SI for Chapter 5. Migration and intermarriage.

SI 5.1. Are tribes populations?

In the early days of anthropology we seldom questioned our ability to define a tribe and identify its members. We seldom doubted the endurance of each tribe, its distinctive language, its continuity and transmission by birth, nor its attachment to a precise location, nor its exclusive occupation of this location, and often its assumed antiquity and unchanging culture and economy. But cases have been found in which one or more of these differ from the expected. These features need not hang together. A name may be maintained while territory changes, a name may fall out of use while a biological population endures in an unchanged location. Locations may be shared by people of different identities, or people may assume an identity to gain access to a location. It has been shown that new tribes can arise by more than simple fission of old ones and that tribes can disappear by people joining other groups and changing their labels for their own and each other's ethnicity. Some have argued that the assumptions about the nature of tribes was so engrained in colonial officials that the identity and geographic and economic isolation of a classical "tribe" was produced by colonial action, for instance in imposing exclusive territory on a group and removing "others" with whom they had long traded and otherwise interacted in vital ways (e.g. Chang 1982, Little 1998). One may of course ask how the colonial officials came to think in terms of tribes. It may have reflected real life experience on their many travels, or may merely have been copied from their school-day studies of Caesar (the first anthropologist of north-west Europe?). An excellent recent case study is Cronk's (2004) description of the transition of Mukogodo (once Cushitic speaking foragers in mountainous country near the Laikipia plateau north of Mt Kenya) to Maasai herders and modern Kenyans. A comparable case in northern Tanzania is provided by Winter's (1979) account of the disappearance of the Assax language (also once Cushitic speaking foragers) from the northern Maasai steppe just some 200 km (120 miles) to the east of Hadza country.

Little (1998) describes people adopting a tribal identity for the access to land that it granted. Young (1965) described many such changes in Congo including change in claimed ethnicity to gain access to paid labor in the Congo. A small scale, short-term parallel has been reported among the Hadza. When exceptional resources are made available by government or missions, there have been claims to Hadza identity by individuals with no Hadza links. Examples include the provision of school and clinic at Endamagha, Yaeda, and Munguli (McDowell, Smith pers comm, informants), and the arrival of a truck full of clothes at Yaeda in 1986, courtesy of a mission (O'Connell obs). The processes seen on a time span of a day at Yaeda, or a century or more at Baringo, could have occurred on a longer scale in the Eyasi basin. The strongly anti-tribalist policies of independent Tanzania have minimized the need for people who want to make use of government resources to pose as Hadza. And their claims are rarely accepted by Hadza. There are two fragments of evidence for a small inflow of "converts" to Hadza identity during or just before this century. Obst mentions "An Isanzu living as an Mkindiga in the Baragu camp." Obst's accounts of Hadza battles with the Maasai are difficult to follow because it is not clear who he refers to by "Wahi" (Kisukuma for Hadza but Obst seems to use it sometimes for Datoga). His account could be taken to say

that among Datoga who lost all their cattle some united with the Hadza living in small groups in the mountains as hunters and gatherers. Present day Datoga accounts imply that these people retained their identity, regained cattle, and today are an identifiable and successful sect of Datoga herders.

Some anthropologists have carried the discovery of the fluidity of ethnicity to an extreme where "tribe" has become a forbidden word, and those who use the word are regarded as poor scholars and politically naïve at best. But tribal identity is important to most inhabitants of the Eyasi area. Day by day it is not an issue of hostility, merely an issue of identity, being able to fit your new acquaintance into a pattern and some expectancies so that interactions may go more smoothly and toes will not get trodden on. On the larger scale of history, and national politics, tribe has of course been a very sensitive issue, and the Tanzanian government and politicians are probably wise to strive to work as if "tribe" does not exist. As one local officer claimed, while discussing with us the Hadza view that their traditional lands should receive protection from occupation and modification by other lifeways, "If I give something for them, just as a tribe, then everyone else will want something special just for their group". In addition, on the large scale, luck has been on the side of Tanzanian statehood, there are so many languages in Tanzania that no single tribe has been able to become dominant and cause nation – wide problems for others. But in the Tanzanian countryside tribe is an everyday reality. Even if one refuses to use the word "tribe", one has to acknowledge the existence of some 200 different languages in Tanzania. In the Eyasi basin at least 5 languages are commonly spoken (KiIraqw (Cushitic), KiDatoga (Nilotic), Hadzane (an isolate), KiIsanzu and Kiswahili (Bantu)) and in Mangola there are native speakers of several more (Chagga, Nyamwesi, Maa, Kipare, …). Only Kiswahili is the national language, and its value is obvious in places such as Mangola with its immigrant onion farmers, and in local centers like Karatu with its cross-national bus traffic. The linguistic diversity has helped successive governments pursue completely "tribe free" policies. Probably quite wisely, the government explicitly proceeds as if "tribe" did not exist. Citizens are encouraged to regard themselves primarily as Tanzanians, and many do so, even in remote countryside. Hadza remain at the conservative end of the spectrum. They identify themselves and each other as Hadza, see this identity as closely tied to hunting and gathering, and see the Eyasi Basin as their land, in which they have always lived.

Hadza refer to other Tanzanians as "Swahili", or by the Hadza name for the visitor's tribe (mother tongue group). Each of these neighbors, and others further afield, have (since at least the 1890s when they told Baumann about the Hadza) also recognized the Hadza. Each had their own name for the Hadza (Kisukuma: Wahi; Kisanzu and Kinyamwesi & KiIramba: Tindiga or Kindiga; Buwe: Wanege), which caused some confusion among writers such as Obst, Bagshawe and Kohl - Larsen, despite the clarity of Baumann's limited (1894) and Dempwolff's (1916) extensive collection of these terms (perhaps an indication that these early writers did not make much use of each other's reports!)

Hadza speakers talk of themselves as distinct from their neighbors, and talk of their neighbors as sometimes dangerous, sometimes untrustworthy, and best avoided.

Resentful talk about intrusions upon their country arises often. Many statistical differences between Hadza and each neighboring group could be documented and would most likely be found to correlate with language use, and to a large extent with where people live and who they live with (and who they marry, Stevens et al. 1977). Documenting these very obvious population distinctions here would take too much space. Despite the hostile talk and observable separations, many interactions with neighbors occur and apparently always have done. Most are friendly, some are personal relationships of friendship or marriage.

SI 5.2. Migration. A study of very small numbers. migration

- **SI 5.2.1. Who got into the study? whogotinstudy**
- **SI 5.2.2. Becoming a Hadza becomingaHadza**
- **SI 5.2.3. Destinations and sources destinationsxsources**
- **SI 5.2.4. Emigration emigration**
- **SI 5.2.5. Location of siblings of interviewed women siblings**
- **SI 5.2.5. Follow up of census cohorts. censuscohorts**
- **SI 5.2.6. Immigration immigrantsnreturnees**
- **SI 5.2.7. Returnees, immigrants previously recorded newcomerIDs**
- **SI 5.2.8. Previously unknown immigrants nonids**
- **SI 5.2.9. Combined immigration combimmig**
- **SI 5.2.10. Net migration netmigration**
- **SI 5.2.11. A small demographic effect of age at which women leave and return byagensex**

SI 5.2.1. Who got into the study?

Who do we call “a Hadza"? Who gets into our study and who does not? In theory we refer to people who identify themselves as Hadza, and who claim that the Hadza language is their mother tongue. Such individuals are widely recognized as Hadza by other Hadza. In practice our field method indirectly allowed Hadza to define themselves. For our censuses and anthropometry we moved from camp to camp, finding each camp by asking people in the current camp where there was another. We also asked informants where each person listed in our population register was currently living (“where are they now” interviews). The register is a list of information about all the people encountered in our research, or who Lars Smith encountered in 1977. We also tried to identify in this register, everyone who we saw in a census. These procedures gave clues about the difficulty of “becoming a Hadza” and of leaving and ceasing to “be a Hadza”. There are also people in our population register who we have not met but who Hadza know to be alive. Our assistant and others say of some of them that they have “gone to the Swahilis”, and although they were Hadza once, in some sense apparent to Hadza they are still "really" Hadza but should now be categorized differently from the majority.

Kaare & Woodburn's (1999) "flexible ethnicity of peripheral persons" would apply to perhaps two men at Yaeda, one family and another man in the Mangola area. It would apply to many more people in the Singida villages. There are people there, children of Isanzu fathers and Hadza mothers, who primarily stay at the villages, and who other Hadza would describe as "gone to the Swahilis" but who might on occasion claim Hadza ethnicity. Most of the time the children of these people seem unlikely to marry back into Hadza society. Exceptions may have occurred. During the Mongo wa Mono settlement around 1990 some pressure was put on Hadza at Munguli to move to live with "all the Hadza together". Late in the 1990s two Hadza women who had lived at Gambasimboye near Munguli for many years married to a Hadza who farmed, were widowed and moved to Domanga with their children and grandchildren. This will have changed the future ethnicity of most of their children and grandchildren. Kaare & Woodburn are right, and ascertaining a total number of Hadza is indeed difficult. But determining important demographic parameters may not require the amount of precision they seemed to have in mind.

SI 5.2.2. Becoming a Hadza.

Very few people become a Hadza other than by birth. Five contemporary people illustrate the possibilities. Two middle aged men seem to have become accepted as Hadza although neither had Hadza parents. They are described as having "become a Hadza", with the obvious implication that once they were not, and that still their identity is somewhat qualified. Both have for long been married to a Hadza and live among the families of their wives. Both speak Hadza. These are two individuals, contrasting with some 250 adult men (aged 20-90 in the population register, or 232 ever measured, age 20-90) who Hadza regard as having been born and raised Hadza. A much younger man, apparently of Maasai descent appeared well on his way to becoming accepted. He too had married a Hadza girl, and lived in her camp. Living near the Mangola springs, he fished with much more success than he hunted, but he seemed to be a popular individual and very much a member of his wife's family. However, he suddenly left, and has not been seen again. A personable and smart teenager got himself a school career by learning Hadza and "pretending to be" a Hadza. I only met him in town, so cannot say how he lived at home or whether he had begun to make his home with Hadza, independently, or with his "Swahili" parents. A young woman of purely Iraqw descent married her Hadza schoolday sweetheart and came to live in his camp. She has now lived there some years and thus is presumably well accepted, even though she is now conspicuously taller and heavier than all Hadza women. She had had no children by the time I ended my study and it is impossible to guess what will become of her or her children. Thus I can list five people who appeared to have been on their way to "becoming a Hadza".

Earlier in the twentieth century there were contexts in which more people may have "become Hadza". But their membership is still recognized as limited, they are Swahili ancestors of present day Hadza, grandparents or great-grandparents, men or women, married to a Hadza spouse. They came from among the Isanzu who came to live in the bush to escape famine, and or the hut tax, according to the early sources such as

Obst (1912) and Bagshawe (1924). Kohl-Larsen (1958) described working with an Isanzu man in the Mangola area in 1934 who had learned Hadzane and lived with the Hadza. There was another group who "came to live in the bush", according to Obst and to contemporary informants, a Datoga group who lost all their cattle in battles with the Maasai. They lived as hunter-gatherers in the bush in Hadza country but according to our informants, managed to get some cattle and returned to their herder life. Today they form a distinguished part of the Datoga population in the area. They apparently did not settle among or marry Hadza. We know of only one Hadza with a Datoga father, much too young to have been part of this event. Datoga have been known to kidnap Hadza children to raise as herd boys. I heard of only one such case, and he was returned after his father interceded. Hadza adults still use Datoga as bogeymen to scare children into not straying too far.

SI 5.2.3. Destinations and sources

I classified destinations of emigrants and sources of immigrants to the study area as follows.

1) the Singida villages to the south (Isanzu villages within what is remembered as predominantly eastern Hadza country).

2) "The West" (Dunduwi) refers to the area west of Lake Eyasi inhabited by western Hadza. Today it is separated from eastern Hadza country by some 40-50 km of country mostly farmland, inhabited by Isanzu.

3) "Far Off". "Outside", among the Swahilis, some in locations inhabited by Hadza in living memory, others in more distant locations. Generally outside the area of most Hadza camps, but includes people described as living among the Swahilis, or having "gone to the Swahilis". Very few of the latter lived in towns but there have been individual Hadza reported to be living in Karatu, Mbulu, Singida, Kondoa, Arusha, Moshi. There is no general movement of Hadza away from their countryside into the towns. In addition to people living outside eastern Hadza country, the phrase "gone to the Swahilis" is also used for a small number of women (or men) living in eastern Hadza country, long married to a Swahili and living a villager life apart from other Hadza. This category does not include people married to a Swahili but living in Hadza camps. About 6% of married women in recent censuses were married to a Swahili, almost none of these are described by Hadza as having "gone to the Swahilis".

There has been no indication of a significant Hadza speaking population outside the traditional area inhabited by eastern and western Hadza. There is absolutely no indication that more than a handful of Hadza speakers (nor descendents of recent Hadza speakers) live far from these two areas. But as text figure 2.2 and SI Figure 5.2.1 shows, there are a number of individuals scattered around the edges of the main concentrations of Hadza speakers, and many of these are known to stay away for long periods, or are

thought of as having permanently left. We need to assess their numbers, and the rate at which people leave for, and return from these "outlying areas".

Several of my censuses failed to include visits to Hadza living in villages at the south end of eastern Hadza country in Singida region, such as Mwangeza, Domenick, Gambasimboye, Endasiku, and Munguli, "the Singida villages". All of these are relatively new Swahili villages that have grown up in what in the memory of many Hadza alive during my study, was wild bush country primarily inhabited and used by Hadza. Munguli was formed as a Hadza settlement village in the mid 1960s and thrived during the time that Rev Bob Ward was based at Kirumi and in Munguli. By the time of our 1985 census it was primarily an Isanzu farming village with a few families of Hadza, some farming, some in mixed marriages. There were Hadza camps in the bush not far away and there still are today. We found about 5 Hadza in the Isanzu village of Mwangeza at that time and we have recorded Hadza living in the other villages listed above. We have to consider movement of people between these villages and our "core" study area. "Core" refers to our movements and locations of our censuses, the word is not intended to imply some relative importance of these locations and the village locations. But the distinction does involve several factors. We know much less about people who lived in the Singida villages during most of the study period. We know that some of them spent some time farming, on a very small scale. We know that they had daily contact with "Swahilis". More of their children went to school during the early 1980s when few other Hadza children went to school. We know that in our "core" study area almost everyone hunted and gathered for most of their food. In so far as our demographic study represents population processes under a hunting and gathering economy, then the people in the "core" area are more relevant than the people in the southern villages. But we report information about the numbers in Munguli and nearby villages, which actually decreased during the period of our study as Hadza became increasingly dissatisfied with life among villagers and, as one well connected elderly woman said, "wanted to be with their own people".

SI 5.2.4. Emigration.

We can get a rough idea of whether emigration is very frequent, or quite limited, by counting the number of people who were reported in the "where are they now" interviews as living outside the study area. We can see already on the map (Figure SI 5.2.1) that they do not go far away and are not very numerous. To express this number as a percentage of the population, for each of our census years, I combined the census data and the "where are they now" data with the population register.

Figure SI 5.1. Camps marked in heavy dots, light dots show locations of outlying individuals traced in the "where are they now?" interviews. Locations of 5 individuals at or near Arusha and Moshi are omitted to preserve the local scale. Same data as text figure 2.2.

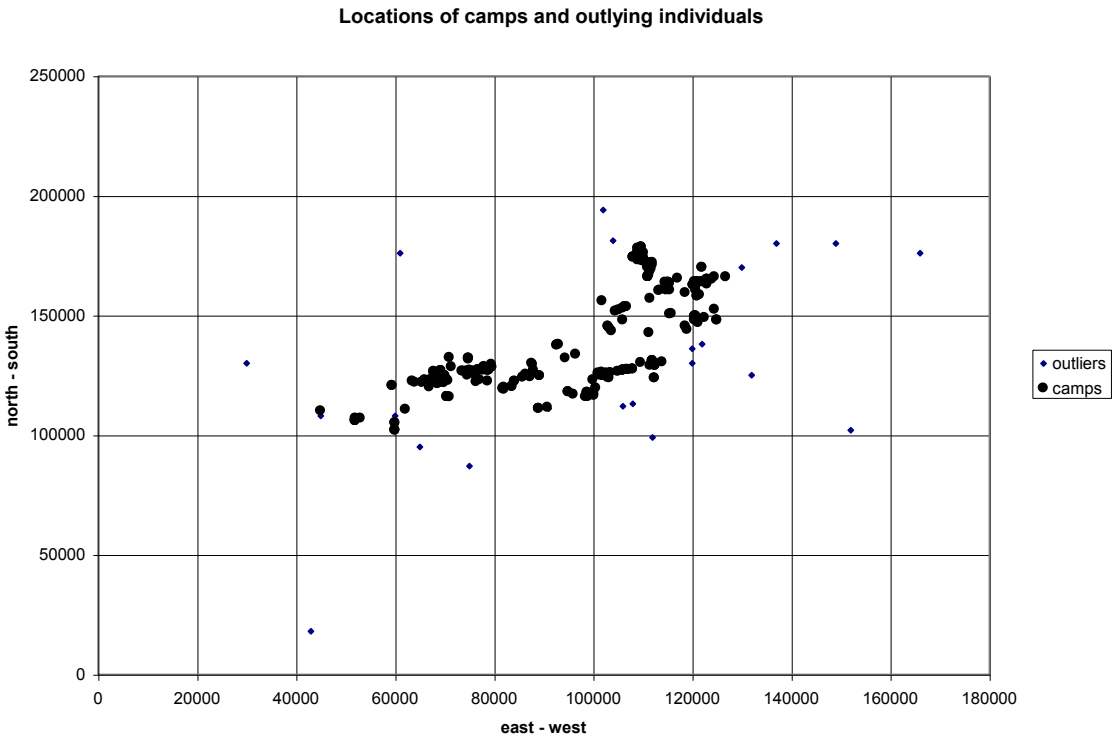

Table SI 5.2.1 shows the numbers in each area (alive and in the population register) for the year of each census. On average, 88% (mean 622 people in a census) of the sample (mean size 706 people) were recorded in the core study area, and 95% within eastern Hadza country (the study area plus the Singida villages). Twenty-two people

(3%) were in the west and 15 people (2%) were "outside". On average, 47 people (7%) were reported as living in or near one of the Singida villages.

This count was dependent on entries in our population register. The register is tied to censuses, interviews of people in these censuses, and previous censuses. People could only have got onto the register by being seen in areas where we, or previous researchers, had worked. There could be other people outside the study area who were not in the population register and who therefore we failed to ask about. We were confident that there was no sizeable concentration of them, if there had been such a concentration, even a small to average - sized camp known to any Hadza in the study area, someone would have suggested we visit it. But we can check whether there are likely to be many potentially missed people, or few, from the information on siblings of the interviewed women.

Table SI 5.2.1. Location of individuals at the time of the censuses. Information from "where are they now" interviews, census household lists, and anthropometry. People were entered only if we or our informants, knew their location in that year. The counts can not be taken as summaries of the total study population because census effort varied (see chapter 9).
Each cell shows number, and percent of col a. Eastern Hadza country = d + e. West, and "Far off" are scored as outside eastern Hadza country. Thus col a = f + b + c.
Col b. "West". N of individuals reported to be now living in the country of the western Hadza, west-north-west of Lake Eyasi.
Col c. "Far off". N of individuals reported to be living among non-Hadza inside (a few) or outside (most of them) eastern Hadza country.
Col d. "Study area". Number of individuals seen in the core study area, the area visited during all censuses.
Col e. "Singida". Number of individuals reported living in or near villages in eastern Hadza country but outside the core study area, mostly in Singida Region.
Col f. "Eastern Hadza country". Number of individuals seen or reported to be living in the area recognized by Hadza as the country of the eastern Hadza. Col d + col e.

	a	b	c	d	e	f
Year	Located + info	West	Far off	Study area	Singida	Eastern Hadza country
1985	792	25 (3.2)	10 (1.3)	636 (80.3)	121 (15.3)	757 (95.6)
1990	635	25 (3.9)	3 (0.5)	542 (85.4)	65 (10.2)	607 (95.6
1991	768	38 (4.9)	17 (2.2)	643 (83.7)	70 (9.1)	713 (92.8)
1992	590	8 (1.4)	2 (0.3)	550 (93.2)	30 (5.1)	580 (98.3)
1995	676	16 (2.4)	12 (1.8)	633 (93.6)	15 (2.2)	648 (95.8)
1997	661	15 (2.3)	31 (4.7)	607 (91.8)	8 (1.2)	615 (93.0)
1999	754	24 (3.2)	14 (1.9)	684 (90.7)	32 (4.2)	716 (94.9)
2000	776	28 (3.6)	30 (3.9)	685 (88.3)	33 (4.2)	718 (92.5)
Means	706.5 100%	22.4 3.2%	14.9 2.1%	622.5 88.1%	46.75 6.6%	669.2 94.7%

SI 5.2.5. Location of siblings of interviewed women.

During the reproductive history interviews women were asked to list their siblings (children of their mother, by any husband/father), and were asked which were dead or alive and where their living siblings lived. Their responses are not limited by our population register. This gave us an opportunity to learn of individuals who we had not met and on whom we had no other record, including those living in places I had never visited. Some pairs of sisters were interviewed and I combined their information to complete the description of the sibship. Each of the 104 sibships was used only once to give the following figures. Subjects listed 166 female sibs and 174 males, 340 in all. How many of these 340 people were "outliers", people living outside the study area or outside traditional eastern Hadza country?

Table SI 5.2.2 shows the results. Ninety-one percent were living in eastern Hadza country. Eighty-six percent of the 340 siblings were living inside the study area. Six percent were living in the west. Two percent were living "outside". More than twice as many females as males had left. With the exception of the West, these numbers are very close to the number of outliers found by the "where are they now" interviews above. Some 8 of the siblings had never appeared in the population register, hitherto unknown outsiders revealed by this method. If there is a significant population of Hadza speakers hidden somewhere, they apparently do not have sisters of reproductive age living in the study area. The proportion in the west was double that found by the population register. This may mean that some siblings moved to the west before Smith's 1977 census and stayed there throughout our study period, or the difference may have arisen because a few of our interviewees were immigrants from the west. But with such small numbers the difference between 3% and 6% cannot be taken very seriously.

These figures suggest that only a small proportion of Hadza are living away from our study area. Some of them may also be on the road to "becoming Swahili". But these counts do not give us much indication of the rate at which people leave. Over what time period did this small number of exiles accumulate? Is there a steady flow of so many per year, or do they represent the result of one or two sudden exoduses? A much better way to investigate departures is to look at the fate of census cohorts over the ensuing years.

Table SI 5.2.2. Location of living siblings of 160 interviewed women. Columns defined in table SI 5.2.1. There were 340 siblings, excluding the interviewees. Each of the 104 sibships was used only once. Distribution across the localities is very similar to that in Table SI 5.1

	a	b	c	d	e	f
	In the West	Far off	In study area	Singida villages	In eastern Hadza country c+d	Total sibs a + b + e
Female sibs	15 (9.0%)	5 (3.0%)	132 (79.5%)	14 (8.4%)	146 (97.9%)	166 (100%)
Male sibs	7 (4.0%)	2 (1.1%)	162 (93.1%)	3 1.7%)	165 (94.8%)	174 (100%)
All sibs	22 (6.5%)	7 (2.0%)	294 (86.5%)	17 (5.0%)	311 (91.5%)	340 (100%)

Emigration: Follow-up of census cohorts.

I looked at the subsequent fate and location of people in our first census, in 1985, and in Lars Smith's census in 1977. This is our best and most direct evidence about emigration. How many of the people who were seen in the study area during these censuses had left the area by the year 2000? We are also interested in the age at which they left, and whether males and females leave at the same or different ages. The ages at which females emigrate would be especially important for demographic consequences.

Table SI 5.2.3 shows the results for the 1977 and 1985 cohorts. It concerns people censused in the core study area (i.e. excluding people censused at Munguli or other Singida villages), and who survived to or beyond 1990. Thirteen females and 12 males (4.6% of the 1985 cohort) were reported during 1995-2000 as living outside among Swahilis, neither in the study area, nor in the Singida villages, nor in the West. Nine females in the 1985 census and 3 males (2.2%) had gone to live in the West. The figure for the 1977 cohort was 5.6% living "among the Swahilis".

To assess effects of this emigration on the population it will be useful for the simulation if we derive an annual rate of emigration of reproductive age women from these figures. The numbers of emigrants accumulate over several years. To get an annual rate we must divide the total of female emigrants by the number of years over which they have accumulated. We need to restrict the starting cohort to women of reproductive age. Girls born in 1985 reached 15 by 2000 and those from the earlier cohorts reached

reproductive age earlier. We could remove some of the older women from the sample at risk for emigration, say anyone over 45 by 2000. This leaves 187 females of reproductive age from the 1985 cohort and 126 from the 1977 cohort.

Thus 7.1 % (9/126) of the females in the 1977 cohort who were in their reproductive years by 2000 had left to live outside among the Swahilis, and 6.9 % (13 / 187) of the 1985 cohort. To get an annual rate we divide the number of females (9, and 13) who left by the number of years from the census to 2000 (15, and 23 years) to give 0.39 per annum from the 1977 cohort and 0.87 per annum from the 1985 cohort. As a fraction of the reproductive age females in 2000 these amount to a rate of emigration for 1977 cohort of .00309, and for the 1985 cohort of .00465. The mean of these is .00387, between a third and a half a percent of the reproductive age females leave each year. So in the population simulation I can test the effect of the loss to emigration each year of say .005 (0.5%) of the females aged 15 to 45. I will also test for effects of much larger rates of migration.

Table SI 5.2.3. Follow up of 1977 and 1985 census cohorts. Location during 1990-2000 of individuals seen in the core study area (excludes those seen in Singida villages) during early censuses and who survived to or beyond 1990, and on whom we had information. Eastern Hadza country (col e) = col a – (cols b + c + d). study area = col e – f. Percentages are out of number alive with information about their location. Information was missing on 7 out of the 1977 cohort and 5 of the 1985 cohort.

	a	b	c	d	e	f	g
	Alive + info g+b+c+d	West	Far off	School out of area	Study area	Singida	Eastern Hadza country e + f
1977	412	17	23	4	363	5	368
%		4.1%	5.6%	1.0%	88.1%	1.2%	89.3%
Female	218	14	9	1	191	3	194
Male	194	3	14	3	172	2	174
1985	539	12	25	13	476	13	489
%		2.2%	4.6%	2.4%	88.3%	2.4%	90.7%
Female	278	9	13	7	239	10	249
Male	261	3	12	6	237	3	240

A few emigrants left from later cohorts, from 1990 onward (1 to Singida villages, 1 to the west, 9 to "Far off". These are included in our comparison of emigration and immigration.

SI Table 5.2.4. Emigrants after 1990. Among the 102 people (aged over 5) seen in a census for the first time in 1990 or later, a few left for other locations.

	Singida villages	West	Far off (Among Swahilis)	Total emigrants
Female	1	1	5	7
Male	0	0	4	4
Both	1	1	9	11

The figures suggest a very low rate of emigration. Below we estimate the number of people who return from living outside, and the number who moved to the east from Dunduwi. These will lower the rate of net emigration.

SI 5.2.6. Immigration

I discussed 5 cases of recruitment by change of ethnic identity in the introduction. The numbers are tiny, perhaps one woman and one man on their way to becoming regarded as a Hadza, and two older men accepted as having "become a Hadza", and one ambitious young claimant unlikely to eventually join the Hadza population. Measuring immigration by "real" Hadza requires more effort.

I examined each census from 1990 to 2000 (household lists and anthropometry records) for individuals who had not been seen in our previous censuses. Some of these have an ID number and are in the population register, either from Lars Smith's 1977 census or our interviews and are either returnees or in-visitors. Others were people who we were unable to identify, I refer to them as the "nonids". Notes made at the time gave us some indication of where they had come from, and of their rough age. I tabulated them by year, by age group, and by where they had come from.

The task is complicated by the movement of people from the Munguli area (the Singida villages) into the core study area. Seventy-four of these (42 females and 32 males) were people with IDs who Lars Smith and I had listed in and around Munguli in 1985 or Lars had listed in 1977. There were another 43 who could not be recognized in the population register. This movement seems to have been concentrated in the early 1990s, either motivated by the Mongo wa Mono settlement process, or by Hadza in the Singida villages tiring of Isanzu invasion and wanting "to be with their own people". In the tables I show two versions, one that counts as newcomers only those people who had not featured in our earlier censuses, another that includes people we had seen previously outside the core study area when we later saw them inside the core study area.

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SI 5.2.7. Returnees, immigrants previously recorded

The program reports people in each census and in our population register but not seen in a previous census in the 1985-2000 series, finds their ID number if they have one, and writes text files showing new people aged 5 or older in each census. These were examined and individuals were excluded who had been seen previously in the study area, for instance during our behavioral observations but not in a census, or who were known from "where are they now" interviews to be resident in the study area. The result is a list of people and the first census in which they were seen.

Table SI 5.2.5a shows the locations from where these new people came. The newcomers seen in all 7 censuses after 1985 (1990-2000) were combined. Because many of the people seen in 1985 at Munguli and the Singida villages moved into the core study area by 2000 (42 females, 32 males), I made a second version of this table. Table 5.2.5b shows newcomers to censuses in the core study area, excluding people previously seen in Munguli or other Singida villages. Since these people had for long interacted with people elsewhere in eastern Hadza country it may not be right to score them as immigrants or returnees to the eastern Hadza population. Consequently in computing Table 5.2.5b, individuals seen previously in Munguli or other Singida villages and who moved into the core study area were not counted as newcomers. This probably gives a better picture of the true rate of immigration to the eastern Hadza. It includes 6 people with ID numbers and in the population register from Lars Smith's 1977 census who had arrived from Singida villages but had not been seen there in 1985. Seven women arrived from the west, and 8 returned from "outside among the Swahilis" during the follow-up period (Table 5.4).

Table SI 5.2.5a. Newcomers to the study area with IDs. In each census after 1985 we encountered some people who we had not seen in a previous census. Some could be found in the population register, they had NIDs. Many had moved from the Munguli area (the Singida villages).

Nids	From Singida villages	From west	From far off among swahilis	Total newcomers with NID
Females	42	7	14	63
Males	32	7	6	45
all	74	14	20	108

Table 5.2.5b.
In this table I do not count those seen previously in Munguli as new when seen in the study area later.

Nids	From Singida villages	From west	From outside among swahilis	Total newcomers with NID
Females	4	7	8	19
Males	2	5	7	14
all	6	12	15	33

SI 5.2.8. Previously unknown immigrants

The program searches the household lists and anthropometry data year by year, and lists the people who had no ID number attributed to them, the program also lists all the available information on these individuals. In each census some of those with no ID were identifiable as a "Swahili", listed as the new husband of a Hadza woman, or measured because they were present at the time and volunteered. There were 19 of them. They were not counted as immigrants. Others were identifiable as a person we had seen before. "NoNids" who could be recognized and were recorded repeatedly, were counted only on the first occasion they appeared, not on subsequent occasions. Table 5.2.6 shows the numbers of NoNid immigrants. Seven females and 5 males returned from living outside among Swahilis. Seven females and 7 males arrived from the west. The 43 from the Singida villages justify Kaare & Woodburn's (1999) caution about the difficulty of enumerating the total number of people who might claim Hadza identity.

If we add the nonids to the new nids (Table 5.2.7) we see that 15 females and 12 males returned from outside, 14 females and 12 males arrived from the west during the study period.

Table 5.2.6. Newcomers with no NID.
In any census after 1985 there were some people who we could not match with anyone in the population register, they had "no Nid". This table shows where they came from as best as we could ascertain.

Nonids	From Singida villages	From west	From outside among swahilis	Total nonid newcomers
Females	23	7	7	37
Males	20	7	5	32
all	43	14	12	69

SI 5.2.9. Combined immigration

Table SI 5.2.7 combines the data on identified and unidentified immigrants. It omits 32 men and 42 women who left Munguli and the Singida villages after we had seen them there in 1985 and moved into the core study area. This was a special event, amounting to a desertion of Munguli by Hadza.

SI Table 5.2.7. New combined immigration table.

Row		From Singida villages	From West	From outside among Swahilis	Total newcomers
1	NID females	4	7	8	19
2	NID males	2	5	7	14
3	Nonid females	23	7	7	37
4	Nonid males	20	7	5	32
5	Total females	27	14	15	56
6	Total males	22	12	12	46
7	Total both sexes	49	26	27	102

SI 5.2.10. Net migration

In Table SI 5.2.9 (same as text table 5.2) we compare the number of new people (immigrants) encountered in the study area between 1985 and 2000 with the departure of people from the 1985 cohort (plus the handful who left from later cohorts during the same time period). These very small numbers produce a rough balance between emigration and immigration between east and west, and to and form life among the Swahilis. This is true whether expressed as raw numbers, as an annual rate, or as the proportion of the population. Slightly more people left to go "Outside" than returned from outside. Slightly more men migrated from the west into eastern Hadza country than emigrated to the west. The very balanced female migration seems to exchange slightly less than one (0.80) female per year between the eastern and western populations. In the chapter on intermarriage we will get some idea of the history of this low level of migration.

Migration between the study area and the Singida villages was far from balanced. The numbers seem to me to represent a one-time desertion of the Singida villages by several Hadza families. This departure probably heralds a further loss of traditional Hadza country and illustrates a process of retreat that could have happened several times in the past as former Hadza country was left to the Isanzu, Iramba, and in the west, Sukuma farmers.

Table SI 5.2.9, same as text table 5.2. Combined emigrants and immigrants to eastern Hadza, between 1985 and 2000. Eleven people, seen for the first time in a census after 1990, emigrated between 1990 and 2000. In this table they have been added to the numbers of emigrants from the 1985 census.

1985 - 2000	To / from Singida villages	To / from the West	To / from "outside"
Emigrated	3 male 11 female	3 male 10 female	16 male 18 female
Immigrated	22 male 27 female	12 male 14 female	12 male 15 female

SI 5.2.11. A small demographic effect of age at which women leave and return

Although nearly balanced in mere numbers, migration of females might still have a demographic effect. If females leave young, and return later, some of their reproductive years have been spent outside the study area. Do they bring as many children back with them as they would have contributed to the Hadza population in the study area if they had stayed home?

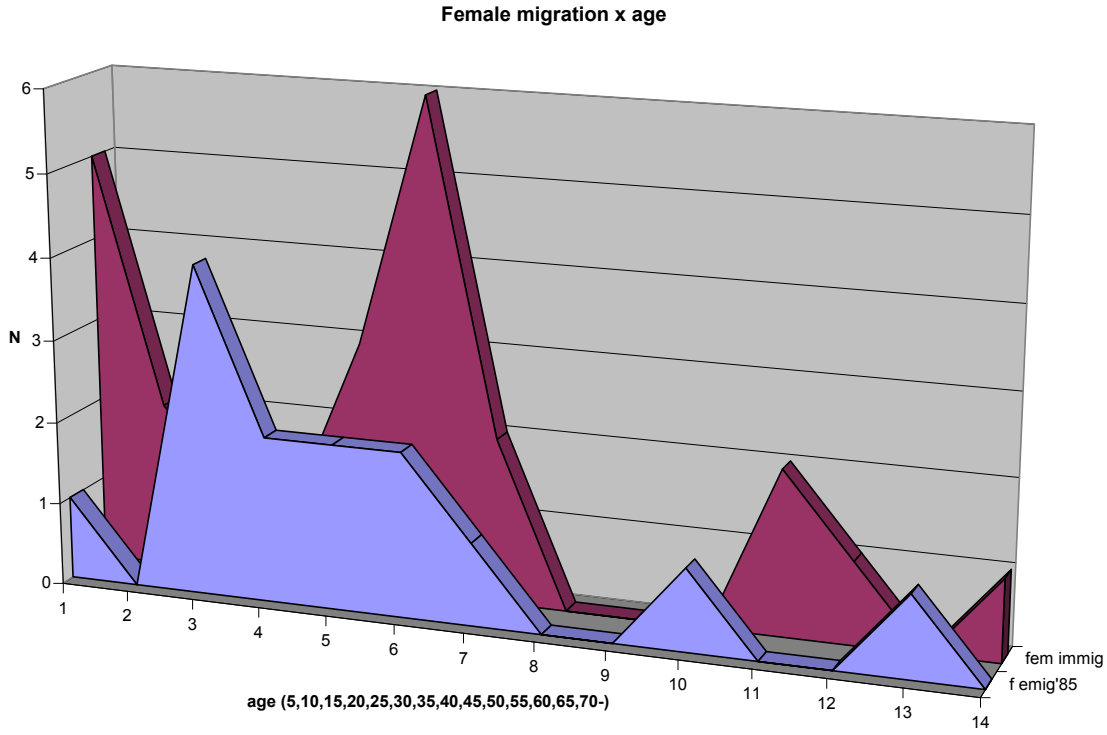
I wanted to see whether women left when young and returned late in their reproductive careers. The numbers of migrants are very small, especially when spread among several age classes. Because important data on immigrants came from the "nonids" and age information on them was very incomplete, we are only able to use very crude age blocks among the adults. I plotted the data on charts to show the age pattern for female emigration and immigration. Year of emigration was estimated for each individual in the 1985 cohort by identifying the first census in which the individual was reported as living outside the study area. Age at departure was calculated to nearest whole year from estimated year of birth to year of departure.

The age pattern of female migration is shown in Figure 5.2. The blue field represents the females who leave, and the red represents those who arrive. Of the females who emigrate (to outside Hadza country), most do so in the 15-19, and 20-29 age blocks. Of the females who immigrate, most do so in the 0-5 and 30-49 year old age block. This supports our impression that young women leave for a marriage to a "Swahili", and although a large proportion of them return, they return later, when their reproductive career is at least half way through. Thus female migration, though balanced in total numbers, could have a demographic effect. We note that some number of the youngest age groups (ages 0-9) also immigrate, suggesting the return of children of Swahili fathers along with their mother. Migration between west and east appeared to show a more even age distribution, young women came from the west to marry an eastern Hadza, and returned later, and vice versa.

Six of the interviewed women had lived outside the area, married to a Swahili before they were interviewed at average age 36.5 years. Of the 22 children they bore while away, they brought back seventeen children with them, an average of 2.83 live children each. Women who had stayed in the study area had on average 3.68 live children at age 36.5. So women who leave but return contribute only 77% of the number of children contributed by women who did not emigrate.

Thus migration to and from life among the Swahilis occurs at a very low rate but includes the departure of young women, which may be expected to have some small demographic effect. In the text I look in more detail at intermarriage, which mostly concerns Hadza women marrying Swahili men.

Figure SI 5.2. Female age at emigration and immigration. Cases with poor age estimates are included in the sample. The result is similar without these cases. Peak age of departure is 15-24, peak age of return is 30-34. The children brought back by women who had emigrated to marry a Swahili comprise the young immigrants. Does not include migration to/from the west which is more evenly distributed as women return to their homeland after a marriage in the east.



SI 5.3. Intermarriage. Non-Hadza mothers, grandmothers, great-grandmothers.

In the Tables (text table 5.4 and SI Tables SI 5.3, 5.4.1 and 5.4.2) sample size appears greater for grandparents than parents because each subject has just 2 parents but 4 grandparents and 8 great-grandparents. We are not here trying to calculate frequency of Swahili genes among the Hadza, merely the incidence of intermarriage in previous generations, the proportion of mixed marriages in previous generations. Note also that we have no record of the ancestors of the Swahili ancestors, we assume they were all Swahilis. By counting number of children with Swahili or Hadza parents we risk biasing the count in favor of whoever has most children who survived and whose ancestry we can trace. I show later that there are no significant differences in fertility or child mortality between Hadza women with Swahili husbands and Hadza women with Hadza husbands during our study period (there could have been in previous decades).

Table SI 5.3. Number of individuals (born in each quinquennium) who had Swahili mother, or Swahili grandmother or Swahili great-grandmother.

Quinquennium ending in	Swahili mother	Hadza mother	Swahili grandmother	Hadza grandmother	Swahili great-grandmother	Hadza great-grandmother
2000	0	118	2	212	6	380
1995	0	120	2	223	3	366
1990	0	107	2	187	6	296
1985	0	114	1	215	9	300
1980	0	97	0	174	6	213
1975	0	113	0	209	15	226
1970	0	57	0	107	9	99
1965	0	77	1	129	8	116
1960	0	75	0	113	4	88
1955	0	44	1	61	2	29
1950	0	32	0	47	2	27
1945	0	39	0	40	0	14
1940	0	40	0	35	0	8
1935	0	32	0	20	2	9
1930	2	38	0	26	2	9
1925	0					
1920	0					

SI 5.4. Western Hadza mothers, fathers, grandparents.

Table SI 5.4.1. Number of individuals (born in each quinquennium) who had a Western Hadza father, or a Western Hadza grandfather or a Western Hadza great-grandfather.

Quinquennium ending in	Western father	Hadza father	Western grandfather	Hadza grandfather	Western great-grandfather	Hadza great-grandfather
2000	1	117	12	200	26	366
1995	2	118	3	221	19	362
1990	5	102	6	182	25	290
1985	0	117	0	218	15	308
1980	2	95	2	176	11	218
1975	3	110	3	208	24	225
1970	3	54	5	102	8	99
1965	2	75	1	135	8	116
1960	1	74	1	119	2	92
1955	1	43	1	64	2	30
1950	0	32	0	48	1	30
1945	1	34	0	40	2	15
1940	2	38	1	36	0	8
1935	3	29	0	25	0	9
1930	2	36	0	28	0	8
1925	3	15	0	6	0	0
1920	0	21	0	7	0	1

Table SI 5.4.2. Number of individuals (born in each quinquennium) who had Western Hadza mother, or Western Hadza grandmother or Western Hadza great-grandmother.

Quinquennium ending in	Western Hadza mother	Hadza mother	Western Hadza grandmother	Hadza grandmother	Western Hadza great-grandmother	Hadza great-grandmother
2000	0	118	11	212	24	380
1995	0	120	7	223	10	366
1990	0	107	4	187	9	296
1985	3	117	10	215	6	300
1980	0	97	5	174	3	213
1975	5	113	13	209	7	226
1970	4	57	8	107	5	99
1965	3	77	5	129	2	116
1960	4	75	3	113	0	88
1955	2	44	1	64	0	29
1950	1	32	1	47	0	27
1945	3	35	2	39	0	14
1940	2	40	0	35	0	8
1935	2	32	0	20	0	9
1930	0	38	0	26	0	9

Figure SI 5.4.1. Percentages of marriages with Western Hadza men.

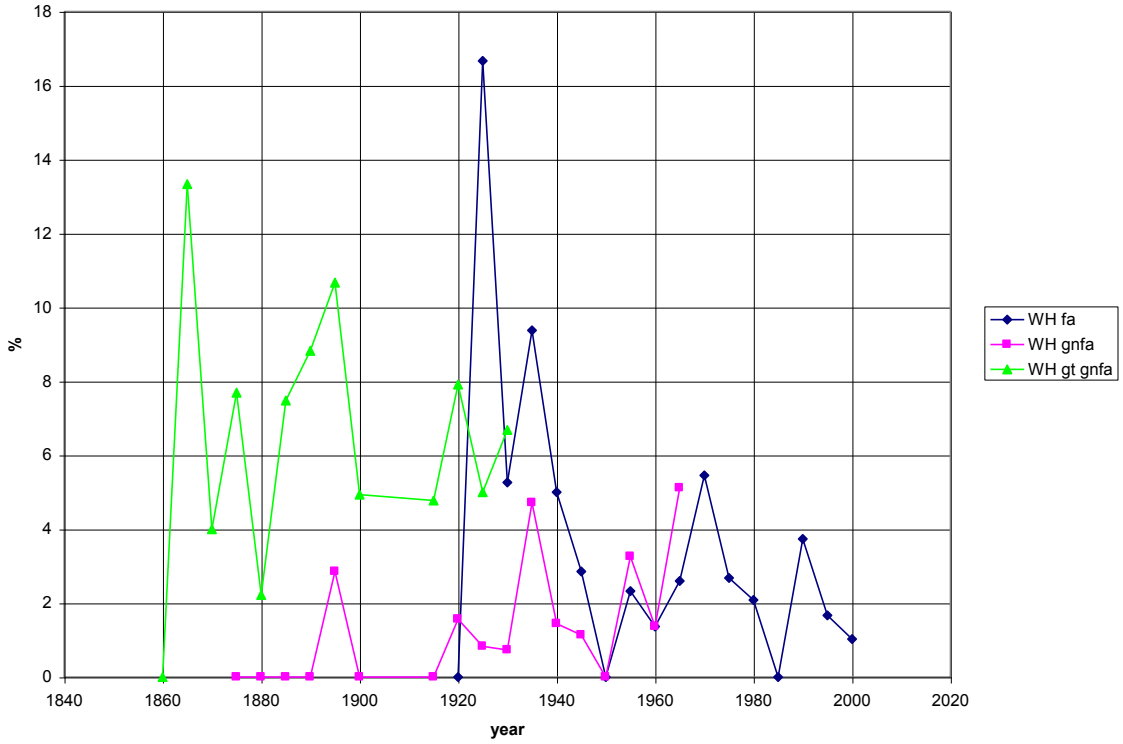
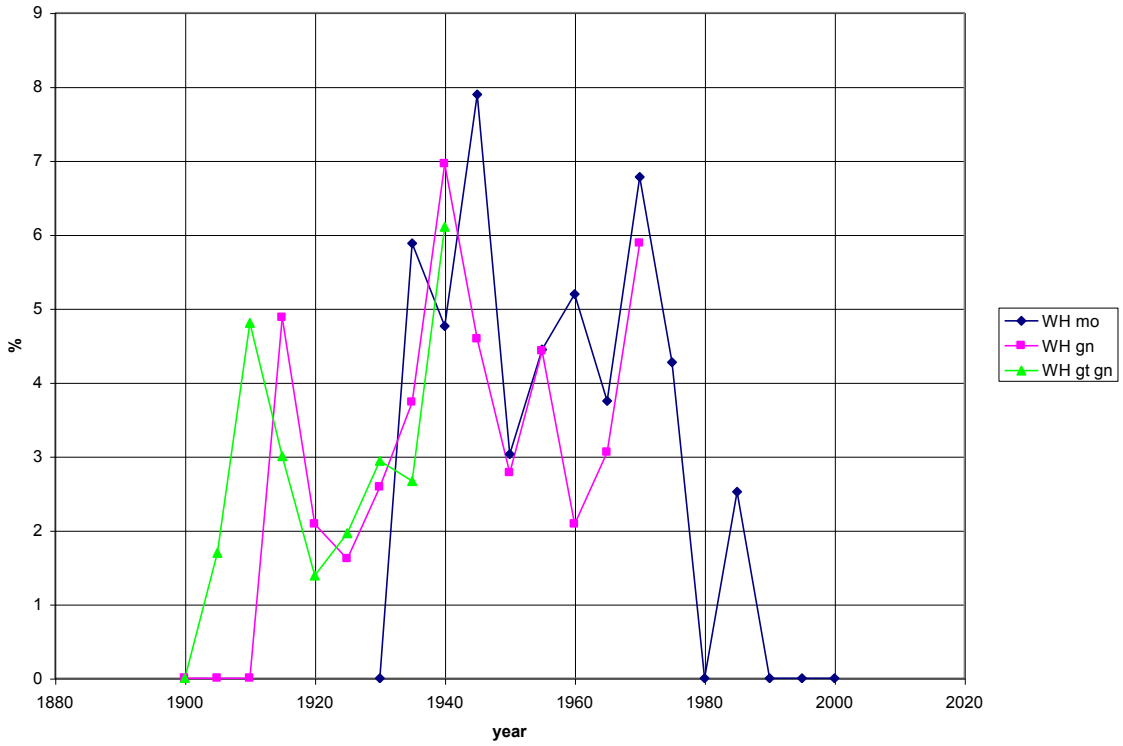


Figure SI 5.4.2. Percent of marriages with women from "the West" among ancestors of contemporary eastern Hadza.



SI 5.5. Comparison with results of Barnicot et al 1972 on intermarriage.

Table SI 5.5. The data on non-Hadza ancestry extracted from Barnicot et al. (1972 table 13).

Intermixture score	Comment	N males	Mean score males	N females	Mean score fem
1.0	Pure Hadza	93	1	70	1
0.99 – 0.75	.75 Hadza	53	0.78	47	0.77
0.74 - 0.5	.5 Hadza	53	0.65	49	0.53
0.49 – 0.0	.25 Hadza	11	0.21	10	0.23
		210		176	

Neither the sentiments expressed by Woodburn (1988), nor our figures, seem to fit closely with numbers given in Barnicot, Mukherjee, Woodburn & Bennett (1972), a report on dermatoglyphic characters which includes correlations with mixed ancestry. These authors imply what looks like a much higher rate of intermarriage. Barnicot et al report the data in two ways that I cannot be certain I know how to replicate. "the proportions of intermixture can be assessed from our genealogical data which varies in depth for different individuals but in many cases extends at least to the great - grandparents. For 437 subjects the proportions of the ancestral components are Hadza 79.8%, Isanzu 17.3%, Sukuma 1.7% and Iramba 1.2% The proportion of foreign ancestry in the western Hadza appears to be relatively low (16.6%) though our genealogical data are less good for this group. As might be expected, most of the intermarriages with Sukuma occur in them. On the other hand those eastern Hadza now settled at or near Munguli, bordering on Isanzu territory, have the highest rate of foreign admixture (30.9%)."

These authors also show an "Intermixture Score" in their table 13 with sample sizes. "Intermixture scores have been divided into four groups ranging from subjects with no known foreign ancestry (score 1.0) to those with less than ¼ Hadza ancestry; even so the numbers in the last group are small." These measures must refer to the number out of 4 possible grandparents (giving scores of exactly 1, 0.75, 0.5, 0.25) and number out of 8 possible great-grandparents (giving scores between these figures, decimalized eighths). Multiplying the mean scores by the sample sizes and summing these gives a figure close to the "proportion of the ancestral components" given by Barnicot et al. This seems like a meaningful measure because it reflects the probability of an individual carrying a gene by direct descent from a Swahili ancestor.

But if I attempt the same score with my data (percentage of the 8 ancestral components that are Hadza) we arrive at a value quite far from Barnicot's 20.2% with foreign ancestry. We obtain a very different value: 93% of the ancestral components are Hadza, 6.9% are "foreign". This is the figure obtained when we pursue in the population register

the ancestors of everyone who appeared in any one or more of our censuses between 1985 and 2000. Note that here we are concerned with how many of the 8 ancestors (great-grandparents) of "ego" were Hadza or swahili, whereas above, when estimating rates of intermarriage we were interested in the proportions of mixed marriages in all the people in the previous generations. There are many complications, such as that if the father, or grandfather is Swahili, we have no record of his ancestry, and we must assume his ancestors were all "swahili".

A rough check compares our data with Barnicot's table 13 row 1. This reports the number of subjects with no "foreign admixture", all ancestral components Hadza. Barnicot et al show 93 males and 70 females, total 163, out of a sample in the table of 386 people, to give a mere 42.2% of the population as "pure" Hadza. The corresponding number for our sample is 68.8% "pure" Hadza, with no Swahili ancestry in the record. We also find that this figure increases above 70% if we require data on 11 or more of the possible 14 ancestors. We clearly record far fewer Swahili grandparents and great-grandparents than Barnicot's team. We can list several possible explanations but can do little to choose between them.

1.Depth of record. Our sample was taken in 1985-2000 whereas Barnicot's was from 1966-67. A generation has passed, and more since Woodburn's first fieldwork. Great grandparents in 1967 are now at least great-great-grandparents and few informants can recall them. In 1967 more of the early 20th century Isanzu immigrants may have been identifiable in the genealogies.

2 Our informants no longer think of those ancestors as Swahili but as Hadza. Children whose mother returned from a marriage to a Swahili husband, married a Hadza and raised more children, may have come to think of the Hadza step-father as their real father. Only careful cross-checking with older kin would reliably reveal such cases. We unearth these among younger people but must have sometimes failed with the oldest subjects.

3. The Dermatoglyphic sample is biased by location toward intermarriage with Swahilis. Judging from Barnicot's table 13 and the discrepancy between intermixture score and mean score, they are unlikely to have used any more great-grandparents than we did. Furthermore our sample is much bigger, and consequently our sample of individuals on whom we have data on great-grandparents is as big as their entire sample.

4. In our data ethnic identity is recorded as Hadza or Swahili, not as "half Isanzu" or any such indicator of previous generations. This might bias us toward slightly lower estimates of Swahili ancestry. If there were many "half-Swahili" great-grandparents, this could be a significant bias.

5. Someone made mistakes in drawing the numbers from the Woodburn genealogies, or we made mistakes in drawing the numbers from our data.

Barnicot's sample, the sample Woodburn refers to from the 1960s, was mostly found in Yaeda and Munguli where many Hadza had been gathered by outside intervention but they indicate much higher rates of intermarriage at a time when our 60 year olds formed a majority of the adult population. Our analysis suggested that rates of intermarriage varied greatly during the 20th century. Rates may especially be high at times of settlements, a time when as Hadza and others (e.g. McDowell 1981a) have reported, the facilities provided for Hadza attract people from elsewhere who arrive and settle in some abundance. When Hadza leave, relinquishing land to "the Swahilis", rates of intermarriage may decline, indeed this may be one of the reasons for leaving these places. It may be that a majority of the children of mixed marriages at Munguli and Yaeda in 1967 acculturated themselves as Isanzu and not as Hadza. We could have missed such people around Munguli, although some "re-appeared" as newcomers to our records when several Munguli families moved to Domanga in the 1990s. It is very unlikely that we missed many such families who had lived at Yaeda.