Title
Comment on Bliege Bird and Bird, "Delayed reciprocity and tolerated theft"

Journal
Current Anthropology, 38

ISSN
0011-3204

Author
Winterhalder, Bruce

Publication Date
1997

Peer reviewed

Bird's predictions for the tolerated-theft model are also consistent with trade as an explanation of food sharing.

Bliege Bird and Bird suggest that social benefits are flowing towards males who engage in encounter turtle hunting through increased alliances which will in turn lead to greater access to and retention of land. However, no empirical data supporting these assertions are presented. Therefore we need to know (1) if males who engage in encounter turtle hunting have increased alliances and (2) if increased alliances lead to greater access to and retention of land. These are testable hypotheses that should be pursued, but it may be difficult to untangle the inevitable problems of phenotypic correlation.

Bliege Bird and Bird's work is a welcome contribution to the sparse empirical data available for testing theories of human food sharing. We look forward to their future efforts in advancing our understanding of traditional foraging.

BRUCE WINTERHALDER
Department of Anthropology and Curriculum in Ecology, Campus Box 3115, Alumni Building, University of North Carolina at Chapel Hill, Chapel Hill, N.C. 27599, U.S.A. (*winterhalder@unc.edu*).
12 VI 96

I will make three observations on issues of method and analysis. I do so in the hope that Bliege Bird and Bird will find them useful as they refine and extend their analysis of subsistence behavior in the Torres Straits. Their work stimulates the optimistic view that behavioral ecology fieldwork with humans is developing to a level of sophistication commensurate with the demands of some very exacting models.

1. Analytical methods: Each of the models being assessed here (tolerated theft, reciprocity/risk-minimization, and trade) assumes diminishing marginal value as holdings in a resource packet increase. By contrast, all of the quantitative assessments performed by the authors assume a constant value to units of the resource, whatever the amount held. This is the case for most empirical studies on these topics. However, the difference between the two methods of calculating costs and benefits can be quite significant for formulating and testing hypotheses about resource transfers (Winterhalder 1996).

For example, turtles are large and valuable packets of food, presumably subject to strongly diminishing marginal returns for the individual(s) acquiring them. So long as the forager(s) retains a few high-value portions, the effective cost of ceding the balance to free-riders may be small or negligible. Because marginal valuation can affect virtually all of the relationships examined here, it would be quite interesting to see the tests reassessed in the units that are assumed by the underlying models.

Decisions concerning the production and distribution of food occur in the broad context of subsistence and economy. Extracting a single resource for analysis gains quantitative purchase and focus, but it does so at some expense to analytical relevance. This kind of unhappy trade-off is common enough in behavioral ecology work. It becomes important to keep it in mind if the general goal is one of evaluating the "explanatory power of ecologically based sharing models." For example, graphical models of tolerated theft show that the amount of a packet transferred depends on the preexisting resource holdings of the participants (Winterhalder 1996). Thus, without data on comparable foodstuffs held by families during exchanges of turtle, it is quite hard to evaluate precisely the fit of the data to predictions from tolerated theft.

These two points are linked: marginal valuation of a resource and opportunity costs associated with subsistence alternatives enter jointly into decisions about resource acquisition and transfer. The two questions—How valuable to me is this *n*th unit of turtle? What else do I have and need?—refer to inseparable elements of economic choice.

2. Risk minimization and reciprocity: The authors use several tests to conclude that risk minimization based in reciprocity is not a significant determinant of patterns of turtle meat distribution. The result appears to be sound. It might also be supported by Meriam data not highlighted by Bliege Bird and Bird. Is there subsistence risk in this society, such that we would expect food distribution patterns to be shaped to minimize it? The material presented suggests not, but it would be useful to know more about risk in general among the Meriam. Is turtle meat of sufficient importance that its distribution would make a difference to risk? Turtle is one commodity in a food economy that includes purchased items, horticulture, animal husbandry, and a variety of other marine resources. Thus it would help to know what percentage of the diet is made up of turtle meat. At least some of the alternative foods are described as highly productive, regularly available, and predictably harvested (low-risk). If subsistence risk is low overall and if turtle meat is a minor component of the diet, then there should be little selection pressure to shape turtle distribution for risk minimization. Other of the potential selective pressures affecting distribution (Winterhalder n.d.) will dominate the pattern that emerges.

3. Scrounging: Tolerated theft has been studied extensively in biology, where it goes by the term "scrounging" (references in Winterhalder n.d.). Because the net rewards of producing and scrounging are frequency-dependent (the success of scrounging, for instance, depends on the frequency of producers), game theory is an appropriate method of evolutionary analysis. The objective is to find the mix (proportion) of tactics such that no individual can gain an advantage by switching roles. Vickery et al. (1991) have done this for a population of producers (who consume only what they themselves obtain), scroungers (who consume by tolerated theft a portion of what producers locate), and opportunists (who produce or scrounge, as the opportunity presents). The mix of these tactics can be predicted by three variables: (1) producer priority, which measures the degree to which a producer can monopolize the consumption of

a packet he or she locates; (2) opportunist's detection opportunities, which measures the degree to which an opportunist benefits by doubling its feeding options over the two specialized tactics; and (3) group size (see Vickery et al. 1991:fig. 2).

A definitive application of this model to the Meriam case would have to engage the seasonal and other environmental differences carefully described by Bliege Bird and Bird. However, some general predictions are possible. Because group size is large and significant amounts of turtle meat are taken by scroungers, we would predict that pure producers will be fairly rare in the Meriam population. Because butchering is public and any household member (indeed, an unattended bucket) can establish a claim at turtle distributions, the opportunist can pursue production opportunities without sacrificing chances to scrounge. Given the advantage of opportunism, if scroungers can claim a large share of the turtle (feast consumption of reef-season turtle) we would predict a population of opportunists, or opportunists mixed with scroungers. If scroungers can claim a smaller share (neighborhood consumption of nesting-season turtle, with greater producer priority), we would predict a population of opportunists, or opportunists mixed with producers. Very roughly, these predictions appear consistent with the Meriam evidence. The game theory approach predicts an equilibrium in which some produce, some produce and scrounge, and some may only scrounge. This is important because the highly unbalanced food transfers observed by Bliege Bird and Bird could result from scrounging without any implication that there are (or need to be) counterflows in reciprocity, trade, or intangible social benefits. It would be interesting to know how they would evaluate this possibility.

Reply

REBECCA BLIEGE BIRD AND DOUGLAS W. BIRD
Salt Lake City, Utah 84112, U.S.A. 17 VII 96

We are grateful for the well-considered criticism and thoughtful commentary provided by all of our reviewers. In light of these, we are even more optimistic about the power of simple models in behavioral ecology for understanding variability in human subsistence patterns.

One common and important criticism of our approach is that we considered turtle sharing in isolation, without also analyzing or describing the sharing of other resources, including both food and nonfood items such as tools, dinghies, and garden land, and how such sharing patterns might covary with turtle availability or season. In this preliminary study, we focused on turtle exclusively because it was the subsistence resource most frequently, widely, and visibly shared of all hunted, collected, or managed resources and the only resource whose sharing and acquisition patterns varied seasonally, allowing us to examine how variation in the costs and benefits of acquisition independently of variation in resource characteristics themselves (nutritional composition, package size) affects the way in which resources are shared. Our hope was that by doing so we could more clearly identify the relationships among certain variables that, on the basis of theoretical expectations, should be important influences on resource acquisition and distribution.

Sosis and Hill make the most specific objections to our testing of sharing models with data from only one resource type. They point out that if the goal of foraging is to reduce the risk of going without meat in general, hunters who share out turtle meat when they are successful could be receiving shares of other kinds of meat when they are unsuccessful; in this case, fish would be the item most commonly used to reciprocate shares of turtle meat. This raises two problems. The first is that the most important source of meat (sardines) is much more synchronously acquired than turtle, much less costly to acquire, and rarely shared beyond the household. In 14 months of residence, in one household for which we have systematic observations, sardine catches were shared with others on 2 out of 120 sardine netting attempts by members of that household. While the distribution patterns of other kinds of fish are unquantified, a preliminary study of the frequency of extrahousehold sharing of fish line-caught on the foreshore suggests that only about 10% by weight of such fish are shared with other households (analysis of fish-sharing patterns is certainly warranted and is in the works). If risk-reduction reciprocity patterns meat exchanges in general, why give up shares of resources that one can easily acquire and that all individuals can obtain synchronously? The second problem is that if the goal is reducing the risk of going without meat, foragers might be expected simply to go fishing instead of hunting turtles. Netting sardines provides enough meat to feed a family comfortably at very low risk of coming home empty-handed. Why drive over sardine schools on the way to hunt risky turtles? If, as Sosis and Hill imply, it is not the risk of going without meat but the risk of going without some essential nutrient provided by turtles, such as fat, then we do show that shares of turtle meat are not reciprocated with shares of turtle meat.

Winterhalder correctly points out that turtle meat may not be important enough in the diet that its distribution would make an important difference in daily dietary risk and that selection could not be expected to favor risk-reduction reciprocity if there is little risk to going without meat. While we do not yet have systematic data on the relative contribution of different resources to the Meriam diet, two factors (one of which we tested) are of importance to understanding the risk of not having meat. The first is, as Davis and Attenborough indicate, the presence of government benefit checks, which smooth out a lot of the variance in consumption according to season by allowing individuals to purchase food if they choose to do so. The second (as we show in tolerated-theft prediction 3) is the presence of freezers, which have become even more common on the island