alternatives were balata bleeding and the work in the goldfields.\textsuperscript{14} Balata bleeding and lumbering were equally conditioned by climatic factors. The balata milk could best be dried in the dry season and the transport of timber was strongly dependent on the water level of the Saramacca river. Sandbanks in the dry season and turbulent waterfalls in the rainy season could make transport of timber rafts impossible. The water level reacts rapidly to changing weather conditions, causing a considerable fluctuation of the level in the Saramacca river. Fluctuations of up to five metres have been recorded.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline
\hline
Rainfall in Boslanti (1964-1973), in mm \\
\hline
207 & 196 & 228 & 260 & 365 & 320 & 217 & 120 & 68 & 35 & 75 & 145 \\
\hline
\end{tabular}
\caption{Rainfall in Boslanti (1964-1973), in mm}
\end{table}
The rainfall data\textsuperscript{15} (table 3) we obtained for the ten year period 1964-1973 for Boslanti give an indication of the most suitable months for the transport of timber and the processing of the balata. Particularly unfavourable are the months October and November when the water reaches its lowest level and the months May and June when the level is generally too high.

Our data from 25 work histories are in accordance with these observations. In most cases work ends in August or September; variations exist in the length and beginning of the work periods, traditionally ranging from two to five months. The collective character of lumbering had the effect that the seasonality of absenteeism was further reinforced.

Climatic conditions are not the only restriction on the working periods of men. The agricultural cycle is even more important. The division of labour and the contribution of males to the agricultural cycle is most manifest around August when plots are cleared. Cutting undergrowth, felling trees and burning are exclusively male activities. The process of burning is recognized as essential and it requires at least a month of drying under good weather conditions. This also explains why men return to the villages in August at the beginning of the dry season. After the first crops (manioc, plantain, watermelon and corn) are planted before the turning of the year, short shopping trips are made to Paramaribo. Before the heavy rains begin to fall in May, the fields are wholly cleared of weeds before rice is planted. Both men and women participate in these activities. While the women stay in the fields to keep an eye on the newly planted rice and to drive the birds away, men pound large quantities of rice and prepare manioc cakes for their stay on the working sites. Once the work parties have left the villages in May and June, the population is largely reduced to women and children, who care for the fields. In July and August, when the rice begins to ripen, the peak in the women’s activities is reached. The rice harvest is an exclusive female activity and men have no tasks in the fields. In these months the division of labour is most pronounced.

In the late 1950s, other work opportunities gradually became available when Bush Negroes were needed for the
exploration of Surinam's vast interior. Government agencies and contractors paid considerably higher wages than the money the Bush Negroes could acquire by lumbering. When in the early 1960s the traditional way of lumbering began to lose its significance, the men assembled and agreed to give up this kind of work definitively. The market oriented activities were no longer restricted to the tribal area. The government services employed Bush Negroes on remote sites in the interior, sometimes far away from the inhabited areas. This resulted in the beginning of a large scale migration to the coast where all administrative centres are. Very few men reside more than twenty years in the city. In the last decade many Matawai women also joined their husbands in town. A number of migrants travel between tribal area and town, such as women fulfilling their traditional obligations towards relatives by helping in the rice harvest or attending rituals at times of crises. Men who stayed behind in the villages partly continued the seasonal labour pattern, working periodically in the lumber concessions of Creoles and Hindustani. Some older men found odd jobs, making boats, building houses or preparing fields for migrated relatives. The recent changes in the labour pattern did not lead to a significant change in the seasonal character of male absenteeism. This is mainly because of the shifting cultivation that remained a constant factor in the pattern of male activities.

Male absenteeism and the level of fertility

We collected data on absenteeism of the population of four upstream villages. In figure 3 we summarize the data on male and female absenteeism of 59 males, residents and affines and of 86 females in the fertile ages. The peaks in the pattern of male absenteeism coincide with peaks in the female pattern with the exception of the period March-September when the division of labour along the sex line is most distinct. The total time that these men are out of the tribal area is 25%. The question here is to what extent does the absence of men
Fig. 3. Male and Female Absenteeism 1973 and 1974. Males between 15 and 55 years of age. Females between 15 and 49 years of age. Migrants are excluded.
from the tribal areas, when their women remain behind, lengthen the birth interval? The interval is composed in part of the months of pregnancy and post-partum infecundity, both periods that do not allow conception, and can easily comprise 21 or 22 months. Looking at the total time of the interval, the rate of male absenteeism in Matawai society could prolong the interval at most by a few percentage points. To be more precise we will base our calculation on Bourgeois-Pichat's model for natural fertility (Bourgeois-Pichat 1965). This model generates a number of variants of age specific fertility patterns under various conditions and replicate the reproductive cycle from sexual intercourse to live birth. An essential element in the model is the waiting time (the time needed to conceive) which is derived from the frequency of sexual intercourse. To estimate the effect of male absenteeism we have adapted the waiting time for the Matawai to a situation in which males are absent during 3 cycles per annum of 13 cycles. The Bourgeois-Pichat model predicts a decrease of the fertility rate of only 2.07%.

We used Matawai demographic data to control the aptness of the selected variant of Bourgeois-Pichat's model. The observed Matawai age specific fertility pattern comes close to the chosen variant after reducing the theoretical maximal reproductive span to the actual reproductive span and by taking into account the reproductive decrease within the reproductive span caused by the dissolution of marital unions. The conclusion is that temporary male absenteeism among the Matawai does not present us with a simple cause and effect explanation. The decrease in the frequency of sexual intercourse as a result of absenteeism does not contribute significantly to the low fertility figures.

Seasonality of birth

It can be expected that the seasonal absenteeism of men will cause a fluctuation in monthly birth rates. Birth data of children born to all females of the ten upper river villages show indeed a remarkable pattern of seasonality. The monthly
distribution of 697 births is given in table 4. We have omitted all cases which were not known by month of birth (30%).

**Table 4** Seasonal variation in birth before and after 1960

<table>
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<th>month of birth</th>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
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<td>57</td>
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<td>155</td>
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</tr>
<tr>
<td><strong>amplitude</strong></td>
<td></td>
<td>117</td>
<td>168</td>
<td>125</td>
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1) total number of births by month  
2) births before January 1, 1960  
3) births after January 1, 1960  
4, 5 and 6) monthly numbers of births divided by yearly total and multiplied by 1200.

A year can be divided in two periods, one from March to August with a low number of births, the other from September to February with a high birth rate. We counted 247 births in the low season as against 450 in the high season. More remarkable is the difference between the peak month December and the lowest month April, with 101 and 33 births respectively. A usual measure for the degree of seasonality of birth is the numerical difference between the deviations in percentages from the annual mean. The amplitude or seasonality acquired in this way is one of the highest recorded. It surpasses 1960 Korean data which Cowgill (1966) mentions as the highest amplitude of any country that has been studied. From her histogram we infer an amplitude for Korea of 90 which is
considerable lower than the values of 168 and 125 calculated for both periods (before 1960 and 1960-1974) in Matawai society.

Before we will look to specific causes of the seasonality, it must be pointed out that the seasonal pattern is reinforced by the fact that there is a clear peak in the birth intervals observable around 24 months. That is, when one birth takes place in the peak season, the next will probably follow in the same period of the year.

Let us now examine whether the pattern of seasonal absenteeism will correlate with the pattern of seasonality of conceptions. In figure 4 we combine data on male absenteeism (de-
viations from the mean calculated over a two year period of men between 15 and 55) and data on seasonality of birth (also deviations from the mean). On the whole, the graphic presentation shows a strong negative correlation, as could be expected. However, examining the pattern more closely, the three months period comprising September, October and November does not show the expected increase of conceptions. In other words, the time of return of most men from the coast is not related with an increase in the conception rate. The question that has to be posed is what causes the first three months of male presence to be passed without a marked increase in conceptions? We have looked for an answer in the organization of work in traditional society. Almost immediately upon their return, the men are busy with the work of felling trees in the hottest period of the year. This keeps them on their garden plots and out of the villages. It is arduous work that presumably negatively influences their physical condition and their eagerness for sexual intercourse. However, the total time spent in these activities seldom exceeds a fortnight. Moreover, the image Matawai have of dewei (dry season) is one of leisure, spending the day with the family in the shadow on a sandbank upriver with an abundance of fish and iguana eggs.

We are left with the fact that September, October and November are the driest months of the year and also have the highest temperatures. It has frequently been observed that in the hot season the lowest number of conceptions occur. According to Thompson & Robbins (1973) referring to the work of Pasamanick et al. (1959, 1960), extreme high temperatures may act to lessen both sexual activity and sperm viability, thereby reducing the chance of conception. The rainy season tends to be associated with a high conception rate. Matawai society is no exception to this rule; the correlation between conception and rainfall is high (see figure 5). However, we have to be careful with the assumption of a direct relationship between climate and frequency of intercourse.

Cantrelle & Léridon (1971), for example, found in rural Senegal that the number of conceptions reaches a minimum during the rainy season and a maximum during the following
quarter which is the first after harvest. They suggest that nutritional factors play a role. This finding is in agreement with recent work on biological determinants of fertility which shows the importance of nutritional factors in the reproductive process. Frisch (1975), in her article on the demographic implications of certain biological determinants, discusses the effects of nutrition on reproductive capability. She points out that nutritional factors influence all stadia of the reproductive process. She concludes that undernutrition and energy-requiring activities may affect the fecundity of marginally nourished populations much more than has been realized. One of the factors she mentions is most relevant in connection with the seasonality of births, the stable reproductive capability. Her
discussion of the nutritional effects on the reproductive capability is focused on the restoration and maintenance of a minimum fat level. In other studies it is pointed out that the suppression of ovulation is a response to dietary deficiencies in protein, as well as calories, vitamin B, vitamin E, and certain minerals (Katz 1972:357, Zuckerman 1962:294-300, see Binford & Chasko 1976:115).

In Matawai society food, especially meat, is an important item in daily conversation. The question ‘I findi gbangha tidei?’ (did you find meat or fish today) has almost the meaning of a greeting, and ‘gbangba angi ta ki’ mi’ (I’m starving from hunger for meat) is the daily complaint. A great deal of the women’s activities is focused on food production and preparation. In most years the field supplies enough rice, plantains and manioc for the household. However, the deficiency of protein is most distinct in the diet. The contribution, for instance, of peanuts and beans to the diet is small. The main staples, rice and manioc, used in great quantities, are poor in protein. For protein Matawai depend on game and fish which have become scarce near the populated areas (Geijskes 1954a, 1954b). Doornbos (1966: 44) mentions the protein component as the weakest in the diet of the Bush Negro and points out that this component is heavily influenced by seasonal factors.

Contrary to the findings of Cantrelle & Léridon for rural Senegal, in Matawai society the time of harvest coincides with the lowest number of conceptions. But there may be another line of explanation available which keeps close to the Cantrelle & Léridon argument. The harvest months are also those when the availability of fish and game has reached a minimum and the deficiencies of the diet are most pronounced. The men, who usually provide their wives with meat and fish, are on the coast and the possibilities for women to supplement their diet with fish are restricted by the unfavourable water level and the labour intensive and time consuming rice harvest. It seems likely that the restoration of the protein and fat levels, which had dropped to a minimum by the time of the return of the men, will take a few months. This may give an explanation for the fact that the incidence of conception is higher in the
When nutritional deficiencies play a role in the observed anomaly, we may also expect that mothers with a regular reproductive pattern are less sensitive to these factors than women with an unstable reproductive capacity. Comparison of the seasonal patterns of mothers with eight and more births with those of mothers with fewer births, reveals significant differences for the three months after the return of men (see figure 6). Our data are not conclusive that these factors are exclusive-
ly nutritional. We have no information on the influence of parasitic diseases or health conditions of particular women (which would interplay with nutritional factors) on the seasonal pattern of births nor do we have reliable data on stillbirths which also may have played a role.24

The time that elapses between the return of the men from the coast and the restoration of adequate fat and protein levels in the females of reproductive age is our main explanation of the low number of conceptions in this period. Moreover, if nutrition is an important variable causing seasonal differences in the birth rate, then we can also expect this variable to work on another level, by reducing the reproductive span (see Frisch 1975: 20). As we have pointed out earlier, the average reproductive span in Matawai is limited to 10 years. On this point it is pertinent to return to the Caribs of Galibi with their rich resources of fish. Kloos (1971: 55, 269) clearly points out that their protein supply from fish is quite sufficient and that their diet is adequate. In Carib society the high level of fertility is linked with an extraordinarily long reproductive span (30 years) (Kloos 1971:100-102). Finally, the seasonal variation may only give an indication of the role of nutritional deficiencies. These exist the whole year, but are most prominent in one half of the year.

Final Remarks

The study of seasonal variations in births is important for the discovery of variables which influence the probability of birth and conception. The first task of such a study is the consideration of intercourse variables. Research on biological variables is further complicated by the chain of intermediate variables which can cause larger ranges of variation than the direct intercourse-conception relation. Data, for instance, on climatic, dietary or parasitic factors affecting the viability of the foetus are difficult to acquire in those societies where they are most influential. In the following flow chart we summarize the suggested variables which are likely to contribute to the
seasonality of birth in Matawai. We focused our analysis on seasonal variation of live births, male absenteeism and nutrition. Some factors remained unexplored, such as the relation between workload and foetal loss and the influence of parasitic diseases. Despite these unavoidable omissions we tried to unfold part of the intricate pattern of biological, social and cultural factors which stand behind demographic data in this particular Bush Negro society.
1. We wish to thank Gary and Rosemary Brana-Shute, H.J. Heeren, Humphrey Lamur, Gigi Santow and Bonno Thoden van Velzen for their critical comments on an earlier draft, although the statements expressed herein remain the responsibility of the authors. Fieldwork among the Matawai was conducted from November 1972 to December 1974. The fieldwork was financed by the Netherlands Foundation for the Advancement of Tropical Research (WOTRO). We wish to thank all the Matawai for their generous hospitality and their cooperation.

2. Migrants are those people who reside primarily in the coastal area, predominantly in and near Paramaribo and who are referred to as such by their relatives in the tribal area and by other Matawai in town. We include the migrants who Matawai classify as 'nango ta kon' (they come and go) in as far as they spend more than 50% of their time on the coast. It must be noted that population data on the two most downstream Matawai villages (Asanwai and Makakieki) are excluded, as well as data from the Kwinti villages Paka Paka and Pikin Paka Paka.

3. Part of this tribe left the Saramacca river and went to the Coppename after a conflict with the Matawai chief Noah Adrai (1883).

4. Marriage is the union between a man and a woman which is initiated by the public ceremony 'da manu ku mujee' (giving a woman to a man).

5. Most migrants from the upstream area have been living in town less than ten years.

6. Our observations on church attendance were useful. Information about church absentees could be collected with the help of a key informant the following day.

7. This is in accordance with Lorimer's hypothesis (1954: 97) that corporate unilineal descent groups generate strong motives for high fertility.

8. The child mortality rate (0-4) is still high despite considerable improvement in the last decades. It has decreased from a level of 400 (1950) to 111 (1973).

In this article we use the following demographic concepts:

- **Fertility**: the actual reproductive performance.
- **Fecundity**: the capacity to reproduce.
- **Natural Fertility**: the number of children a non-contracepting woman can conceive over her reproductive period.
- **Age Specific Fertility Rate**: annual births per 1,000 women in age group divided by the midyear population of women.
- **Total Fertility Rate**: the sum total of age specific fertility. This rate represents the number of children that would be born per 1,000 females experiencing no mortality.
- **Crude Birth Rate**: the number of births in a given year divided by the number of population in the middle of the given year; this rate is given per 1,000.
- **Birth interval**: time period between two successive live births of one mother.
- **Actual Reproductive Span**: time between first and last live birth of mother with completed reproductive period.
- **Reproductive period**: the time between first menses (menarche) and the cessation of menstruation (menopause) in women.
Phot. 2. The butchering of hunting game (tapir).
Waiting time: the period of exposure to the risk of conception.
Child Mortality Rate: number of deaths to children under five years of age in a given period divided by the number of children born in the same period; this rate is given per 1,000.

9. Crude birth rates between 50-60 per 1,000 in African populations are considered as 'normal' (Romaniuk 1968: 214). The Matawai crude birth rate is considerably lower, fluctuating around 30 in the last few years (1970-1973).

10. In two cases we used the retrospective method to calculate the age specific and total fertility rate. First, for women older than 45 years of age of ten upper river villages at January, 1974 (TFR = 3953). Second, for all adult women of the same villages at the same date (TFR = 4165). We used the prospective method for the calculation of the third total fertility rate, which is based on all births of the period 1966-1973 (TFR = 4980).

11. Romaniuk (1968: 214) supposes that a percentage of childless women of over 45 years of age of 5% corresponds to 'natural infertility' in populations with birth rates of 50 to 60 per 1,000.

12. Among the Djuka of the Tapanahony a longer post-partum taboo is observed; as long as the mother breastfeeds the child, sexual relations should not be resumed. (personal communication of Thoden van Velzen).

13. A Surinam guilder is about 57 U.S. dollar cents.

14. Before 1925 Matawai also were engaged in river transport on the Maroni and the Lawa (French Guiana) and shared in the prosperity of the gold industry (de Beet & Thoden van Velzen 1977: 127).

15. The rainfall data are obtained from ‘Regenval in Suriname’, Meteorologische Dienst. We calculated the monthly means over the periods 1964-1973 for Boslanti.

16. We refer to those relatives who stay more or less permanently on the coast (more than half of the time).

17. The sample includes all males and females in the fertile ages (males 15-55 and females 15-49) of the four upstream villages. We included male affines of the women of these villages and excluded the migrants who resided usually more than half of the time on the coast.

18. 1,630 out of 6,549 weeks.

19. Bourgeois-Pichat's model is composed of a combination of the following variables: a) time of pregnancy, b) post-partum infecundity, c) proportion of fertile ovules, d) foetal loss, e) frequency of sexual intercourse and f) age. We used the variant a_1 (all ovules fertile, frequency of intercourse 8 per cycle age 20-24, long post-partum infecundity) for our calculations (Bourgeois-Pichat 1965: 416).
20. In a year with 13 cycles and a male absenteeism of n cycles, the waiting time is enlarged by the factor:
\[
\frac{13 \text{ waiting time} + (n + n-1 + n-2 \ldots n-n)}{13 \text{ waiting time}}
\]

21. We will use the total pattern of seasonality of conceptions (pre-1960 plus 1960-1974). The distribution did not change significantly after 1960 (Spearman's rank correlation test). Also we assume that despite the changed labour pattern after 1960, the seasonal character of absenteeism remained unchanged. Therefore it is justified to compare the present (1973-1975) absenteeism with the total pattern of seasonality of conceptions.

22. This observation is in agreement with the research of Luyken & Luyken-Koning (1960, 1961).

23. We must add that another nutritional factor may play a role. The first months of the year palmfruits (kumnu, awula, maipu) enrich the diet with vitamin B and C (Geijsskes 1954b: 152).

24. We have no information of seasonal influences on foetal death. It would require specific data on the time of conception and length of gestation which were impossible to collect in a retrospective way. Moreover, the figures we collected were far too low compared with estimates of 'natural foetal death' (Nurge 1975: 26).
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