
Limited Needs and Hunter-Gatherer Time Allocation

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Among the stimulating issues raised by Smith I take up three. First, he notes parallels in a "limited-needs" conception of time allocation to subsistence and expectations from evolutionary ecology. I argue that the differences are fundamental and usefully emphasized. Second, he disputes assumptions made in Hawkes, O'Connell, Hill and Charnov (HOHC) about the shape of fitness return curves, then adopts other curves without justifying the assumptions implicit in them. I suggest that this obscures the fact that such return curves might take any shape at all, that the shape they take depends on underlying assumptions (explicit or otherwise), and that the appropriate curves for a specific empirical problem depend on the empirical characteristics of the problem. Third, he points out the importance of the opportunity costs of foraging, criticizing HOHC for underestimating these effects. This is a telling point, one that has become increasingly central in work done in the 5 years since HOHC was written. I agree that these opportunity costs are as important as foraging returns for explaining time allocation.

(1) Smith argues, in opposition to HOHC that the limited-needs view is not necessarily inconsistent with the theory of natural selection or models of optimal foraging (pp. 73-85). As HOHC noted, there are similarities in some of the predictions of opportunity-cost models and predictions from limited needs, but Smith himself points out (as we did not) that even these predictions are not actually identical. More to the point, Smith does not comment on the fundamental distinction between the classic limited-needs view and the perspective of evolutionary ecology. This distinction rests on whether adjustments toward an optimum are expected at all. As Marshall Sahlins (1969, pp. 29-30), the most influential architect of that classic view, has said:

economizing admits of only one solution to any problem of resource allocation: "the one best way." But survival is anything that works . . . adaptation is normally a principle of non-optimal resource use.

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According to Sahlins, there are no general standards or performance that can be used to predict variation in behavior across cultures, let alone more widely. Evolutionary ecology is grounded on a completely different proposition; that is, there is a general standard of performance—differential reproductive success. Evolutionary ecologists expect foraging time to be minimized when the fitness return rates for competing activities are higher than those for foraging (e.g., foraging may be incompatible with mating) or when foraging has some additional cost (e.g., exposure to dangerous predators). The limited-needs theorists expect hunter–gatherers to stop foraging because “the hunter, one is tempted to say, is ‘uneconomic man.’ . . . His wants are scarce and his means (in relation) plentiful” (Sahlins 1972, p. 13). From such a perspective, competition, central in Darwinian theory, is relegated to a qualifying footnote (Sahlins 1969, p. 29). Having disputed our emphasis on the differences Smith himself ends his comment at precisely the point where HOHC began: “the real problem with the limited-needs view is that in itself it cannot explain variation . . .” (p. xx). Ironically, this is the same charge (appropriate, I think) Sahlins (1969) levels at utility theory (Hirshleifer 1977). That issue, important to the argument of HOHC (please see discussion therein) is, however, tangential to Smith’s comment.

(2) In HOHC we made the assumptions that (a) fitness returns for hunting diminish slowly, (b) hunting is a high-fitness-return activity, and (c) opportunity costs for foraging (i.e., fitness-return rates for alternative activities) remain constant. The first two of these were justified by the ethnographic observation that food is a consuming passion to most foragers and is not only fitness enhancing to eat but to give away. A more extended argument could be marshalled, especially for hunting, given the high value most foragers place on meat. This ethnographic foundation dictated the shallow shape of the “isofitness” curves we chose. The graph Smith constructs contains isofitness curves with different slopes. The higher the curve (upper left), the more steeply it diminishes. His “general statement” (p. xx) depends entirely on the shape of his curves (as the general argument of HOHC depended on the shape of curves therein). Isofitness curves could, in fact, have any shape. They could be straight lines, diminish at varying rates, increase to scale, or represent some changing combination of these. The choice of curves most useful for a given problem depends on empirical characteristics of the problem, on what is known about the constraints, the individuals, and the situation of interest. What we know, or think we know, about hunter–gatherers must guide our choice of models.

(3) By making the assumption that fitness return rates for alternative activities remain constant, we set aside the critical issue of the opportunity costs for foraging. Smith disputes this simplification. He argues instead that the “income effect,” which we had assumed to be “typically” negligible for human foragers, may frequently be significant. In this case the “income effect,” the increased consumption of “goods” (including leisure), would be the increased time spent mating and parenting which more food could

support. Smith expects it to be stronger than the "substitution effect" (the increase in time devoted to foraging as return rates for foraging increase relative to alternative activities) for most ethnographically known hunter-gatherers most of the time (p. xx). This, he says, is because foragers "must eventually reach some plateau where marginal returns on foraging time will be less than from other activities (or even fall to zero if they harvest more resources than they can exchange, store, or otherwise convert into fitness enhancement)," and because they "have multiple and extraordinary uses for time not devoted to production" (p. xx). Ethnography must tell us whether either of these two circumstances is common. As to the former, Sahlins (surely a disinterested source for this particular debate) may be cited for his review of the cultural orientation of foragers: remarkably "'gastric' as Julian Steward said of the Shoshoni" (Sahlins 1972, p. 38). Foragers I have observed (Ache and Hadza) not only eat their way through astounding quantities of food when it is available, they also continuously talk about food—food they have eaten, are eating, and expect to eat shortly.

The latter issue, the multiple and extraordinary uses for time not devoted to production, is of great importance, both as a criticism of HOHC and as a central problem for current research. The original paper focused on the amount of time men in foraging societies devote to hunting. Consider the Ache for a moment. Not only do Ache men spend long hours hunting during periods of mobile foraging, but better hunters spend more time at it. Subsequent work has shown that better hunters also have higher reproductive success (Kaplan and Hill 1985). Hunting appears to be a high-fitness-return activity for Ache men. They show the "substitution effect" when return rates increase. Ache women, however, do not hunt. They spend less than 2 hours a day in food acquisition. During periods when fruits are in season and their return rates for collecting go up, they do not spend more time at it (Hurtado et al. 1985). They do not substitute more foraging for alternative activities.

Thus, even within a single society, there is variation between individuals, in this case on the basis of sex, in the relative importance of "substitution" and "income" effects. In fact, the most powerful demonstration of the fitness importance of a wide array of activities alternative to food production is the marked variation in patterns of time allocation across sex and age within foraging societies. HOHC is really a paper about an aspect of men's strategies. To explore and explain differences between men's and women's strategies, and the variation in these across ecological settings with opportunity cost models we must look not only at the costs and benefits of foraging, and the variation in these (with individual skill and local options), but the costs and benefits of other activities (like mate guarding and child care) and the variation in these, not only with sex and age, but with ecology (Hawkes in press; Hawkes et al. 1986; Hill 1983; Hill and Kaplan 1986; Hill et al. 1986; Kaplan and Dove 1986).

The problem for current research is to find ways to measure the returns

of activities alternative to foraging. In the present context—set by the bias of HOHC—note especially this difficulty for the activities of men. Sahlins again provides documentation of the frequent reports that “modern hunters at least tend to employ their time off in such activities as daytime sleep” (1972, p. 35). Current observations of the Hadza support the (preliminary and provisional) generalization that, as predicted in HOHC, men hunt more when hunting returns are higher, and better hunters spend more time hunting than do those with lower success rates. Yet Hadza men in general spend a puzzling amount of time sitting, often sleeping, in camp. Although we can estimate the opportunity costs of not foraging, how shall we measure the fitness costs and benefits of afternoon naps? Could they be guarding mates or waiting for sexual opportunities they would miss away from camp? Finding ways to measure such activities is a major challenge.

As Smith points out, optimal strategies often depend on what others are doing and frequency-dependent models that recognize conflicts of interest hold great promise for untangling the riddle of what men may be gaining while they are not hunting. Blurton Jones (1983, 1984) offers a particularly relevant example of such a model. Under some circumstances social foragers may obtain more food from “tolerated theft” than from foraging. By being present when others procure the goods, they obtain a larger share than they might from their own acquisition. Conversely, extra effort may only provide more for others to expropriate. Factors such as these may combine with other benefits for not hunting. These conceptions are likely to prove increasingly useful as we find ways to measure the costs and benefits of nonforaging activities in terms relevant to fitness.

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