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Turtle hunting and tombstone opening: public generosity as costly signaling

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Abstract

Costly signaling theory (CST) offers an explanation of generosity and collective action that contrasts sharply with explanations based on conditional reciprocity. This makes it particularly relevant to situations involving widespread unconditional provisioning of collective goods. We provide a preliminary application of CST to ethnographic data on turtle hunting and public feasting among the Meriam of Torres Strait, Australia. Turtle hunting appears to meet the key conditions specified in CST: it is (1) an honest signal of underlying abilities such as strength, risk-taking, skill, and leadership; (2) costly in ways not subject to reciprocation; (3) an effective means of broadcasting signals, since the collective good (a feast) attracts a large audience; and (4) seems to provide benefits to signalers (turtle hunters) as well as recipients (audience). We conclude with some suggestions as to the broader implications of this research, and the costly signaling paradigm in general, for understanding collective action and generosity in human social groups.

Keywords: Collective action; Costly signaling; Foraging; Food sharing; Torres Strait Islanders

Explaining the patterns of extrafamilial cooperation and resource transfers found in some social species, including humans, has been a central concern in evolutionary biology for several decades (Dugatkin, 1997). In evolutionary anthropology and behavioral ecology, explanations of apparently altruistic or generous acts, such as the sharing of food or other collective goods, beyond a circle of close kin have usually relied on notions of reciprocity (Hawkes, 1992). While the reciprocity framework is theoretically rich, evidence from human and nonhuman societies has raised doubts about its ability to explain some instances of cooperation, widespread sharing, or provisioning of collective goods (reviews in Connor, 1995; Hawkes, 1992; Pusey and Packer, 1997). Those who study the evolution of cooperation, including hu-

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man behavioral ecologists, increasingly realize the necessity to consider a variety of mechanisms and models (Boone, 1992; Dugatkin, 1997; Winterhalder, 1996, 1997).

One approach that seems to hold promise for understanding generosity and collective goods is the costly signaling framework developed by Zahavi (1975, 1977) and Grafen (1990), among others. In this paper, we discuss how costly signaling theory (CST) can, in principle, account for a variety of prominent and widespread features of generosity and collective action—indeed, the very features that pose problems for reciprocity-based models. We offer a preliminary application of this framework to ethnographic patterns we studied among the Meriam of Torres Strait, Australia. We conclude with some suggestions as to the broader implications of this research, and the costly signaling paradigm in general, for understanding aspects of human social behavior.

1. Costly signaling theory

CST proposes that expensive behavioral or morphological signals are designed to convey honest information benefiting both signalers and the recipients of these signals. There are two key conditions required for evolutionary stability of such signaling (Zahavi, 1975; Grafen, 1990). First, signals must convey reliable information about variation in the underlying quality being advertised. This quality could involve aspects of the signaler's competitive ability, genetic endowment, health and vigor, resource control, or the like. The second condition is that signals impose a cost on the signaler that is linked to the quality being advertised. This link can take one of two forms: either lower-quality signalers pay higher marginal costs for signaling, or they reap lower marginal benefits.[1] These two conditions are linked, since quality-dependent cost (the second condition) serves to ensure that the signal honestly advertises the relevant underlying qualities of the signaler (the first condition).

In principle, CST provides a sound framework for explaining how honest communication can be evolutionarily stable despite the pervasive conflicts of interest generated by natural selection. When these outlined conditions are met, then honest signals and reliable communication may be of benefit to both signaler and recipient. The payoff to the signaler comes from being chosen as a mate or ally or deferred to as a dominant in mating, cooperative, or competitive contexts, respectively. The payoff to the signal recipient comes from the usefulness of the information inferred from the signal: he or she should be able to evaluate the signaler's qualities as competitor, mate, or ally by attending to the signal rather than through more costly means of assessing the signaler's abilities, qualities, or motivations. Costly signaling thus can benefit both signaler and recipient, even when they are antagonists or competitors. Signal cost minimizes or eliminates the advantage of engaging in false advertising, the rock

[1] It is possible that low-quality individuals could gain *higher* marginal benefits from signaling while still paying higher marginal costs, in which case the predicted outcome would involve greater signaling by individuals at each extreme of the quality spectrum than by those in the middle (Adams and Mesterton-Gibbons, 1995). This can allow a certain frequency of bluffing to persist in a population. Note, however, that signal reliability still requires that there be a negative correlation between signal cost and signaler quality (ibid.), as predicted by CST.

on which many previous evolutionary accounts of communication have foundered; it thereby guarantees that recipients will pay attention to such signals.

2. Costly signaling in human behavior: a case study

Judging from existing theory as well as research on other species, likely arenas for costly signaling in humans include competition for status, resource access (including parental investment), or mates (Johnstone, 1997). While CST has yet to be subject to detailed empirical tests using data on human behavior, it appears to have considerable potential for explaining a wide range of seemingly "wasteful" behaviors, such as foot binding and genital mutilation (Mackie, 1996), monumental architecture (Neiman, 1998), expensive public rituals (Boone, 1998), certain inefficient subsistence choices (see following, and Sosis, 2000), and various phenomena in bourgeois society covered by Veblen's concept of "conspicuous consumption" (Veblen, 1899).

However, in this paper we are particularly interested in considering how CST might be applied to phenomena that appear to be socially beneficent rather than "wasteful." Hence, we focus on how CST may illuminate an important category of human social behavior, involving provisioning of collective goods.[2] In particular, we examine funerary ritual and feasting among the Meriam, a Melanesian society of Torres Strait, Australia. We then explore the implications of this case for the general issue of hunting and sharing of large game, which has recently become a contentious topic in human behavioral ecology, and we argue that CST offers a coherent account of these phenomena.

2.1. The Meriam

Mer (a.k.a. Murray Island) is a barrier reef island 140 km from New Guinea in Australia's Torres Strait. The current population is 430 individuals of mainly Meriam descent, divided into approximately 85 households, the majority of which are located along the northern and western shoreline. The indigenous language, Meriam Mir, is a non-Austronesian language closely related to Bene, Gidra, and Gizra spoken on the Oriomo plateau of south-coastal New Guinea. The Torres Strait as a whole is administered by the State of Queensland and the Commonwealth of Australia. It is one of the few regions of Australia to remain continuously inhabited by an indigenous majority.

The terrestrial landscape of Mer consists of volcanic landforms, rich volcanic soil supporting dense monsoon vine thicket, plus typical coastal fringe vegetation. The island is approxi-

[2] By "collective good" we mean any good or service that, once produced (whether individually or collectively), is available for consumption by members of some collective (task group, village, population, etc.), regardless of whether they paid the costs of providing the good, and for which consumption by some reduces the amount available for consumption by the remainder. In contrast, "public goods" (Samuelson, 1954) have a more restrictive definition that eliminates the last requirement we just listed, by specifying that the goods involved are indivisible (e.g., like the light from a lighthouse); accordingly, we prefer to use the term "collective goods" (Hardin, 1982: 16ff) for the cases we analyze here and for any widespread sharing of food, rather than "public goods" (cf. Hawkes, 1993).

mately 1 to 2 million years old, with a fairly narrow fringing reef and few lagoons. The marine environment is rich with Indo-Pacific fishes, sea turtles, a few dugong, and diverse shellfish. Many fish feed very near shore due to the presence of large schools of sardines (*Harengula ovalis*, the Murray Island sardine).

The islanders' first contact with Europeans is undocumented, but the islands are situated on the northern entrance to the Great Barrier Reef, and many of the first official European ships through the Strait mention "Murray's Islands." Missions were established on Mer in 1872, and conversion to the Anglican religion rapidly followed; nevertheless, elements of indigenous religious belief and practice persist, both within and alongside Christianity. In 1898, Alfred Cort Haddon, first a zoologist and then an anthropologist at the Cambridge University, led a major anthropological expedition to the area (Haddon, 1901–1935). Prior to about 1975, when Australian welfare payments were made available to all indigenous Australians, the Meriam were nearly full-time subsistence horticulturalists and marine foragers planting tropical yams, bananas, sugar cane, and introduced new world crops such as manioc, sweet potatoes, and corn. In recent years, the importance of horticulture has dwindled, but fishing, shellfish gathering, and turtle hunting remain important subsistence pursuits. Households occasionally keep pigs, but pig husbandry has never been intensive nor an important part of subsistence or social exchange.

Meriam marriages are today exclusively monogamous, although prior to missionary influence, a few influential men married polygynously. Even so, many men adopt a polygynous mating pattern that involves multiple partners residing in different households, as well as short-term trysts. Similar arrangements among women, particularly married women, are intensively discouraged by men. Formal monogamous marriages are currently very rare, although marriages in the past were traditionally an important way of cementing alliances between patrilines: the majority of partnerships today are created simply by co-residence. Adoptions are common, usually between close biological kin. Households are complex, multigenerational, and fluid in composition. Households are headed by an elder male and his coresident female partner, although an unmarried partner has fewer rights to land than married partners (but all the responsibility of maintaining the household).

Brothers cluster on land owned corporately by patrilineages: household clusters are grouped into named districts colloquially called "villages," and districts are grouped into seven major clan territories dividing the foreshore and reef. Most residents currently maintain their main household in two of the seven clan districts on Mer, even though their own residential lands are in another clan's territory, which results in contemporary districts comprising multiple unrelated patrilineages. Inheritance of land involves corporate primogeniture: the first born male in a patrilineage inherits the right to decide how land is used, assigns use rights for that generation, and decides who ultimately inherits the property. Territoriality is fairly extreme: both residential lands and foraging territories are defended, but defense becomes more diffuse and involves larger and larger use-groups the farther one gets from the residential territory (e.g., garden territory limited to households, nearshore reef territory limited to patriclans, edge reef territory limited to clans, fishing territory clan-owned but not exclusively used).

Marine resources play a critical role in contemporary society, not just in household consumption but also in the provisioning of public feasts. This is especially the case for large pe-

lagic fish such as tuna and mackerel, large tridacnid clams, and turtle. During such public feasting events (and to a lesser extent at other times), men engage in competition involving dancing, sorcery, gardening, hunting, diving, marble shooting, top spinning, and boat racing. The political system currently is divided and contested on many fronts, with an elected Chairman and council representing the community to the larger Australian government but with limited authority within the community. Political leaders within the community were and usually are clan elders or the leaders of religious sects, of which there were many even prior to missionary influence. No complex or stable political system has ever been demonstrated to exist for the island, even to the extent that "Big Men" were fairly uncommon; thus, the saying dated to the turn of the century, "Everyone thinks he is *mamoose* (chief) on Mer."

2.2. The tombstone opening

Funeral ceremonies comprise some of the most elaborate and important rituals in Melanesian societies. Among Meriam, the occasion of any death engenders many expensive public ceremonies and feasting events. When a death is first announced, the deceased's immediate family calls a meeting of the kin group (generally, a patrilineal clan) to select a leader for the events to follow and to elicit monetary contributions to pay for mortuary expenses (preparation of the body, purchasing a casket, shipping between the island and the funeral home on Thursday Island). The next day, the *bood* begins: a public sitting near the deceased's home where kin and others attend. The immediate family is responsible for feeding all who come to show respect for the deceased and the kin group. Donations of food (e.g., fish, turtle, shellfish, sweet potatoes, yams, pumpkin, coconuts) are made by kinsmen and others in the village, as well as by the hunting, fishing, and purchasing efforts of the immediate family. The *bood* lasts for several days, as long as the immediate family wishes to publicly mourn (or has the ability to continue to supply free food to all comers, a form of feasting termed *bood lewer*). A temporary cross and grave are constructed at the burial site (one of several elements reflecting Meriam colonial history and conversion to Christianity in the late nineteenth century). At the end of the *bood*, a public funeral feast (*izurwur lewer*) announces the end of the formal period of mourning.

Roughly 2 to 5 years later, the family announces that the permanent tombstone is ready. These tombstones have developed into elaborate granite, tile, and concrete structures with color photos, engravings, molded reliefs of totems and fruits, and other expensive details. The family hosts a series of public work-party feasts to engage helpers to ready the grave to set the stone, and a final public feast (*kirim akos lewer*) is held after public setting of the headstone (*kirim akos*). Following this event, the date for the final "tombstone opening" ceremony is set (the "opening" being an unveiling of the tombstone, which is covered from view immediately following the setting ceremony). The opening ceremony begins with preparations and public work-party feasts, which can start up to 2 months before the date of the penultimate feast. During preparations, all those who come to assist must be fed by the immediate family, and the family can never predict how many people will come. Theoretically, the entire island (over 400 men, women, and children) could attend, although attendance by half or less is typical.

The tombstone opening feast (*kirim auskir lewer*) features tables laden with bowls of

cooked fish, turtle, shellfish, pig, purchased meats, rice, breads, fruits, and other foraged, planted, and purchased items. Gifts intended for the feast goers, such as sarongs, towels, flowered material, beads and missionary dresses, are displayed publicly by tying them to the feasting *mood* (shade structure) or placing them in large containers constructed for the purpose: for example, a huge paper maché model of the deceased's totem or an enormous sardine scoop. Gardening men who have managed to cultivate a particularly large (but woody and mostly inedible) yam, sweet potato, or bunch of bananas donate their goods to be displayed on special bamboo racks on the feasting grounds. Careful lists are made to ensure that representatives of all family allies are given gifts and honored by sitting at a special table. Feasts provide a large audience for many other forms of competition and display of skills, and competitions involving top spinning, dart throwing, and especially dancing occur throughout the night.

2.3. Meriam turtle hunting

One of the best documented forms of public generosity that occur in the context of Meriam funerary rites is hunting to supply turtles for the feast. Turtle hunting has considerable antiquity in the Torres Strait region, and although its technical and social details have changed in recent decades, there is also much continuity. Contemporary turtle hunting on Mer occurs primarily during the non-nesting season (*kob kerker*) between May and October, when green turtles (*Chelonia mydas*) mate on shallow reefs about 16 to 20 km from the island. Field observations (Bliege Bird and Bird, 1997: 55) indicate turtles captured on these hunts range from 100 to 150 kg live weight, with an average edible yield of 50.1 kg ($n = 11$, $SD = 5.9$). Hunts are conducted by a crew of three to six men, consisting of a hunt leader (*ariemer-le*) who directs the hunt, one or more "jumpers" (*arpeir-le*) who leap into the water to pursue turtles, a harpooner (*akos-le*), and a pilot or driver (*korizer-le*) who pilots the outboard-powered skiff under the direction of the leader. The driver often will double as a jumper, and the harpooner may also, unless the leader serves as the harpooner. The leader assembles the crew and gear, decides the timing and location of the hunt (which requires extensive knowledge of the seascape, tidal conditions, turtle behavior, etc.), and directs the hunt itself. Leaders generally are about a decade older than jumpers (mean leader age 33.1 ± 7.8, $n = 22$; mean age for jumpers 24.4 ± 5.5, $n = 29$).

During search and pursuit, the leader stands in the bow and directs the driver (or drivers, if there are two boats), while the jumpers remain ready to pursue a turtle using a harpoon, a hook attached to a long rope, or bare hands. The hunter searches across the reef top for signs of turtle, and, when a turtle is spotted, he decides whether to pursue it based on its size (large turtles have more meat) and sex (female turtles have more fat). Both boats give chase, and, when the turtle begins to tire, the hunter directs a jumper to launch himself from the bow of the boat with his turtle hook and attempt to secure the turtle, or the hunter throws his harpoon and the lead jumper jumps, followed by his helpers. If they are successful, the turtle is brought alongside the boat, and everyone assists in hoisting it into the boat. If conditions are promising, the hunt continues for more turtles. At the end of the hunt, which typically lasts several hours, the crew returns to Mer and delivers the turtle(s) alive and intact to the family who commissioned the hunt, who then take charge of butchering and cooking the turtle(s) for serving at a public feast.

No turtles are hunted solely for private consumption during non-nesting season, but more than half of the turtles acquired during the nesting season (*nam kerker*, between November and April) are distributed in uncooked shares among a small number (four to five) of households. During nesting season, gravid female turtles come up to lay eggs on sandy beaches surrounding Mer and nearby islets. Accordingly, acquisition is low cost, free of danger, and fairly predictable, and collection of nesting turtles and their eggs is accomplished by women, children, and older men as well as young men.

The costs of turtle hunting, measured in time, energy, money (for engine fuel and equipment), and potential risk of injury, are substantial. Yet those who supply turtles for a public feast receive no recompense, not even portions of their catch (except normal servings should they attend the feast where the catch is served). Why are some Meriam men willing to pay these costs? The CST framework can be used to generate an explanation, which we state here in the form of a series of predictions:

1. *Success in hunting is an honest signal of quality.* The signals sent by hunt participants differ according to their role in the hunt. Jumpers usually are hunters in training, but to jump on turtles in open water requires considerable agility, strength, diving ability, and willingness to risk injury; here, youth and physical condition seems to be more important than experience or skill. Hunt leaders, who gain all the public recognition for the hunt, must exercise leadership in order to assemble the crew and direct the hunt, and draw on a store of knowledge about where to find turtle, how to recognize the highest ranked prey, and how to pursue the prey successfully at high speed and under conditions of low visibility. Thus, the hunt leader is likely to broadcast signals of charisma, skill, specialized knowledge accumulation, and, most importantly, the ability to absorb the cost of his generous act.

   Whether participants are sending signals of knowledge and leadership or of risk taking and physical condition, turtle hunting provides a reliable signal, especially during the non-nesting season, when turtles are only located on distant reefs. While men do sometimes hunt on nearby reefs during the nesting season, men and women also collect nesting turtles. Collectors could pose as hunters and so undermine the honesty of the signal during the nesting season. But during the non-nesting season, the only turtles that can be obtained are those for whom costly, long-distance hunts were undertaken. We hypothesize that a turtle serves as an honest signal of the costs hunters incurred to acquire it and of the qualities they must possess in order to successfully do so. While detailed tests of this hypothesis will be presented elsewhere (Bliege Bird et al., submitted), one relevant observation is that only a select number of men engage in turtle hunting. Thus, for a 12-month sample in 1994–1995, 36 men (and three 15-year-old boys) participated in 29 turtle hunts, out of 97 Meriam men between the ages of 16 and 50 years (age range of hunters 15 to 47, mean 28.2 $\pm$ 7.9). Of these, only 15 different men (15.5% of the male population aged 16 to 50) engaged in the most costly long-distance (non-nesting season) hunts. In contrast, over the same 12-month period, our sample contains 92 episodes of nesting turtle collection, involving 65 men, 16 women, and 16 children.
2. *Turtle hunting to provision feasts is costly and is not counterbalanced by reciprocity or trade.* Because hunters who provision public feasts do not engage in sequentially dy-

adic transfers of meat portions, but rather give to all recipients simultaneously (provide a collective good), repaying a hunter's generosity through reciprocation would create a collective action problem regarding which recipient(s) would repay the hunter. In contrast to reciprocity-based explanations, CST does not require that those who receive turtle meat perform some costly act of reciprocation to repay the hunter. In fact, hunters never claimed a share of the turtle as payment for delivering the turtle to the feast givers, either for the nine turtles delivered to feasts during the non-nesting season, nor for the 45 turtles delivered to feasts during the nesting season. Interviews with hunters reveal that feast givers expect hunters to absorb the full costs of the hunt, including buying the fuel (around AU$60 per boat per hunt). Hunters explain that they do not feel as if they are doing the feast givers a favor, but rather enjoy the opportunity that hunting for a feast provides. Finally, hunters do not seem to be trading turtles for alliances with feast-giving families, as one of us had previously hypothesized (Bliege Bird and Bird, 1997): turtle hunters are not more likely to be named as valuable allies than other men (unpublished data).

3. *Turtle hunting is an effective means for broadcasting costly signals.* Our ethnographic data indicate that Meriam are aware of the outcomes of turtle hunts and can distinguish hunters from nonhunters, as well as better hunters from poorer hunters. Interviews with 18 men (some hunters, some not) indicate that a handful of individuals are consistently named as the best turtle hunters; indeed, just three individuals account for 38% of the 54 nominations for good turtle hunters in these interviews. At feasts, gossip quickly broadcasts the information on who supplied the turtles being consumed. Small males delivered to a feast have been known to provoke ridicule of the hunter's skills (as noted earlier, females have more valued fat). As discussed later, we think the primary motivation for turtle hunting is the opportunity it provides for broadcasting the results at a feast. Thus, it is relevant that Meriam do not pursue this type of hunting except in the context of public feasting (Bliege Bird and Bird, 1997; Bliege Bird et al. submitted); that is, hunters undertake the most materially costly form of hunting precisely when they will be giving all the catch away.
4. *Successful turtle hunters gain net benefits as a result.* CST suggests that those who observe honest signals of high quality will find it in their interest to behave in ways that have the effect of benefiting the signaler. Accordingly, we expect that those known as better turtle hunters should reap benefits from being accorded this status, benefits that more than compensate for the signaling costs they have taken on. What these benefits are will depend on the nature of the signal, which varies according to the specific role played by each hunt participant, and on the nature of the audience: competitors, mates, allies, or the public in general. Those who lead turtle hunts appear to be signaling leadership skills, accumulation of specialized knowledge, and generosity in supplying costly collective goods; accordingly, we expect the benefits gained thereby to involve widespread social status and to be realized through multiple avenues.

One such avenue suggested by younger hunters is the increased respect of elders, who might be more willing to listen to or support the ideas or suggestions of successful hunters in political contexts such as public meetings or private disputes. Being a turtle hunter who sup-

plies much turtle to public feasts, they suggest, is part of a social strategy that involves demonstrations of "public spirit," as one Meriam put it. Establishing a reputation as a man with the best interests of the collective at heart via costly signaling of this sort expands a man's sphere of political influence to include a broader section of Meriam society than simply his immediate kin group. Indeed, informal observations suggest that frequent feast-donating turtle hunters appear to be among the few young men who feel confident enough to speak at public meetings.

A second avenue of benefit, one suggested primarily by older men who were active hunters in the past, is the value of demonstrating one's character to potential in-laws (elder males and females) in order to impress the parents of the "best" (hardest-working) girl to accept (or choose) you as a husband for their daughter. Those who participate in a more junior fashion as "jumpers" seem to be signaling their physical condition and their willingness to take risks; these qualities would likely raise their status as competitors within their set of age-mates, which in turn may give them an edge in contests with these other males (involving mating access or mate defense, for example). Of course, "jumpers" may well be apprenticing to become hunt leaders, in which case the costs they pay may primarily be investments toward future status attainment, rather than costly signaling per se.

It is relevant to these speculations that identity of hunt leaders is widespread—public knowledge, as it were–whereas we had to seek the identity of junior participants on turtle hunts directly through observation or through asking the hunt leaders or the age mates of the "jumpers." It is also relevant to note that neither hunters nor jumpers seem to gain immediate benefits in terms of female choice: in interviews, women did not indicate hunting ability as a criterion in their choice of mates, but rather focused on other contests, particularly dancing and demonstrations of musical skill. In our survey of 13 Meriam women, 46% spontaneously named dancing or musical ability as one criterion of a popular sexual partner, while 38% named physical appearance (musculature and confident bearing) or ability to give pleasure during sex. In contrast, 92% of the interviewed women named either hardworking men or kind men as their sole criterion for an ideal marriage partner, while 15% named a man with high status, and 77% looked for a man who would act like a "father" (provide much food, stay home, help with women's work, care for children). Women who mentioned men's subsistence work at all mentioned that a good fisherman or a man who knew how to do "women's work" was often a good provider. And judging from statements informants made concerning the importance of one's reputation as a hunter or "hard-working man" to future in-laws, hunting status is more likely to have long-term effects on ability to acquire better marriage partners (e.g., hard-working women) than immediate effects on ability to acquire sexual partners. We are presently engaged in analyzing demographic, observational, and survey data that will allow us to test these predictions. Preliminary results indicate that turtle hunters, and hunt leaders in particular, enjoy higher age-specific reproductive success than other Meriam men (Smith et al., in preparation).

3. Generosity and the problem of collective action

Generosity—the phenomenon of sharing food outside the immediate family, giving gifts, hosting public events, helping neighbors in need, all at some cost to ones' self—seems to be

a cross-culturally ubiquitous feature of social life. But generosity is not universally nor unconditionally extended. Instead, it appears to be strategic: the contexts in which such acts occur, as well as the characteristics of donors and recipients, seem to be highly constrained and patterned. Some of this variability may be adaptive and hence explicable using theory from evolutionary ecology. As noted in the introduction, such explanations have most frequently been posed as issues of conditional reciprocity, in terms of reciprocal altruism, tit-for-tat, iterated prisoner's dilemma, and the like (Trivers, 1971; Axelrod and Hamilton, 1981; Cosmides and Tooby, 1989). Others have argued that sharing or other forms of putative generosity are due to coercion on the part of receivers, and hence a form of "tolerated theft" (Blurton Jones, 1984; Hawkes, 1992). Hence our discussion (following) of the ways CST might explain generosity and sharing are couched partly in terms of comparisons to these two alternative frameworks. This discussion thus is meant to contribute to the critical examination of the causes of cooperation that is currently under way in behavioral ecology (Dugatkin, 1997; Pusey and Packer, 1997; Winterhalder, 1996).

In public ceremonial contexts such as Meriam tombstone openings, big-man feasting (Wiessner and Schiefenhövel, 1995), Northwest Coast Indian potlatching (Boone, 1998), or charity galas in capitalist society (Veblen 1899), generosity takes place not between two individuals, but within a broader social arena. While dyadic interactions often may fit the criteria of some type of reciprocity, whenever individuals begin to act in ways that provide a collective good, explanations based on conditional reciprocity raise problems of collective action (Hawkes, 1992). If the generous individual cannot pick and choose the recipients of his generosity, how can he ensure that any of them will return the favor? If sharing or generosity cannot be made contingent on reciprocation, then the fundamental condition for evolutionarily stable reciprocity is absent. We argue that this is the case for various instances of generosity associated with Meriam feasts, including the provisioning of turtles and other foods and services.

The social dynamic known as tolerated theft (Blurton Jones, 1984, 1987) or demand sharing (Peterson, 1993) provides an alternative explanation for resource transfers under these circumstances. In this framework, transfers of goods occur when those who have superordinate amounts face potentially costly demands from have-nots, given diminishing marginal returns to consumption of the good, and approximately equal competitive ability. But demand sharing cannot by itself account for cases where the acquirers actively seek out opportunities to share goods widely and unconditionally. As formulated, tolerated theft does not incorporate any benefit associated with giving; rather, the motivation for sharing is simply to avoid the costs of hoarding.

Our evidence on Meriam turtle hunting and feasting does not conform to the conditional reciprocity paradigm because the shares of turtle eaten at public feasts are provided to all who come (and all are invited, including men who have never hunted and given their age never will). Since hunters have no ability to extract reciprocity in kind or future favors in some other currency, this truly is unconditional sharing (see also Bliege Bird and Bird, 1997). The evidence does not conform to the demand sharing/tolerated theft explanation either, because turtle hunters who provision feasts keep no shares of their catch whatsoever, turning over whole turtles to the feast hosts (who then engage in costly signaling themselves, encouraging broad attendance and sharing unconditionally with all who attend the public feast). In contrast, in seasons when turtles are more readily available and are harvested for household consumption, shares are subject to piecemeal distribution in a manner entirely consistent with demand sharing (Bliege Bird and Bird, 1997).

CST proposes that hunters benefit from unconditional sharing because their harvesting success sends honest signals about the acquirer. Paying attention to such signals can benefit observers because the cost inherent in the signal guarantees that it is an honest measure of the underlying qualities at issue. The fact that the signal provides a collective good (widely shared food) is an incidental bonus to the information value of the signal, but may well enhance broadcast efficiency (see later). Costly signaling benefits the signaler if the information alters the optimal strategy of observers in a way that provides a *net* gain to the signaler (after subtracting signaling costs). As noted earlier, these benefits will depend on the specific signal and audience, but for hunt leaders might consist of being deferred to by elders or gaining benefits of a hard-working wife's labor, while for jumpers it might involve avoiding costlier means of establishing social dominance among peers and hence preferential access to resources.

It bears emphasizing that the logic of CST does not in any way entail future reciprocity. Thus, when we say that signal recipients may use the information they have received to choose someone as a (future) spouse, we are *not* proposing that this is a favor reciprocated to the signaler, any more than a peahen that chooses the peacock with the showiest tail is "paying back" the cock for having expended high signaling costs over the preceding years of its life. Rather, it is simply the best choice a signal recipient can make given the available information. Similarly, if Meriam are more apt to defer politically to younger men who have greater social dominance, and if that social dominance is established in part by demonstrating the ability to engage in costly signaling such as turtle hunting, no one deferring to a hunter is "paying back" the hunter for shares of meat he provided in the past. The mere fact that a costly action today (e.g., turtle hunting) results in a beneficial response tomorrow (e.g., deference) does not entail reciprocity.

While we do not yet have the data to demonstrate conclusively that turtle hunting is explained by CST, we wish to reiterate a fundamental point: the inability of hunters or feast hosts to withhold shares from any specific individual renders conditional reciprocity an untenable explanation for Meriam turtle hunting. The key conditions specified by CST do indeed seem to be met: a significant and unfakeable cost (of labor and/or goods), an underlying quality being signaled (the donor's ability to generate a surplus and give it away), and mutual gain to signaler and recipient (status or other social benefits for the signalers, information about their skills and intentions for the observers). The exact nature of the gains realized by signalers and observers will depend crucially on details of the exact signal produced and the intended audience, as we have shown for the various turtle hunting roles. Work in progress explores these issues more fully and reveals that hunters do reap social benefits that translate into gains in reproductive success (Bliege Bird et al., submitted; Smith et al., in preparation). More generally, we argue that many varieties of n-person generosity (and perhaps some of dyadic generosity) in a variety of social systems seem much more plausible as instances of costly signaling than as instances of conditional reciprocity.

3.1. Why collective goods?

There remains the problem of why costly signaling should ever take the form of providing collective goods. After all, in other species, such signaling generally involves socially useless or even harmful displays, such as peacock's tails or roaring contests between red deer or

elephant seals. Indeed, there appear to be numerous human examples of such socially wasteful displays: foot binding, head hunting, various forms of conspicuous consumption, violent brawls, top spinning, and growing large yams that are only marginally edible. We can think of two possible answers to this question, one involving the advantages of a bigger audience, and the other invoking group selection among alternative evolutionarily stable equilibria. We will concentrate on the first explanation (for the second, see Boyd and Richerson, 1990).

Providing a collective good in a public context, as in hosting a feast, hunting a turtle for a feast, or big-game hunting in general, differs from dyadic generosity in three ways. First, the audience is larger; second, the quantities contributed are often larger; and third, there is the opportunity for the audience to compare among contributors. Public generosity thus would seem to provide an ideal opportunity for broadcasting honest signals of quality to as wide an audience as possible. Larger quantities given away mean greater handicap, but signaling to a large audience could counterbalance the increased cost of the larger handicap.

Thus, we propose that the value *to the signaler* of providing a collective good over some more "wasteful" display of handicap lies in the broadcast efficiency of the signal. We might expect that, over time, selection and/or learning processes would favor increased efficiency in signal broadcasting. Thus, a man who expended a given amount of energy and risk fighting with his neighbor might broadcast his abilities to far fewer people that one who assumed the same costs in acquiring a very large turtle to donate to a feast attended by 200 people. If status acquisition via costly signaling is important to individual reproductive strategies, we would expect individuals to take advantage of any means for increasing broadcast efficiency and thus to prefer to signal via providing collective goods if it does offer this opportunity. Furthermore, we predict that signal competition will drive a process in which increasing quantities of collective goods are provided to attract larger audiences to a central location (see following).[3]

At the same time and place, selfish signals might proliferate as individuals take advantage of the audience attracted to the initial collective good. That is, less socially beneficial signals, such as dancing, top-spinning competitions, and violent brawls, might piggyback on top of public feasting as a way for signalers to take advantage of the large audience attracted by the promise of collective goods such as free food. Although not collective goods, these displays provide opportunities for audiences to evaluate the signals of a number of different competitors at once. This aggregation of individuals simultaneously displaying skills such as strength, coordination, grace, aesthetic sense, and past devotion to hours of practice, via activities such as dancing and various sports, and being observed by a large and diverse audience, provides a marketplace for signal evaluation by potential mates, allies, and competitors that may have far-reaching (if diffuse) social consequences.

When does signaling competition become important enough in individual political and reproductive strategies to fuel increasing production of collective goods? At least two condi-

[3] Against this benefit must be charged the costs of providing the collective good to political and reproductive competitors (Peter Richerson, personal communication). Calculating the balance between these and other costs and benefits would be quite complex, but because collective goods also benefit the competitors of competitors, we think this objection is unlikely to be crucial.

tions seem to be crucial: (1) some individuals derive greater marginal benefits from investing in forms of status or mating competition than in alternative forms of reproductive investment such as parenting; and (2) increased provisioning of the collective good enhances the quality of the signal. By this latter condition we mean, for example, that if individuals have the option of hunting ever larger game to attract ever larger audiences, the signal value per unit harvest actually increases, since larger game is generally harder to find and kill than smaller game. But if the amount of a resource you harvest does not reflect differences in underlying quality, such as in netting sardines (for which a larger harvest entails more foraging time, but not necessarily greater skill or risk), the marginal payoff to the signaler of providing a larger harvest might not be high enough to justify the increased labor costs.

In addition, we hypothesize that harvest of large game is more sensitive to marginal differences in levels of skill and strength and thus generally will allow recipients or observers to discriminate among competing signalers in terms of their underlying qualities more effectively. If so, harvests of plants or small game generally should attract a smaller audience than an equivalent amount of resource (such as big game) that does facilitate such discrimination. This would increase further the difference in payoff to the signaler of harvesting and providing skill-related collective goods versus other resources. In sum, we propose that humans may be particularly involved in collective goods provisioning because their ability to acquire large animals coupled with their intense sociality encourages an escalation of costly signaling in this arena.

3.2. Costly signaling and "showing off"

Our argument has some obvious similarities to the "show-off" model proposed by Kristen Hawkes (1990, 1991, 2000; Hawkes et al., 1991). In this model, difficulties with controlling access to harvests of large game make it a collective good, undermining the nutritional incentive to hunt. Hawkes pioneered the hypothesis that big-game hunting can have benefits beyond the nutritional, and pointed out the competitive display inherent in pursuing high-variance and widely shared resources. While acknowledging the importance of Hawkes' arguments in challenging the conventional wisdom regarding hunting and sharing, we had doubts about its explanatory sufficiency (Smith, 1993), particularly with regard to cases such as Meriam turtle hunting and feasting. Whether the show-off model, CST, or both provide valid explanations of foraging behavior cannot be determined without extensive empirical tests. Here we simply hope to show that these two accounts differ in some of their predictions, as well as delineate some of the key assumptions and conditions of each, and hence the circumstances under which one or the other would likely apply.

In Hawkes' account, hunters benefit from garnering "social attention" from a large number of recipients, and recipients benefit by consuming their share of the collective good. Hawkes states that a successful hunter benefits from others preferring him as a neighbor because he is a source of collective goods and, as a consequence, ally with or defer to him. Recipients direct social attention toward the hunter because they benefit by acting toward him in ways that keep *him* around. The show-off model thus seems to envision a situation where residential groups are highly fluid, and successful hunters are likely to leave a group if they feel they can gain more social attention elsewhere.

In the costly signaling account, a successful hunter benefits from creating a public arena to broadcast signals of his success, which supplies an immediate boost to his status over that of his competitors. In turn, the information observers gain about his status (or the underlying qualities on which status is based) is expected to structure future social interactions involving mating, alliance, or conflict in ways that are beneficial to him. (As we discussed earlier, observers are not motivated by reciprocity, but rather are making the best use of previously garnered information, as in the case of consumers who buy a particular brand because comparisons have convinced them it is the best product.) In contrast to the show-off model, in the costly signaling account each observer may react differently toward hunters; some observers might even decide to *avoid* social contact with them (if, for example, the observer decided that hunting success was a signal of competitive superiority). There is no necessary implication here that observers would uniformly benefit from keeping successful hunters in their group, or all act in ways to ensure this.

The benefit to recipients in the show-off model is simply in obtaining shares of meat and, more generally, in having successful hunters in the group. By this account, a successful hunter is essentially a rich resource patch where others can obtain low-cost food (Hawkes, personal communication). While Hawkes (2000) stresses the unpredictable nature of hunting success and the continually shifting roster of successful hunters, the costly signaling argument hinges on successful hunting being a reliable signal that allows observers to discriminate among men in terms of underlying qualities. This information about underlying qualities is hypothesized to be the primary benefit, with shares of meat being a by-product benefit. Thus, the show-off model seems most likely to apply where hunters cannot be reliably ranked in quality, or where there is no other competitive arena into which poorer hunters can enter. The costly signaling model may apply where success in at least some kinds of hunting is a persistent attribute of some males, allowing observers to use such cues to reliably discriminate between males of different quality.

We suggest that bestowing social attention will only be stable if these actions cost the bestowers nothing; otherwise, those who consume shares of the collective good but withhold social attention from the hunter will be able to free-ride on the actions of those who do. If enough individuals defect from paying the cost of social attention, the hunter may refuse to provide the collective good, or go to another group. But if the harvest is a collective good whose distribution he does not control (as the show-off model assumes), a hunter cannot make his hunting conditional on *particular individuals* providing social attention. Thus, social attention as an incentive for providing a collective good (such as big-game hunting) would need to be cost-free (or nearly so), whatever the precise nature of that attention.

By hypothesizing that meat is not the only benefit recipients get, the costly signaling account in principle is able to explain a broader range of subsistence activities, including more "wasteful" forms of behavior that do not necessarily provide collective goods to attract an audience. For example, during low tide, most Meriam men prefer to spend time on the reef spearing fish instead of collecting shellfish, a choice that provides them half the rate of return and much smaller total amounts of meat than they might otherwise have obtained (Bliege Bird, 1996, 1999). Yet spear fishing does make sense as a form of costly signaling that reaches an audience through its wide visibility to observers both on the reef and in the village (Bliege Bird et al., submitted). This is perhaps the clearest contrast between the costly signal-

ing and show-off explanations. Put simply, in Hawkes' model one can only show off by providing a collective good (such as big game), while CST suggests that there are many ways to show off; providing a collective good is only one of these, albeit a socially and evolutionarily significant one.

4. Conclusions

CST provides the basis for arguing that generosity—incurring the costs of providing collective goods or of giving gifts in more dyadic contexts—is one means by which individuals and coalitions of individuals compete for status and, ultimately, for the material and fitness-enhancing correlates of status, such as mates, food, or territory. The cost of providing the collective good guarantees the honesty of the signaler's claim to qualities such as wealth, leadership abilities, kin-group solidarity, economic productivity, and vigor—information that is useful to potential mates, allies, and competitors of the signaler (Boone, 1998). If this explanation is correct, it means that those who engage in acts of generosity or collective goods provisioning are not behaving altruistically in hope of reciprocation, nor are they sacrificing for the good of the group. Rather, they are competing for status and its perquisites. As Zahavi and Zahavi (1997: 157) argue with respect to colonially breeding birds, an individual

> invests in altruism, we believe, because it reliably demonstrates its ability as a rival and its value as a partner, in ways that other members of the group recognize. The gain to the "altruist" is not the benefit that the group derives, but the recognition of other individuals—the prestige he or she wins . . . . The "altruistic" individual thus serves its own interests—it expends effort to demonstrate its quality reliably. Because it does so by engaging in altruism, rather than by showing off, as a peacock does with its tail . . . [the individual] is also showing its interest in continued collaboration with the members of its group. Groupmates pay attention to the dual message because the information enables them to make their own decisions.

In this paper, we outlined how CST can strengthen adaptive explanations of complex human social behaviors and institutions such as big-game hunting, ceremonial feasting, and other forms of collective action. Plausibility arguments that show how CST *might* explain various social phenomena are, of course, not a very powerful way of generating reliable knowledge. Instead, use of CST to formulate testable hypotheses, and putting these hypotheses to empirical test, is the direction in which research should move. In future publications, we intend to provide much more rigorous evaluations of CST, and we hope the present essay will inspire others to do the same.

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