

7 The global process and local ecology: how should we explain differences between the Hadza and the !Kung?

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Introduction

In this chapter we discuss explanations for the diversity of behavior of contemporary forager populations. Other contributors document variation among southern African savanna Bushman groups, and central African forest Pygmies. We confine ourselves to trying to explain some differences between two savanna groups who have been studied quantitatively, the Hadza and the !Kung. We further confine ourselves to discussing two kinds of explanation that are currently considered to be opposed to one another, behavioral ecology (Smith and Winterhalder 1992), and political economy/historical revisionism as presented to hunter-gatherer researchers by Wilmsen (1989). We believe that explaining variation in human behavior is a major aim of anthropology, and that success in this task is a good test of any anthropological theory.

We choose the Hadza foragers of northern Tanzania (Woodburn 1968a, 1988 and elsewhere) because we work with them (O'Connell *et al.* 1988a, b, 1990, 1991; Hawkes *et al.* 1989, 1991; Blurton Jones *et al.* 1989, 1992). We choose the !Kung of north-western Botswana because so much quantitative work on their behavior in the 1960s and early 1970s has been published (Lee and DeVore 1976; Lee 1979; Howell 1979). Both live in sub-Saharan African savanna, exploiting some of the same plant and animal genera, hunting with bow and poison arrows, and collecting with digging stick and kaross. While other authors attend to variation within a single culture, we generalize here, to compare two cultures. Except when reporting census data, when we write "Hadza" we mean those we have worked with between 1984 and 1992, living in the Tli'ika region of Hadza country.

We limit our main effort to explaining five points of difference between the Hadza and the !Kung:

- 1 Hadza children collect food for themselves while !Kung children seldom do (Blurton Jones *et al.* 1989; Obst 1912 and many others since; Draper 1976; Draper and Cashdan 1988).

- 2 Hadza women are more fertile than !Kung forager women (Blurton Jones *et al.* 1992; Howell 1979).
- 3 Hadza seem to be less responsive parents than !Kung.
- 4 !Kung men use various traps and acquire much small game; Hadza men rarely trap, they specialize in big game (Lee 1979; Hawkes *et al.* 1991).
- 5 Relations between men and women are described as segregated, or oppositional among the Hadza (particularly during the dry season) (Woodburn 1968a:52) but egalitarian among the !Kung (Kolata 1974; Draper 1975).

The previous accounts of the Hadza, some dozen reports of fieldwork from Bauman (1894) and Obst (1912) onward, show that throughout the past hundred years the Hadza have known and been known to their several neighboring tribes, and have traded with them. Much has changed in the surrounding countryside and the neighbors have moved ever closer, yet numerous aspects of Hadza behavior have not changed (Blurton Jones *et al.* in press; Woodburn 1979, 1988).

Political economy and evolutionary ecology

In *Land Filled with Flies*, Wilmsen (1989) presents his favored political economic explanations of contemporary forager behavior as directly opposed to ecological explanations. Furthermore, he criticizes any school of anthropology that perceives people as isolated and pristine, and that divides them into "tribes" to be understood without reference to their neighbors. He promotes the view that contemporary foragers should not be seen as inhabiting an unchanging and self-contained world in which people live in peaceful equilibrium with each other and their environment. He argues that contemporary hunters and gatherers are best regarded as "the rural proletariat," products of a global process of economic depredation. As such they are not "living fossils," and, he suggests, they have nothing to teach us about prehistoric hunting and gathering societies. He claims that anthropology has served merely to fuel the continuing deprivation of these peoples.

It is important for anthropology to respond to Wilmsen's challenges. Surprisingly, the debate (e.g., Solway and Lee 1990) has so far concentrated on local history and geography and included little discussion of the nature of the explanations given by political economists or comparison with the explanations given by other anthropologists, including ecologists. This issue is important because the debate between anthropologists and "revisionists/critical theorists" about contemporary foragers is a compact example of the wider debate in the social and

behavioral disciplines, where the debate is also often seen as argument for or against science. As researchers who feel the study of human behavior has suffered from too little science, our aim here is to join the debate on the side of anthropology in general and one kind of ecological paradigm in particular, that derived from evolutionary ecology. Nonetheless, we are ambivalent about the task for two reasons. First, we too disagree with much in the earlier "ecological" presentations of the !Kung (see Hawkes and O'Connell 1981; Hawkes, O'Connell, Hill and Charnov 1985; and Blurton Jones *et al.* 1994a). Second, we hesitate lest we encourage a fallacious philosophy of science. We have in mind the common claim to have tested "the evolutionary explanation" of some piece of human behavior, disproved it, and thus shown that the evolutionary ecology enterprise should be abandoned. This claim neglects the distinctions between paradigm, theory, models, and hypotheses. Any particular "test" concerns one hypothesis, drawn by a certain model (explicit or intuitive), dependent on its particular starting assumptions and simplifications, employing the particular logic by which its predictions are derived from its assumptions. Many other tests are possible within the same paradigm and with the same overarching or unifying assumption. We illustrate such a case when we consider the Maynard-Smith models of mate desertion, and then the "show-off hypothesis." Both are used here to try to explain similar features of men's behavior. Both ultimately assume that people tend to behave in ways that maximize their reproductive success. But other starting assumptions differ, and the models attend to slightly different sets of observables. The two explanations usefully compete with each other. While one explanation can claim to account for more observations than the other, neither can claim to represent "*the* evolutionary explanation."

The same point could be made for Wilmsen's combination of political economy and critical theory. While we deal with some specific hypotheses close to his views, he can certainly develop others, which attend to other differences in the factors affecting the Hadza, and which suggest testable outcomes. No one should think that when we make a prediction by trying to take a political economy perspective, and find the prediction fails, we have "disproved political economy!" But the existence and competition of different hypotheses within a theory or family of explanations does not prevent us from comparing the performance of the two larger paradigms. Over the long term, which paradigm generates most rigorously testable hypotheses from its few basic assumptions, and by the most explicit logic? Over the long haul, which generates the greatest number of hypotheses that endure the test of real-life observations? (Those critical theorists who believe that the scientific

method, and the guidance scientists take from philosophers of science, are merely instances of the devices by which the ruling class maintain their power, will disallow this contest.)

Thus in this chapter we begin to examine how each paradigm copes with the task of accounting for differences between the Hadza and the !Kung. We compare the ability of these paradigms to generate correct predictions. But this cannot be more than the first round of a longer term contest. As it happens, we conclude that the two paradigms have much in common, and either could easily be modified so as to become a component of the other.

Our effort is severely handicapped by the obscurantism with which authors such as Wilmsen write. We can only debate that which we understand. Perhaps we can provoke revisionists into being more explicit about their theory of human behavior, their methodology, and their criteria for distinguishing truth from falsehood. Fortunately other authors, such as Denbow (1990), have provided clear hints about their theory of human behavior. Their basic argument appears to be that all people respond opportunistically to the situations that confront them, and that primary among these are the opportunities presented by neighbors and their neighbors in turn. People seek to make the most of these opportunities, and in doing so change the opportunities available to each other. On the whole, people with more wealth and power are able to influence the interaction more than the poor and less powerful. A chain of interactions links the most powerful to the weakest in a global process of exploitation of the poor by the rich ("global process theory"). It seems to us that it takes little extension of this view to include the opportunities (costs and benefits) provided by the environment, or by members of the same "mother tongue group" (tribe!). Nor does it take much extension of ecological approaches to add neighbors and others as influences upon the costs and benefits of different courses of action. The combination of the two sets of factors is illustrated by several chapters in this book.

The version of ecology that we pursue (that based on evolutionary ecology: see Smith and Winterhalder 1992), and which we illustrate in the first half of the chapter, differs from the ecology that Wilmsen has in mind. His criticism, though expressed as generally "anti-ecology," seems specially targeted at an ecology he understands to view foragers as Rousseau-esque "originally affluent," primevally peaceful, unwilling to change, or incapable of it. We, and most of those who apply evolutionary ecology principles to the study of human behavior, see individuals as more restless, opportunistically (but often unconsciously) weighing costs and benefits of different behavior in their current circumstances, and behaving in a way that maximizes production of descendants – a

“reproductive strategy.” Our approach is like an economics in which descendants are seen as a more important currency than dollars. This perspective has guided much recent field work, especially on hunters and gatherers (reviewed by Smith and Winterhalder 1992; Smith 1992; Borgerhoff-Mulder 1991; Cronk 1991).

The settings

The !Kung and their social and material circumstances are so well known to anthropologists that we will not describe them here, except to make an initial contrast between “remoteness” and “isolation.” Wilmsen has presented evidence against the view that the Dobe !Kung were isolated from the events of the world around them. If lack of isolation can be claimed for the geographically remote !Kung, we must expect it to be shown easily for the geographically accessible Hadza. Until the mid-1980s, the Botswana-based anthropologist visiting the !Kung had a two-day journey from Maun, the nearest market-town, where there was a small airfield, finally crossing a 100-km waterless stretch to reach the Dobe area. In complete contrast, the Hadza researcher has a drive of a mere six hours from an international airport, and only about two hours from either the district capital or a major tourist route to a point where he may find Hadza who gain much of their food by hunting and gathering. While this clearly shows that the Hadza cannot be described as either remote or isolated, it gives us little clue about their relationships with non-Hadza. Woodburn (1988) describes the remarkable extent to which the Hadza have kept themselves separate from others. We support his observation of Hadza inclinations. Even in those regions of Hadza country where non-Hadza have settled most densely, Hadza seem eager to keep to themselves.

Archaeological evidence suggests the periodic presence of farmers and herders in the Hadza area for several centuries, and of hunter-gatherers for far longer (Mehlman 1988). Among this evidence is the presence of rock construction irrigation channels at Endamagha (Sutton 1986). Rainfall in the rift valley floor inhabited by the Hadza is much lower than in the surrounding highlands. Most successful agriculture in the area today depends on irrigation. Written historical evidence, dating only from the memories of Obst's (1912) informants, is unclear about the presence of herders, although it does suggest that few, if any, farmers lived within the area Hadza describe as their country. Since then there has been an accelerating influx of herders, farmers, charcoal traders, and gemstone miners. The influx has been greatest in the Mangola and Siponga regions (Figure 7.1). Herders and farmers moved

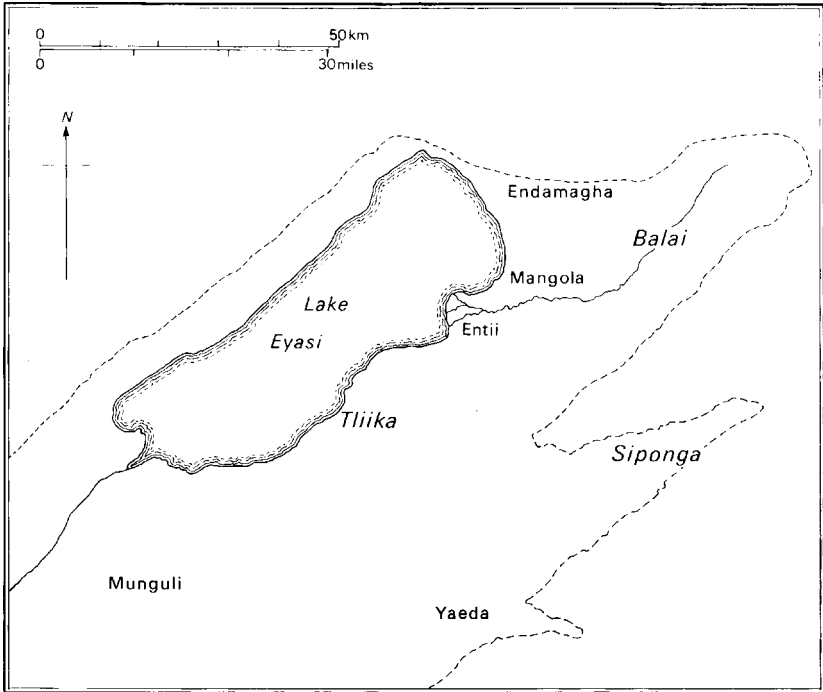


Figure 7.1 Map of Lake Eyasi area marking locations named in the text. Names by which Hazda refer to regions of their country are marked in italic script. The approximate line of the 1500-meter contour is marked by the partly double line. Sections of this line that run SW to NE approximately correspond to the rift escarpments

into both. Higher parts of Siponga have now been reduced to bare rock beneath thorn scrub. Charcoal traders have felled most of the Balai valley trees and berry groves. The Balai delta is the home of a thriving onion industry with trucks calling daily. A prison is sited nearby at Entii.

Hadza told Obst (1912) that they hunted and gathered as long ago as anyone had heard about. But Obst claimed that among the Hadza words for domestic animals, only that for goat was a loan, suggesting an agricultural past. Others (Dempwolff 1916–17; Berger 1943) claim most such words as loans from one or another of the representatives of the several major language families (Bantu, Cushitic, and Nilotic) in the surrounding countryside. The persistence of Hadzane as a language whose affinity to any other is still under debate means that Hadza have been distinct from all these neighbors for a very long time indeed. But

their separateness does not tell us that they always lived only by hunting and gathering.

Few tourists come to Hadza country but it is a game-controlled area and commercial hunting outfits use it in some years for foreign clients. Since at least Bagshawe's day (1917-23, see Bagshawe 1923) game officials have not restricted Hadza hunting with traditional weapons, except to ask them not to kill giraffes and elephants, and not to trade meat. Poachers seem to visit the area from time to time, and Hadza sometimes get meat from the animals that the poachers kill. There may be more illegal hunting by non-Hadza than this suggests. We have met and heard tell of unknown trucks with armed people. Frequent hunting visits are made by non-Tanzanian residents. At the turn of the century, Obst's informants describe raids by Isanzu who came to hunt elephants, and who also captured women and children. Sukuma hunting parties were smaller and negotiated "permission" to hunt in exchange for iron goods. Hadza have made arrowheads and knives from iron obtained by barter as far back as we have written accounts (1910).

The Datoga herder neighbors of the Hadza seem to make little demand for Hadza labor and do not practice the mafisa system that allows !Kung a chance to acquire livestock. Hadza experiences with livestock and with the Datoga have been traumatic, as discussed later in this chapter. A few Hadza have one or two chickens; one elderly woman tried to keep some in remote bush camps for a while. Not many dogs are kept, but recently two survived in bush camps for several years. Although some Hadza at the south of their range have farmed for some decades, fewer currently do so. We know of no Hadza who owns a goat, a sheep, a cow, or a donkey.

The demand for Hadza labor from farmers and others seems small, and it is locally variable. Some Hadza take seasonal employment guarding maize fields from animals, for which they extract payment in maize as well as the marauding game. Some take occasional employment harvesting sweet potatoes. Over the past twenty years or so, two German farmers have been favored sources of temporary employment for Hadza, perhaps because they treat the Hadza with much more respect than do other non-Hadza. One of these employers has commented many times on the unusual honesty of his Hadza employees, an impression we can confirm by our totally unguarded bush camps. During the latest settlement scheme about five young educated Hadza men were appointed as Community Development Assistants, which involved some form of payment.

The most conspicuous "outside" influence upon the Hadza in recent decades has been the string of settlement schemes, listed by McDowell

(1981) and Ndagala (1986). The number of people involved in each of these, and the length of time they stayed at a settlement, may have been exaggerated. None of these interludes of imposed village life lasted long. No generation of Hadza has grown up unfamiliar with life in the bush and the techniques of hunting and gathering. But probably no Hadza has failed to experience some version of village life. Indeed, many Hadza seem able to switch instantly and quite easily between village and bush, and to have done so for many years. The Hadza ambivalence to settlement and their loose and fleeting economic ties to neighbors set up a striking contrast to the rapid change described among the !Kung since the early 1970s. Should this contrast be explained by differences in the alternatives to foraging that the modern world has offered, or by differences in the opportunities provided by life in the bush?

We have shown here that there are ample manifestations of the "global process" impinging upon the Hadza. Yet, as Woodburn (1988) describes, the Hadza had until late 1988 in no way been swallowed up by it. But can we account for their behavior as reactions to this process? How many of the differences between the Hadza and the !Kung (as described by Lee 1979, Howell 1979, the authors in Lee and DeVore 1976, and others) can be accounted for by the global process and the different forms it takes as it reaches down to each of these small rural populations? We will return to these questions after outlining the ecological explanations offered by our research.

An evolutionary ecology account

We claim that many differences between !Kung and Hadza behavior can be accounted for by the relatively simple idea of reproductive strategy. It should come as no surprise that fertility, child rearing, marriage, and sex roles should be intimately linked; their links to subsistence may be less obvious.

Children's foraging

Hadza children forage, both accompanied by adults (Figure 7.2), and unaccompanied. Children aged 5–10 are able to acquire 200–600 kcal/hr and seem to contribute from a third to a half of their RDA by their own efforts, and much more from age 12 onward (Figure 7.3). !Kung children did not forage at all (Draper 1976; Draper and Cashdan 1988). Blurton Jones *et al.* (1994a) report !Kung informants' confirmations of this observation and their explanation for it – children who try to forage without adults get lost in the flat and featureless landscape, and some

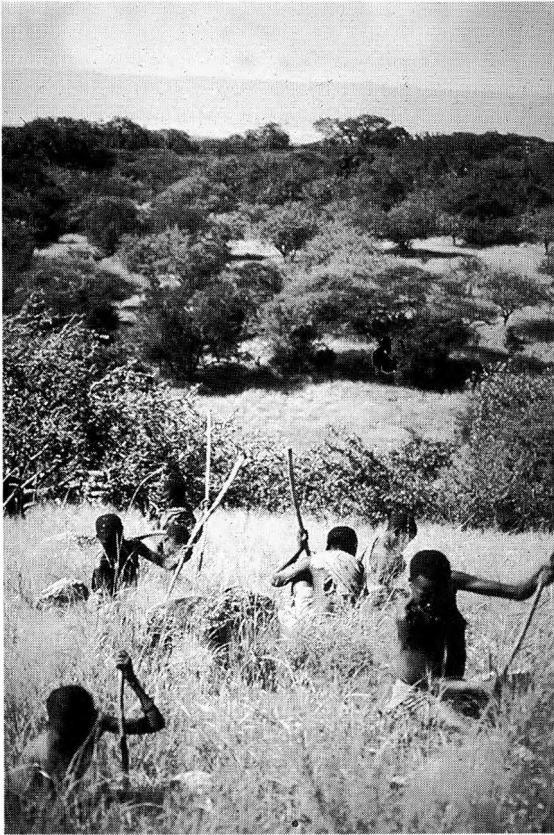


Figure 7.2 Hazda women and children digging roots. Just beyond the horizon, a main road crosses the plateau atop the rift wall, bearing tourists to view game, and trucks to and from Lake Victoria

have died this way. Children who go with adults get tired and thirsty and want to go home, they “spoil the work.” Blurton Jones *et al.* (1994b) present data that show how little food !Kung children could acquire by foraging without adults, a strong contrast with the Hadza situation, which (like the risks of getting lost) arises from the botany and geomorphology of their habitats. Blurton Jones *et al.* present data and computations about children accompanying mothers on long trips to the nutgroves. The calculations show that, because nuts require lengthy processing (unlike the berries that Hadza children collect on equally long trips with adults), unless !Kung children can carry a hefty load of nuts (with the unlikely absence of significant costs due to intense heat



Figure 7.3 Some Hadza children processing baobab fruit in a camp

with no shade or water *en route*), they would be as much help to their mothers and siblings if they stayed home and spent some time cracking mongongo nuts, just as Lee reports that they do. Thus we claim to have presented evidence of an economic explanation for this difference, dependent on the distribution of food and water in the environment, and differences in the processing costs of the highest-return foods. We also suggest that this difference in children's dependence on adults for food has important consequences for adult reproductive strategies.

Fertility

Hadza women living to menopause bear an average of 6.2 children (Dyson 1977; Blurton Jones *et al.* 1992). This is a great deal higher than the 4.7 reported by Howell (1979) for !Kung women who completed their childbearing years before 1968. The Hadza figure resembles the mean of forager and farmer populations summarized by Campbell and Wood (1988). The Hadza have been increasing quite fast while the !Kung population was scarcely growing at the time of Howell's study.

Given limited resources, a fitness-maximizing parent is faced with a trade-off between number of offspring and the fitness of each offspring

(Smith and Fretwell 1974; McGinley and Charnov 1988; Lack 1966; Krebs and Davies 1987; Lessels 1991; Blurton Jones and Sibly 1978; Blurton Jones 1986, 1987; Pennington and Harpending 1988). Parental care enhances offspring fitness. Providing food keeps children alive, and enables them to grow larger and perhaps enhances their later reproductive success. But food given to one offspring is not available to another, nor is it available to the mother to supply her next pregnancy and lactation. We have argued (Blurton Jones *et al.* 1989) that Hadza children's opportunity to feed themselves affects the mother's trade-off between numbers and care of offspring. A Hadza mother who keeps more food for herself, or takes more rest, will threaten the growth and survival of her children over 5 years old much less than if she lived in the !Kung environment, where children do not have the same opportunities for making up the shortfall by their own efforts. We thus expected Hadza women to bear more babies than !Kung women, and our demographic studies show that they do. But there are other important biological explanations of variation in fertility, two of which involve influences from neighbors. Although these have long been discussed in anthropology, they are the kind of "external" influence to which "global process theory" makes us sensitive.

Does the average Hadza woman bear more children than the average !Kung woman because more Hadza women have spent more time in villages or settled around farmers? We showed that, on the contrary, age structure was younger among the most bush-living Hadza than in the population at large (Blurton Jones *et al.* 1992). Since age structure most readily reflects fertility, we conclude that "settlement" is not the explanation for Hadza having higher fertility than the !Kung.

Pennington (1992) suggested that !Kung fertility is low because of diseases of the reproductive tract. Bennett *et al.* (1973) reported a low incidence of treponemal antibodies in Hadza blood samples (but Hadza reported VD as a reason for having gone in search of outside medical help). Thus Hadza fertility might be higher because of less disease, or because of better access to medicine. The suggestion about the !Kung is based on the observation of low fertility, albeit expressed as the proportion of older women reporting that they had never borne a child (10 percent !Kung, 2.5 percent Hadza 1990), on secondary sterility (Harpending 1994; Blurton Jones *et al.* 1994), and on arguments about the low fertility of the Herero herders early this century, when the evidence of venereal disease is absent and there is good evidence of extreme hardship due to the "global process" (rinderpest, and fleeing into Botswana after losing a war with the Germans in South-West Africa).

Blurton Jones *et al.* (1994) concluded that TFR (Total Fertility Rate) of forager !Kung women seemed to be uninfluenced by disease of the reproductive tract but was just over 5, higher than Howell's 4.7 but still substantially lower than the Hadza 6.2. However, the VD explanation remains quite plausible, if relatively untested. While immunological tests of exposure to gonorrhoea and syphilis are possible and might confirm the theory, there are other, less easily identified diseases for this theory to fall back upon. Its mirror image – availability of antibiotics – should be more testable, but in the case of the !Kung and Hadza, dating their arrival and availability in either location would be no mean feat of historical research (but a very interesting study of the global process).

Consequences for maternal behavior?

Parental care enhances offspring fitness. Blurton Jones (1993) suggested that it might help us to think about parental behavior if we discriminate mother's fertility, and two aspects of offspring fitness: survival, and later offspring reproductive success (ORS). Food is likely to enhance both (nutritionists believe that the effects of undernutrition on susceptibility to disease is a major factor in child mortality in the Third World; biological life history theory suggests that growth rate has important effects on length and fertility of reproductive career (Hill 1983)). Providing food for her children might thus be expected to take precedence over other forms of care. But local circumstances may determine the actual benefits to mother's fitness from different kinds of care (e.g., Ache women provide very little food but exert considerable effort to keep children from the dangers of the forest floor: Kaplan and Dove 1987). In populations with high mentality such as the Hadza and the !Kung we might expect care that enhances child survival to take precedence over care that enhances adult skills and competitive ability, such as teaching. Little direct teaching is seen in either society.

If the Hadza mother invests a larger portion of her resources, including time, in her own fertility we may expect her to invest less in each child's survival. If providing for offspring is less effective among the Hadza, then, other things being equal, we should also expect a little less time or energy to be spent in other forms of survival-enhancing care (Blurton Jones 1993; Rogers and Blurton Jones in prep.). Having a larger family, the Hadza mother may also invest more in care that affects all her offspring at once, care that needs no more effort for five children than for four. Thus we may be able to predict differences in child-rearing practices or styles of parent-child interaction between the Hadza and the !Kung. The Hadza do appear much less responsive, less

vigilant, and more directive and punitive than the famously gentle !Kung parents described by Konner (1972, 1976), Bakeman *et al.* (1990), Barr *et al.* (1991), Draper (1976), and Draper and Cashdan (1988). Furthermore, Hadza parents allow, even command, children to take risks by fetching water, sometimes firewood, and even to approach and throw rocks at snakes. Alternative predictions can be derived from the trade-off between the low reproductive value of infants (who suffer high mortality and thus have less chance of reproducing) and the higher RV of children, and the smaller effect of parental care on the survival of older children. Among the !Kung, where children are so dependent upon adults for food, care directed to older children may have a relatively greater effect on mother's fitness than it would among the Hadza. This would suggest that the greatest difference between !Kung and Hadza parenting should be found in their behavior to older children.

Differences between behavior of !Kung and Hadza men

It has been traditional in much of anthropology (and psychology and other social sciences) to think of families as fully cooperating units, with men as providers and protectors of their wives and children. Indeed, among both !Kung and Hadza, men and women seem to think of men in this way. This assumption has also been particularly prevalent and mostly unquestioned in discussion of "evolutionary scenarios," e.g., Lovejoy (1981). It has been challenged by Hawkes (1990; 1991; Hawkes *et al.* 1991), particularly in respect to the inability of this view to offer a convincing adaptive advantage to big-game hunting – held to have been so formative in human evolution. Does the comparison of the !Kung and the Hadza, and the proposed difference in consequences of parental provisioning, shed any light on men's reproductive strategies?

Well-known models of mate desertion were set out for biologists by Maynard-Smith (1977). These models are mainly aimed at understanding why there are some animal species in which males desert, others in which females desert, some in which the deserted partner stays to rear the offspring, and others where the deserted partner also deserts. They also predict differences in time spent with each "brood," whether it is likely to be deserted earlier or later. One of these models attends to two parameters: (1) effects on offspring survivorship from desertion by father or mother; (2) opportunities for new matings or marriages by the deserting partner. Desertion depends on the trade-off between costs to the survival of offspring and the opportunities (and productivity, an important issue that may require a revised model for humans) of new matings. If there is no opportunity for increased reproduction by a new

mating, there is no benefit to set against even a slight cost to the survival of existing offspring that may result from desertion. An anthropological example was presented by Hurtado and Hill (1992), who compared Ache and Hiwi men.

We have already suggested that reduced effort by either parent should have less effect on Hadza children's survival than on !Kung children. If we assume maternal care is more effective than paternal care, we will expect men to desert before women (unless this effect is overwhelmed by new matings promoting women's reproductive success more than men's). (This does not exclude other possibilities, such as a woman expelling her husband, which does not necessarily involve deserting her children.) Unless sex ratios are very different, or women are somehow taken out of circulation (e.g., by marriage to neighbors of richer tribes), the proposed weaker effect of Hadza parental care should lead us to expect Hadza men to invest less in their children with their current wife, desert more readily, and pursue alternative matings more energetically than !Kung men.

If we take a further small step, from investing less in their children to a wider range of parental and "husbandly" behavior, we may expect Hadza men to be less inclined to be "homebodies" than !Kung husbands (more like "Cads" and less like "Dads," Draper and Harpending 1982). Some observations seem to confirm this expectation. !Kung men make clothes, mortars and pestles, digging sticks, karosses (Lee 1979: table 9.1 and pp. 273-80), and also collect firewood. While we have seen Hadza men staking out and scraping skins, and occasionally picking up firewood as they return to camp, we have seldom seen a Hadza man sew more than a patch on his own clothes, and only rarely have men asked us for needles, often demanded of us by women. Hadza women make their own digging sticks and women regularly collect firewood. In any gathering of Hadza, men and women divide into separate groups. Hadza men who are in camp during the daytime stay at a separate place on the edge of or outside camp where women seldom go (quantitative account in O'Connell *et al.* 1991). Hadza have frequent ceremonies conducted by men, which women may not attend. While small children are sometimes handed to Hadza men to care for at "the men's place," such care does not seem to last more than a few minutes. Quantitative information may correct the impression, but Hadza men seem to have much less interaction with small children than do !Kung men. Hadza men do, however, make bows for their sons (aged 3 and up) and lend axes to older sons (10 and up) to get honey.

This is a nice story but how much of it can be substantiated with further quantitative data? Two assumptions of the model were that a

Hadza father has less effect on his children's survival than a Hadza mother, and less effect than a !Kung father has on his children. We have already suggested that Hadza children's foraging made them less dependent on parental care. We could furthermore point to the widespread sharing of meat in both societies. Little of the big-game meat that a child eats comes from its own father. If, as appears to be the case, small game are less widely shared in each society, and !Kung men bring in more small game and gather 19 percent of the plant food (Lee 1979), then the !Kung father might be expected to have more effect on his children's nutrition and survivorship. Is there any evidence of the effects of men upon their children's survival?

Evidence about the !Kung has already been published by Howell (1979) and Pennington and Harpending (1988), but it is very indirect and, although based on large samples, these samples include a mixture of subsistence types. Howell, arguing from meat sharing as we did above, suggests that the effect of father on child survival would be very small. She compared the observed population with the number of !Kung of each age predicted by the *AMBUSH* simulation to have a parent still living. The simulation used the assumption that the mortality of a child is independent of mortality of its parent. The predicted number of people with a living father was very slightly lower than observed. This suggests !Kung fathers do have a small effect upon the survival of their offspring.

Pennington and Harpending (1988) compared survivorship of children of women who had only one marriage (her husband survived and stayed) with those who had more than one marriage (at least one husband died or departed, and they show that most were cases in which the husband died). Child survivorship was significantly and substantially lower in the second group, from which these authors conclude that !Kung fathers have a significant and large effect upon child survivorship.

We can offer direct, longitudinal data from the Hadza but on a very small sample. We have conducted two censuses of the Hadza, one in 1985, another in 1991. We extracted the data on how many of the children who were aged less than 5 in the 1985 census survived until 1991 (Table 7.1). Among the eleven whose mothers died before 1991, only six survived. Despite the foraging success of the over-5s, mother seems very important to the survival of younger Hadza children. We next looked at the families in which father had died or left by 1991. There is no difference in the survivorship of under-5s between those whose father stayed and those whose father left or died; children of broken marriages always stayed with the mother if she was alive. Thus, if there is an effect of a

Table 7.1. *Survivorship of Hadza children aged 5 or less in 1985 until 1990*

	Parents together	Father died	Mother died	Divorced or single mother
Child died	13	1	6	5
Child lived	38	10	5	20

Table 7.2. *Ratios of males to females among !Kung (from Howell 1979) and Hadza (!Kung aged over 10 from Howell p. 247 and mean of three diagrams p. 40)*

	Men	Women
Hadza total	340	366
Hadza aged 15-45	145	149
!Kung aged over 10	91	100
!Kung aged 15-45	53	47

Hadza father on the survivorship of his young children, it looks as if it is small (but we might expect desertions to be timed so as to reduce their effect on offspring mortality). These results are a strong contrast with Pennington and Harpending's finding on the !Kung.

Let us conclude that desertion is less costly for Hadza men than for !Kung men. Now what about opportunities for remarriage? How many women are available? Personal tastes are likely to be as important among Hadza and !Kung as among anyone else, but just as with Americans or Europeans, some of the variance may be accounted for by etic generalizations, including mere opportunity.

Table 7.2 shows that sex ratios are similar in the two populations; neither is significantly far from the usual. There is no obvious shortage of men or women in either society. Other issues may be more important, such as hypergamy, an effect of neighbors. Bailey (1988) discusses the widespread tendency for hunter-gatherer women to marry richer men from other tribes, and reports extensively on this for the Efe. He reports Howell (pp. 233-4) as showing that fifteen out of 149 !Kung women aged over 19 were married to Bantu men (10.07 percent). Including the 15-19-year-old girls from Howell's Table 12.1 (!Kung girls commonly marry around 15) makes little difference ($17/165 = 10.3$ percent). Bailey reports that 13 percent of Efe women were married to villagers. The corresponding figure for Hadza in our 1985 census was $9/223 = 4$ percent

of Hadza women were married to villagers. This is a significant difference from the !Kung (chi-squared = 6.07, $df = 1$, $p < 0.025 > 0.01$).

Thus the opportunities for a new marriage may be lower for a !Kung man than for a Hadza man. The conditions under which the mate desertion models predict early desertion by males seem to hold more strongly among the Hadza than among the !Kung. Not only does the departure of the Hadza cost him no increased child mortality but his opportunities for new matings seem to be greater than for a !Kung man. (Since both cost to children and mating opportunity differ, we cannot attribute the difference between !Kung and Hadza men to either factor alone. In Hurtado and Hill's (1992) comparison of Ache and Hiwi men, it appeared that differences in mating opportunity overwhelmed the differences in cost to children.) It would indeed seem that we may expect Hadza men, more than !Kung men, to divert effort away from provisioning their offspring with their current wife and invest it in effort toward additional matings. In so far as this strategy characterizes the "Cad" more than the "Dad" and the "homebody," the conditions fit the differences summarized above.

We might use these models to predict when men will leave, and who initiates divorce. If the !Kung man has so much effect on his children's survival then "Women who lose mates either to death or divorce appear to lose a resource significant to their fitness" (Pennington and Harpending 1988:312). !Kung women might be expected to try harder to keep their husbands and to be less inclined to leave them than Hadza women. These considerations might be relevant to understanding the apparently great "power" of Hadza women.

The "show-off" model

The model proposes four strategies, two for women, two for men. Although Hawkes (1990) uses the word "married," we should emphasize that the model attends not to residence, nor to social labels, but to sources of food and sexual access. Some women ("wives" *W*) limit their matings so that only m percent of their children are fathered by men other than their "husband," an individual man whose strategy is that of provisioner; he acquires food to pass to his wife and her children and uses none of it to gain matings with other women. He tolerates the m percent of children to his "wife" fathered by other men (m can vary; in Hawkes' 1990 model the experimenter varies m , but a provisioner might be expected to try to limit m in relation to the benefit gained by his own children from his wife's lovers, the "show-offs").

These other men, show-offs, pursue big game to distribute the meat

widely and increase their chances of matings with a variety of women. These men may be tolerated, and their children may receive special treatment, in order to keep the flow of meat bonanzas coming. Hawkes denotes the special treatment as *i*, another given variable. Again we should develop some suggestions about conditions that would be expected to increase or reduce *i*. The cost of *i* to each of its donors would not be expected to exceed the benefit from their share of the bonanzas. Hawkes (1990) shows that under quite a wide range of these parameters, showing off is a strategy that can invade a population and persist.

Since only provisioners provide for and confine their matings to one female, and since men are either provisioners or show-offs, there will be fewer provisioners when there are more show-offs; some women cannot capture a provisioner for themselves, so we will expect more "unmarried" women in a population with more show-off males. Thus if we expect more Hadza men to adopt a show-off strategy than !Kung men, we should expect to find more single Hadza women than !Kung women, in so far as marriage or co-residence represents the W strategy. We gave arguments for suggesting that Hadza men might be expected to direct more effort to matings and less to provisioning when compared to !Kung men. The show-off strategy, hunting big game which can be widely distributed (even at cost of very high variance in hunting returns, Hawkes *et al.* 1991), is one way of directing effort to increased matings. The amount of big game available may influence the frequency of a show-off strategy. If little is available and it is caught extremely seldom, one would expect the balance to tip away from show-off and toward provisioner. Hawkes *et al.* (1991) showed that trapping small animals can lead to an almost daily but small supply of meat, probably a good strategy for a provisioner. The ethnographies seem to show that !Kung catch many small animals that Hadza mostly ignore or eat in the bush rather than bring home.

Consequently, proposing that more Hadza men adopt a show-off strategy and more !Kung men play provisioner accounts for the observations reported above, and leads us to expect to find more unmarried Hadza women than !Kung women. In our 1985 census there were 27 unmarried Hadza women out of 110 women between the ages of 20 and 45. Thus 24.5 percent of Hadza women of reproductive age were unmarried, despite the equal sex ratio. Howell (1979:234, table 12.1) shows 7 unmarried !Kung women out of 87 aged 20–45, which is 8 percent. Chi-squared is 9.23, *df* = 1, which gives $p < 0.005$. We do not really know whether the methods used to arrive at the counts of married and single women are comparable but it appears that there are significantly more unmarried women of reproductive age among the Hadza

than among the !Kung. As with any confirmed prediction, we should remember that it might be possible to generate the prediction from hypotheses other than the one we used.

At first sight, our claim that the show-off strategy is more frequent among Hadza is contradicted by the Woodburn (1968b) and Kohl-Larsen (1958) reports of homicide as a normal response to adultery among the Hadza. But Kohl-Larsen's discussion of adultery makes it clear that the response includes much flexibility. The matter is more easily settled if the husband has "a good heart," or if the offender pays some retribution. The Hadza view of big-game hunting as reported by Woodburn (1968b), emphasizing reciprocity much more strongly, also seems not to coincide with ours. We are only just beginning to investigate these issues among the Hadza. We hope to continue thinking, modeling, predicting, and testing. It should be evident that both sets of models suggest many issues to investigate.

The show-off model seems to account for the use of traps by !Kung and their absence among the Hadza. Not only do the Hadza seldom trap (even though they know how to do it, and sometimes do so as children), but Obst (1912) reports them as viewing trapping as "unmanly." Traps catch a reliable supply of small game (see also Kent's figures from Kutse in chapter 6), which is a good technique for a provisioner (Hawkes *et al.* 1991). Hunting acquires large game. Whether the theory will ever give us any insight into the wider range of hunting techniques and social arrangements such as Pygmy net hunting, or the extensive game drives and large pit traps described by Guenther in chapter 3, is at present quite unclear.

It should be evident by now that we have generated a picture of !Kung men's interests as being closer to those of their womenfolk (if, as Hawkes argues from the show-off game, women do better by capturing a provisioner than by manipulating show-offs) than are Hadza men's interests. We think it is a small step from this to the description Woodburn gives of a degree of separateness and almost opposition between the sexes in Hadza society. He seems to regard this as one of the key features of Hadza social organization. While some have stressed the equality and relatedness of men and women in !Kung society, no one has claimed unity or equality between the sexes for Hadza society. This is not to say that Hadza society is dominated by men. Hadza women vote with their feet quite effectively, and the obligations of son-in-law to mother-in-law that Woodburn describes seem to be very much in evidence. Older women (and some young women) have powerful and aggressive personalities, which anthropologists and male informants treat with awe!

Thus, although false confirmations may arise too easily in a com-

parison of just two populations, even though several of our predictions were genuine predictions to data awaiting analysis (e.g., effects of Hadza father's death, number of unmarried Hadza women), and some links in our argument are weak, some are quite strong, and we have been able, working in the evolutionary ecology framework, to link many features of Hadza and !Kung life, and offer explanations around the single idea of a trade-off between effort to promote survival of offspring and effort to generate more offspring. We are able to derive predictions from the framework, and find some support for them in the data.

“Global process theory”: another family of explanations

What can thinking about the global process add to our account of differences between the Hadza and the !Kung? Does global process theory suggest we should attend to different costs and benefits? Does it offer alternative, competing explanations for the observations? Of course, however hard we try, we cannot generate hypotheses from global process theory as fruitfully as can its true proponents. Consequently, we restrict our discussion to a few ideas that can be found in the literature. The influence of neighbors was already implied in our discussions of settlements and venereal disease in connection with fertility, and hypergamy in connection with male strategies.

Men's response to “hypergamy,” forager women marrying rich neighbors

Hypergamy has been suggested as a reason for hunters emphasizing hunting, and resisting settlement. The pressure of hypergamy might lead forager men, unable to compete in the village, to resist settlement and increase their emphasis on positive aspects of hunting and the forest life, such as the greater access to meat (Headland 1985; Bailey 1988). While the !Kung seem to show no reluctance to farm or herd (given the chance), the Hadza conform to Headland's pattern, showing lasting ambivalence to settlement schemes, and seldom staying in them for long. Thus we might attribute the Hadza emphasis on hunting big game and distributing its meat to the need to combat the attractions of village life and villager husbands. Yet these attractions seem weaker for Hadza women than for !Kung women. We observe that fewer Hadza women marry neighbors, and of those who do, many return to the bush with their children. But if we are stubborn, we might suggest that !Kung men compete (in a context of sparser big game) by performing more tasks about the house (building houses, making clothing, and spending more

time with their wives), and that !Kung women are married so young because !Kung men try to marry them before the Bantu do!

But is a low level of hypergamy an indication of a less severe threat of it, or of a more successful adaptation to prevent it? Could we assess the threat to be greater among the Hadza? Is there demand for Hadza wives? One might expect the many immigrants to the Mangola area to be looking for wives, but few Hadza were married to them. As far as we can see, not many Datoga seek or take Hadza wives, unlike the Herero and Tswana neighbors of the !Kung.

Would a Hadza woman or a !Kung woman have more to gain by marrying a neighbor? Although Hadza women work longer hours than !Kung women, it appears that they usually get more calories per hour, and the climate is less demanding. Hadza men apparently bring in more meat than !Kung men. Thus Hadza women may eat more meat than !Kung women, and they have as many children as the average farmer, while !Kung women had fewer. Hadza women are as successful at keeping their children alive as are !Kung women. The bush is simply a better economic/reproductive alternative where the Hadza live than where the !Kung live. This would explain not only why fewer Hadza girls marry "Swahilis" but also why some of those who have done return with their children to resume life as Hadza. These points do not amount to evidence that hypergamy is a greater threat to Hadza men. Indeed Bagshawe (1923) reported that during a famine among farmers around 1917, several Isanzu girls married Hadza men.

Fertility and population increase

Wilmsen (1989) presents the argument that !Kung fertility is lowest among those with least access to resources. Motzafi-Haller (1990) implies the same. This view is easily reconciled with our own. There are other theories in the literature, some of them very well known such as the "wealth-flows theory"; others less well known but more in tune with global process theory.

Murdoch (1980) provides one of the more lucid summaries of the view that poverty increases fertility. He emphasizes the security provided by a large kin network under the unpredictable and uncontrollable environments of the very poor and exploited. This "people as security" idea resembles the argument of Draper (1989) about "people as resources." Raising many children, and promoting pro-natalist beliefs among one's kin and allies, may generate a usefully large network of exchange partners that better buffers hard times. While much has been made of the "reliability" of hunting and gathering, uncertainty of this

type has been discussed extensively in work on the !Kung and other southern African foragers (e.g., Kent, chapter 1, this volume). Among the !Kung, spatial variation is dampened by the *xharo* exchange system (Weissner 1982). Temporal variation is sometimes localized, and so it can be translated into spatial variation, and solved by moving to another locality or calling on help from distant partners or kin. Among the Hadza, we observed in our 1985 census data that women with more living siblings had more living children, which we interpret to mean that there may be reproductive benefits that accrue from having more kin. But these kin tend to live together; thus they cannot buffer spatial-temporal variation in resources. We have seen no mass movement of people from one region to another, and like Woodburn (1968b) are impressed with the stability of these regional populations. There is no record of serious shortage among the Eastern Hadza (but Bleek's 1930 informants told her of famine in the area of the Western Hadza which people had moved to avoid: Bleek 1931). As Lee (1979) reports for the !Kung, there are accounts of farmer neighbors of the Hadza using bush foods in times of crop failure (Bagshawe 1923). On the other hand, some Hadza foods, particularly berries, seem very variable from year to year, especially in the time and size of the harvest.

By the standards used in accounts such as Murdoch's (1980), the Hadza and the !Kung are both dramatically poor, and perhaps indistinguishably so, but the theory would have to predict from the observed difference in fertility that the Hadza were poorer than the !Kung. We could view the Hadza as poorer than the !Kung because they work longer hours. But Hadza get more for their work, their women are fatter, their men more muscular, and their children survive as well.

In Blurton Jones *et al.* (1992) we showed that the Hadza population was increasing and might have been increasing for some time. We suggested that it might have been suppressed in pre-colonial (or pre-rinderpest) times by the raids described by Obst's informants. These may well have been associated with the slave trade, which continued until 1873 in east Africa (Sheriff 1979). Thus, even though we cannot muster support for the poverty theory of fertility, our favored explanation of population increase, another key demographic parameter derives directly from global process ideas.

Poverty and parental behavior

If contemporary foragers are the rural proletariat (as Wilmsen 1989 and others suggest), perhaps we should explain their parental behavior in

the same way as we explain differences in parental behavior between socioeconomic groups in other contexts, such as in industrial societies.

(a) Sociologists and psychologists have suggested that children of the lower classes may be trained in deference (Newson and Newson 1968, and references in Belsky 1984). Does this shape !Kung or Hadza child-rearing? Neither Draper nor Konner has described anything in !Kung child-rearing that they interpret as deference training. Draper (1975:92) in fact describes almost the opposite. Nor can we decide which population we should expect to show most training in deference: perhaps the !Kung, in so far as they more often work for more powerful neighbors.

(b) There is an enormous literature on socioeconomic status differences in parental behavior in industrial societies. In so far as socioeconomic status differences in child-rearing reflect the kind of exploitation that global process theory holds to be so important, perhaps we should expect the !Kung and the Hadza to differ accordingly. Lower status and greater poverty in industrial societies are associated with less interaction between parents and children, and less response by parents to child behavior (most clearly in respect to response to speech), more physical punishment, and more verbal commands and prohibitions directed to the child (McLloyd 1990). Thus, very, very loosely, the Hadza more resemble parents of low socioeconomic status and the !Kung more resemble higher-status parents (although their actual frequency of response to infant vocalization was shown by Konner [1977] to be the same as that of Boston working-class parents). So again global process theory leads us to propose that the Hadza are more exploited and impoverished than the !Kung. We have yet to identify evidence that Hadza are poorer than !Kung.

Meat trade and men's subsistence strategies

Could we explain the Hadza concentration on big game and their neglect of trapping by a greater demand by neighbors for traded meat? Several contemporary descriptions of the !Kung and other San peoples indicate that they are often employed to hunt by their richer neighbors who own horses and guns (Osaki 1984; Kent, chapter 6, this volume). That the quarry of these hunts are large game may support the premise that commercial hunting would lead to concentration on large game. Very little meat was traded by the Hadza that we have observed, but they are the people who live furthest from villages. Less than 5 percent of their food was farm produce. This would have come from relatives in villages, trading honey, nagging, and possibly least of all in exchange for meat.

We imagine that the demand for meat from villagers is great. The

Hadza are surrounded by dense populations of farming people (WaIraqw and WaIsanzu). Although these are mixed farmers (Iraqw adding pigs to the usual chickens, cattle, goats, and sheep), we have no reason to think that animal protein is in any less demand than elsewhere in Africa. Meat is often discussed when non-Hadza (of any level in society) meet Hadza. In 1992, several instances of trading meat were observed and they seemed to be associated with and arise from the latest settlement efforts (the "Hadza Centrement Scheme" and a newly initiated Pentecostal mission).

Another external influence is probably important. Trade in wild game is illegal in Tanzania, and Hadza seem quite aware of this. The game laws may be more effectively enforced on the Hadza than in the remote areas of Ngamiland. But this would allow !Kung to conduct more trade, and if larger game is better for trade, the meat-trade theory should lead us to expect the !Kung and not the Hadza to specialize in large game. However, the relative scarcity of large game in !Kung country might offset this, an ecological factor lowering the trading opportunity.

Avoiding Datoga and other strangers

Hadza show some fear and distrust of their Datoga herder neighbors, and of strangers of any sort. Some Hadza attribute their flight from the sound of a vehicle to the fear that it is "the government" coming to settle them (see also Woodburn 1979). But we should note that unfortunate experiences at the hand of strangers go back beyond the turn of the century. Obst (1912) was told of neighbors coming to hunt elephants (apparently Isanzu and Sukuma, not Europeans); they also captured women and children. He was told of the peace that followed the decline in the elephant population.

Over the years there are said to have been some killings of Hadza by Datoga, and some retaliation by Hadza. Bagshawe (1923) reports:

Once, according to tradition, some Kangeju [Hadza] killed an elephant and obtained a few goats from a native stranger in exchange for the ivory. Next morning the goats strayed into the bush and were lost, for all were eating elephant meat and no one bothered to follow them. The feasting Kangeju were attacked by Tatoga, who declared that the goats had been stolen from them, and many were killed. Their first experiment as pastoralists ended in disaster and they have never repeated it.

For the Hadza, such incidents may have been repeated sufficiently often to create a persistent fear that has efficiently cut off herding as a possible way of life or direction for "development."

Datoga traditions by which the killer of an "enemy of the people"

(most often a lion) is lavishly rewarded may have led young Datoga once in a while to classify Hadza as such. Hadza say that their fear of Datoga is the reason why Hadza women forage as a group, and demand the company of at least one male with poison arrows (even if a young teenager). Datoga are used by adults as “bogeymen” to persuade children. Datoga have been known to capture children to raise as herders (Sellen, pers. comm.). A Hadza informant told us of one Hadza child held temporarily by Datoga, and of a vigorous raid on a Hadza camp some 25 years ago from which all the children escaped. Despite this, Hadza children are often the only daytime occupants of the camp, or are in the bush as a small group of mixed ages. In complete contrast, Datoga are the main customers for Hadza honey, which they need to make mead for frequent and important ceremonial and political occasions.

In O’Connell *et al.* (1990) we suggested that models of the economics of bone transport might need to take account of the Hadza wish not to linger at lowland kill sites where encounters with Datoga might be likely. It remains to be seen whether doing this enables us to account for any more of the variance in which skeletal parts are transported from kill site to home site.

National politics

Global process theory claims that even the “remotest and most isolated” locations are influenced by the global process, by the state, and by its relation to other states. Thus the different political systems of Botswana and Tanzania might affect the !Kung and the Hadza differently. Socialism claims to promote equality between individuals, sexes, parents and children, and neighbors. This could be a reason for the apparently weaker impact of neighbors on the Hadza, although it has not stopped substantial parts of their land being taken or devastated. Furthermore, the direct or indirect impact of the state (e.g., threat of state power by those who would settle the Hadza, in the last decade with no authority from the state) has been conspicuous from time to time (Woodburn 1979, 1988; Kaare 1988). We observe that the foragers in the socialist state show greater separation between men and women, and less attention by parents to children’s interests. This is the opposite of the intuitive “global process” expectation.

Encapsulation: Is Woodburn describing an influence of the global process?

Woodburn (1988) describes the way Hadza maintain their independence from their neighbors. He argues that their “immediate return” system

allows them to avoid lasting trade or work arrangements, and thus to resist absorption by agricultural neighbors. He suggests that this may be why so many of the forager populations that survived into this century were immediate-return societies. Nonetheless, he argues that the Hadza were not changed into an immediate-return society by the need to stay separate from neighbors.

But given that Hadza wish to preserve their identity, and given the nature of the outside forces that have impinged on them ("farm or else stay backward!"), then their endurance, their presence as foragers in the twentieth century, is partly explained by global process theory. The global process demands that they farm or perish, and trying to farm in the land that is now left to them also means to perish, leaving occasional labor for farmers as their only obvious livelihood. Because they refuse, the process leaves them little alternative but to cut themselves off and to avoid lasting entanglements with the outside world. Having done that, there is little left for them to adapt to but each other, and the natural environment. Thus global process theory becomes a part of the ecological explanation of Hadza behavior.

We are of course obliged to try to explain why Hadza wish to preserve their identity! In his hypergamy paper, Bailey (1988) implies that it would be mainly men who are concerned about this. If Hadza get too close to neighbors, Hadza men will not get wives and will not leave descendants. But we have no evidence of gender differences in the tendency to move away from "Swahilis."

The issue is complicated additionally because a further consequence of the immediate-return habit seems to be loss of land. Welcoming outsiders into their land, Hadza ask only gifts of small amounts of maize from time to time. When in due course the presence of the outsiders becomes problematic, the Hadza simply move away. As is now evident to a few educated younger Hadza, they thus sacrifice land and habitat and their long-term security (the habitat quickly becomes almost desert under the destructive farming practices of their neighbors) for tiny short-term gains.

Conclusions

We have suggested that influences of neighbors and the global economy can easily be incorporated within the behavioral ecology approach. Neighbors modify the costs and benefits of alternative courses of action just as do flora, fauna, climate, geomorphology, and friends and relatives. We suggested that the lower cost of Hadza children, determined by the greater opportunities for children to acquire food for themselves,

allows women to invest in higher fertility and devote less effort to their children's survival, and allows Hadza men to invest less in child-care and more in affairs or new marriages. Since the opportunity for men to make new marriages depends upon women being available, the incidence of marriage to men of neighboring tribes enters into the issue. More !Kung women marry men of other tribes. Thus neighbors, and the higher costs of desertion, work in favor of !Kung men staying with their spouses and investing in them and their children. Data support the implication that fathers have more effect on survival of children among the !Kung than among the Hadza.

But when we looked at some other influences of neighbors suggested in the literature, things did not go so smoothly. Much literature suggests that poverty increases fertility, and makes for harsher child rearing, which would imply that Hadza are poorer or more exploited than !Kung. Yet Hadza get more food for their work, and are heavier. Large game may be better for trade, yet Hadza, who specialize in big game, seem to be not heavily involved in meat trading. While the strongly socialist government of Tanzania aims for equality between tribes and sexes, and continued Hadza autonomy may be partly an outcome of this ideology, the sexes are described as opposed among Hadza and equal among the !Kung. On the other hand, the apparently steady increase in Hadza population is probably best explained by the cessation of raids by neighbors during the last century. Clearly one cannot assume that potential influences of neighbors and the wider world are either inevitably effective, or inevitably detrimental. Therefore, the global process as a cause of behavior becomes one of the many ecological and economic influences affecting people and their strategies.

Our evolutionary ecology framework drew attention to a series of interdependent differences in behavior and reproduction between the Hadza and the !Kung. The apparent ease with which Hadza children can help provide their own food lowers the reproductive penalties of more frequent births and harsher treatment by mother, and lowers the penalties of desertion by father. We claim this explains the higher fertility, less attentive child rearing, and greater separation between the sexes among the Hadza. Evolutionary ecology generates testable predictions about a variety of aspects of behavior from a small number of premises. Although many think it unwise to expect models based on natural selection to apply to people, the attraction of logically consistent models that make testable predictions about differences may outweigh these reservations.

These differences may follow from small (but we believe crucial) differences in the environment: the spatial separation of water and food

in most of !Kung country and their intermingling in most of Hadza country, and the resource type and possible return rates. It is important to realize that we do not claim to have created a general rule, such as that wherever water and food are intermingled there will be sexist societies! We think this aspect of geography only shows up as important because many other costs and benefits of behavior have been so similar in the Hadza and !Kung environments and lifeways. The rule that we espouse is much more general: behavior will be that which combines costs and benefits in such a way that more descendants are left than are left by behaving in another way. The actual costs and benefits, and thus the optimal behavior, will depend on local circumstances (and the behavior of other individuals) and it would be difficult to generalize about how they will play out. Thus we often see ourselves as “evolutionary particularists!” Note that this formulation excludes no kind of material influence upon costs or benefits.

Although we are likely to pursue our comparisons between the Hadza and the !Kung, it is important to compare other groups, or larger samples, and, as the reader of other chapters in this volume will readily agree, it is likely to be chastening. We expect it will strengthen the “evolutionary particularist” view, reducing emphasis on the importance of any single environmental factor (such as ease of foraging by children), and increasing emphasis on cost-benefit analyses that pay attention to more variables. For instance, if we begin to think about the fertility of Hadza and Ache, we immediately see that Ache high fertility does not entail specially successful foraging by children. Details about the effects of children on women’s subsistence seem unlikely to explain much about Ache fertility, or about the differences of Ache from !Kung and Hadza. The greater proportion of food acquired by Ache men must be a much more significant factor for this comparison.

The arguments outlined here are unfinished. Within our presentation of evolutionary ecology we have used provisional results or impressions from investigations that are still incomplete. Our answer to the critique of ecological approaches by writers such as Wilmsen must also be regarded as incomplete because global process theorists should be able to generate more competing explanations for the phenomena than we have discussed here. But if global process theory is taken to imply “change based upon opportunistic responses to new economic, social, and market possibilities” (Denbow 1990:126), then it can draw attention to costs and benefits of behavior that we might otherwise have ignored. Some are, once noticed (like “hypergamy,” and opportunities to trade meat), easily incorporated into the evolutionary ecology approach. Others simply failed, or are more difficult to test, including some that more obviously compete with evolutionary ecology explanations, such

as the implication from child rearing and from high fertility that Hadza are poorer or more downtrodden than !Kung. The difficulty arises merely because we cannot pin down the concept of poverty (it may refer to many variables – from food intake to control or extent of options available, all of which need further definition but can be usefully translated into costs and benefits accruing to the key participants from alternative actions).

Elsewhere we (Blurton Jones *et al.* 1992) and others (e.g., Schrire 1990) have suggested that the global process of interaction between peoples tends to produce similarities between contemporary hunters and gatherers. But in principle, as we and other contributors to this volume have made quite evident, global process theory should also be able to account for differences, because the global process may act in different ways in different localities. Not only are there differences in the behavior of the herder neighbors of the Hadza and the !Kung but the demands of the larger world system have shown differences in the two localities during the past century or so. Ivory has been extracted from both localities. But while cattle were extracted from Namibia, slaves were extracted from east Africa. People have migrated from the remotest corners of Botswana to work in the mines in South Africa. Little or no long-range demand for labor seems to have impinged on the Hadza since the end of slave export from east Africa in 1873. Displacement of people was a major event in Namibia and Botswana in 1904–6. Herders were displaced into and expanded into Hadza country much more recently, but historical and archaeological evidence suggests that some have been there from time to time during the past several hundred years.

The assault on anthropology from global process theory is of course much wider than a call to attend to more factors influencing cost-benefit equations. Revisionists claim that anthropologists err in their concept of separable cultures, err in writing only of a “time slice” assumed to represent a lasting and stable condition, and err in selectively perceiving constancy and contentment where there is neither. (Both evolutionary ecologists and revisionists criticize anthropology for neglecting conflicts of interest.) Revisionists argue that anthropologists ignore, or “peel away,” crucial events and lasting pressures of “history” or the “social relations of production.” But anthropologists are likely to continue these habits as long as none of the revisionist concepts is explained clearly or dissected very usefully. So long as global process theory offers neither a clear, explicit theory of human behavior, nor a criterion for the truth of its own claims, it cannot claim to be a serious theory, at least not a serious scientific theory. But its vigorous challenges may continue to stimulate reexaminations of many issues in anthropology.