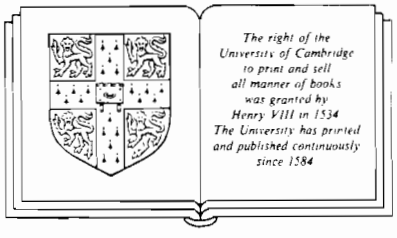
Human reproductive behaviour

a Darwinian perspective

Edited by

Laura Betzig,
Monique Borgerhoff Mulder
and Paul Turke



CAMBRIDGE UNIVERSITY PRESS
Cambridge
New York New Rochelle
Melbourne Sydney

Mark V. Flinn[1]

Parent–offspring interactions in a Caribbean village: daughter guarding

Human kin groups may take over the competitive searching and courtship roles of the mating pair: they *breed* their members as they breed their cows and camels. It should not surprise us to find that this ready made organization would also assume responsibility for the control of paternal probability for members in whom they have nepotistic interest. These transfers of function are, I would guess, unique attributes of the human species and seem to me to be striking testimonials to the significance of inclusive fitness in our species.
(Mildred Dickemann 1981:424)

Human parents commonly exert considerable control over the mating relationships of their offspring. In some societies (e.g. The Tiwi: Hart and Pilling 1960), parents arrange the marriages of infants, or even of unborn offspring. In other societies (e.g. the Dobu: Fortune 1963), parental influence over an offspring's mating/marriage relationships is limited to friendly advice.

A variety of devices have been developed to control female sexuality. Examples include chastity belts, genital mutilations (e.g. clitorectomy and infibulation), and claustration (Dickemann 1981). A possible purpose of these devices is to enforce pre-marital and marital fidelity and hence maintain parental marriage arrangements. Other more simple day-to-day behaviors may have a similar function.

During 1978 and 1979–1980 I spent nine months conducting ethnographic field research in rural Trinidad, mostly in the village of 'Grande Anse.' In Grande Anse I frequently observed behaviors that had the apparent purpose of controlling (with or without conscious intent) the mating activities of offspring. All observed cases involved daughters. The means by which villagers attempted to 'guard' offspring included physical violence directed toward a daughter or her potential suitor(s), restricting the daughter's movements (keeping her at

[1] Department of Anthropology, University of Missouri, Columbia, MO 65201, USA

home), chaperoning (keeping her under surveillance by a family member), economic sanctions, and verbal threats of the above behaviors.

The objective of this paper is to test predictions based on the hypothesis that attempts to control the mating activities of daughters, i.e. 'daughter guarding,' are behavioral strategies that increase a father's inclusive fitness. Behavioral scan data, genealogical data, and economic data are analyzed to test the hypothesis against alternative explanations. Before presenting the results I will first briefly describe the study site and field techniques so as to provide a background for understanding the data base.

The study site

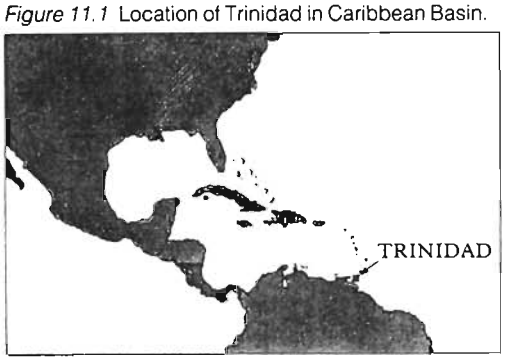
The village of 'Grande Anse' is located on the northern coast of Trinidad (Figure 11.1). It is isolated from the more heavily populated and economically developed central and western areas of the country by the steep and densely vegetated slopes of the Northern Range, which rise directly from the sea. Most of the 342 inhabitants live in the small pocket of relatively level alluvial deposits from the Grande Anse river. The surrounding hillsides are cultivated with cocoa, coffee, bananas and citrus as cash crops, and cassava, corn, dasheen, and vine tubers as subsistence items. Further inland the topography is too severe for efficient cultivation. Most of this land is undeveloped government forest reserve.

The village founders arrived about 1860 from Venezuela in small sailing canoes (Harrison 1979). Later, immigrants rowed or sailed from the nearby (40 kilometers) island of Tobago. By 1900 the community was thriving, with most villagers owning or squatting on plots of land, cultivating cocoa and subsistence crops. During the cocoa boom of the early 1900s outside interests purchased tracts of land and employed village labor. However, the cocoa market crashed during the 1920s and never recovered. Workers were laid off, and the smaller cocoa plots abandoned. Diversification into other crops such as coffee, citrus, and bananas helped to maintain the agricultural base of the village, but it never returned to the prosperity of the early cocoa days. Census data indicate that the village population has slowly declined, largely due to emigration to more developed areas (Harrison 1979).

There are a variety of ways to make a living in Grande Anse. Some are more lucrative than others. Most villagers have several part-time occupations, such as cocoa cultivation, fishing, carpentry, road work (government job), and shopkeeping. A majority of adult villagers have rights to cultivated land and spend some effort growing cash crops (e.g. cocoa, coffee) and subsistence crops. But the profits are slim and the work is hard so cultivation is the primary occupation of very few villagers today (about 13% of adult males, 8% of adult females).

At the time of the fieldwork, there were 28 co-residential father–daughter dyads, 6 part-time co-residential father–daughter dyads, and 21 non-residential father–daughter dyads in the village. About half (14 of 27) of the females between the ages of 18 and 28 did not have fathers resident in the village, but almost all had co-residential mothers (24 of 27). These figures jibe with other ethnographic studies of Caribbean populations (e.g. Clarke 1957, Smith 1962), and reflect the instability of paternal relationships.

Figure 11.1 Location of Trinidad in Caribbean Basin.



Methods and field techniques

During July and August 1978, and October 1979 through April 1980, I conducted field research in the village of 'Grande Anse' and surrounding areas. The methods and field techniques utilized in this study were designed to gather and analyze data that most reliably and objectively described: (1) day-to-day behavior, (2) genealogical relatedness, (3) economic assets and occupations, (4) past and current mating and marriage relationships, (5) residence, (6) the productivity of

certain horticultural and subsistence activities, and (7) the flow of material resources among individuals (i.e. gifts and inheritances). This paper is concerned with analysis of the first five types of information, hence description of methods will be limited to them (for a more complete discussion see Flinn 1983).

To gather behavioral information useful for testing hypotheses about daughter guarding, I collected data detailing the day-to-day behavior of the villagers with an 'instantaneous scan sample' procedure (cf. Munroe and Munroe 1971, Altmann 1974, Johnson 1975, Denham 1978, Hames 1979, Munroe *et al.* 1983, Rogoff 1985, Betzig and Turke 1986).

The procedure was as follows: I travelled a set 4.7 km route through the study site once or twice daily, starting at a randomly determined time and place on the route. The route went through the entire village, passing within 20 meters of each inhabited house and each community structure (e.g. church, cricket field, water outlets). Because village houses are quite open, and because the route passed close by each house, observability was excellent. Each time an individual was observed, I recorded (with a notebook and/or tape recorder) the time, location, individual, and behavior. This information was coded within 48 hours onto computer format sheets. For each 'observation,' the date, time, one of 1375 location codes, one of 480 individual identification numbers, and one or more of 475 behavior codes were numerically recorded for computer analysis. For example, on 11 February 1980 at 6.12 a.m. I observed Hilario Ruiz throwing grain to chickens in the backyard of house No. 001. This observation was coded:

date	time	location	individual	behavior
110280	0612	0017	0012	293

I recorded about 33 000 observations in this fashion over a period of six months (173 scan routes on 152 days). Of these observations, 24 577 form the data base used in this paper. I have excluded observations recorded during the first two weeks of the procedure, observations recorded during scan routes in which less than 50% of the villagers were observed, observations of visitors to the village and observations of unidentified individuals.

During each scan I attempted to account for each individual in the village. However, Grande Anse is not a small place, and some individuals travelled out of the village daily for school or work, resulting in incomplete scan samples. On average the scans accounted for 73% of all individuals. An additional 8% were accounted for by questioning family members about the whereabouts of the unobserved individual; most of these cases were teenagers attending a school in a neighboring village, adults away on shopping or business trips to 'town,' adults working on distant cocoa plots, and adults working in road repair crews away from the village. This information was often verified by walking out to the individual's location (e.g. cocoa plot), observing children returning from school, and so forth. The scan data accounted for a total observability rate of 81% of all individuals (cf. Hames 1979). Because the sample is incomplete, there may be some biases (Flinn 1983). However, it is unlikely that such biases would significantly affect the tests of the hypotheses presented in this paper.

A substantial number of the observations (16 541, or 66%) involved interactions between two or more individuals. Objectively defining 'interaction' was not a simple task. In general, if individuals were (1) communicating to one another, (2) touching or in close proximity (less than one meter) to each other, or (3) engaged in tasks that required mutual cooperation (e.g. hauling in a fish net), then I recorded the observation as an interaction. Most interactions were between dyads, although some multiple party interactions were recorded (e.g. three men rolling a log).

The advantages of the behavioral scan data are that they allow numerical description of the frequencies and types of behavior for specific individuals. For example, these data can be analyzed by computer to provide an objective, quantitative description of the interactions that parent–offspring relationships entail. The disadvantage is that much information is omitted in the rather crude numerical coding of behaviors.

Collecting accurate genealogies was a primary objective of the field study. Genealogies are an important source of information about parental relationships. Initially I interviewed informants from each household, usually adult females, obtaining the names, genealogical relationships, ages, and current residences of all the relatives (blood and affinal) that they could remember.

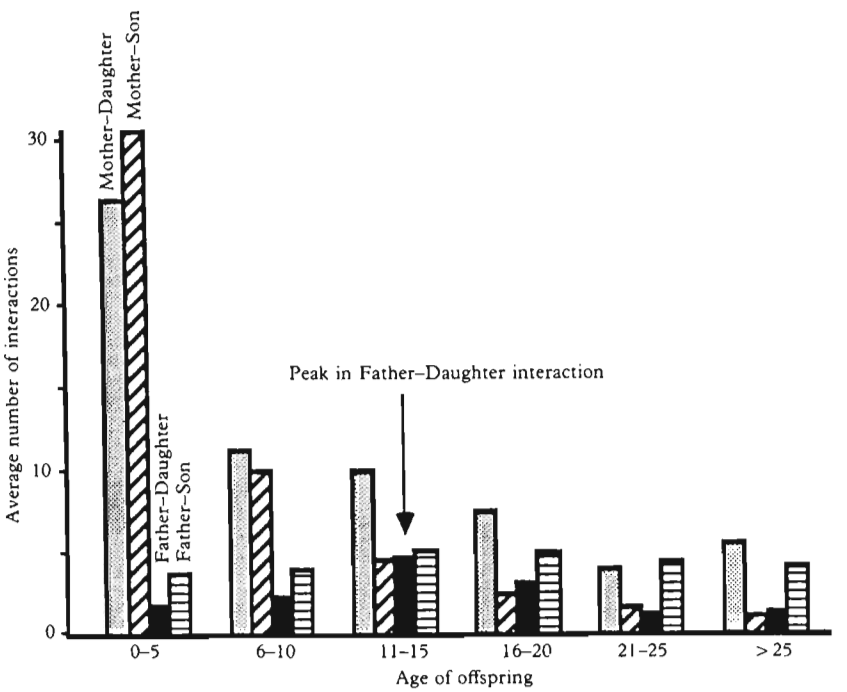
These interviews were well received, most villagers seeming pleased that someone was interested in their 'roots.' Upon returning from the interview, I assigned unique ID numbers to each individual collected in the genealogies and put all of the above information on 3 × 5 inch index cards for each individual. This information was analyzed by computer (after returning to the US) for cross reference with the behavioral scan data.

The parental relationships analyzed in this paper were widely recognized by the villagers and were readily observable. I do not believe that whatever incompleteness exists in the genealogical data is likely to have resulted in a bias that favors any of the hypotheses tested in this paper.

To test for associations between daughter guarding and resource control, information about economic assets and occupations was collected by interview (What land do you own, rent, cultivate? What major possessions do you own – e.g. house, mule, radio? What jobs do you have, and how much money do you make?). This survey was conducted directly with informants at their place of residence, and in some cases, was corroborated by interviews with other villagers. Government land ownership maps were useful for corroborating information about land ownership (especially the precise size of landholdings, or at least the government's measurement of the acreage) and for establishing patterns of 'legal' inheritance.

In this paper land ownership is used as the indicator of individual economic status, because land was the most stable resource over time, and because land was measured more accurately and reliably than other economic assets. Land ownership is associated with mating success (Flinn 1983, 1986). I use household land as a measure of individual land ownership because land is worked jointly by household family members, the benefits are distributed among household family members, and land is not always 'owned' by individuals (see e.g. Besson 1979 for discussion of land tenure in Caribbean societies). No adjustment for the number of household members was made because this was difficult to do appropriately, and because there seemed no reason why not adjusting for house-

Figure 11.2 The frequency of parent–offspring interactions at different ages. Note the peak in father–daughter interactions at ages 11–15. These data suggest that there may be something unique about the father–daughter relationship during these ages.



hold size would bias the results for or against any of the hypotheses tested.

The data analyzed in this paper are complete for each villager. That is, behavior (scan sample), genealogies of at least two generations in depth, current mating relationships, and land ownership are known for each of the 342 individuals in the sample population.

Results

First let us examine whether daughter guarding occurs in this population. Figure 11.2 shows the frequency of parent–offspring interactions by the age and sex of the offspring.

These behavioral scan data indicate several interesting patterns in parent–offspring interactions (Flinn 1983). Here I should like to focus on the peak in the frequency of father–daughter interactions during the ages 11–15. This peak may partially represent the efforts by fathers to control the mating activities of their daughters. There are, however, a number of other possible reasons for the peak in father–daughter interaction frequency. For instance, 11–15 year-old daughters might be doing more horticultural work with their fathers. To test this possibility I examined the scan data to see if there was an increase in the frequency of horticultural work interactions. There was no significant trend (in fact there was a slight decrease in horticultural work interactions between fathers and older daughters, in contrast to a significant increase between fathers and older sons).

Another aspect of parent–offspring relations illustrated by Figure 11.2 is the absence of significant change in mother–daughter interaction frequences. Although informants suggested to me that mothers (and other female relatives) were at least equally as important as fathers in 'preserving their daughter's honor,' the role of the mother in daughter guarding was very difficult to analyze. There were several reasons for this. First, because the frequency of cooperative behavior with older daughters was quite high (Flinn 1983), the 'guarding' role of the mother was obscured in the scan data. Second, mothers appeared to use more subtle, less observable means of influencing their daughter's mating activities than did fathers. Third, almost all young women (aged 18–28) had mothers resident in the village (24 out of 27), whereas slightly less than half (13 out of 27) had fathers resident (see below and Flinn 1986), so the effects of mother's absence were much more difficult to evaluate than the effects of father's absence. And fourth, mothers were less likely to confront young males. For these reasons the analysis is limited to daughter guarding by fathers.

Figure 11.3 The proportion of father–daughter interactions that are agonistic at different ages. The number of father–daughter dyads in each age category are: 14, 12, 10, 7, 6, and 6. The vertical bars represent 95% confidence intervals (1.96 × SE). The frequency of agnostic interactions during the 11–15 age category is significantly higher than all other age categories except 16–20 (χ^2 tests, $p < 0.05$).

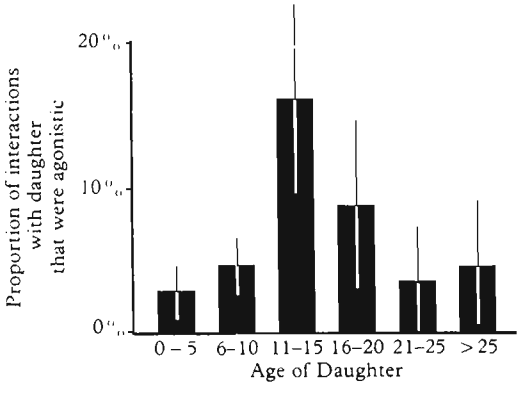
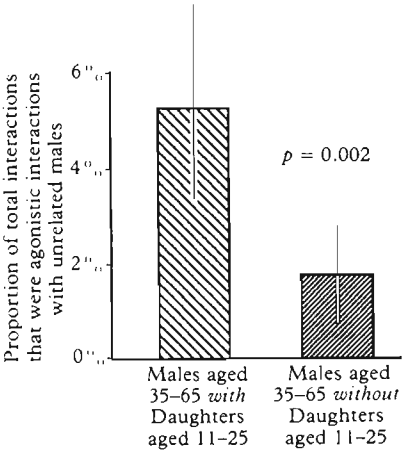


Figure 11.4 Histogram showing that males with daughters aged 10–25 have higher rates of agonistic interactions with unrelated males than do males of equivalent ages without daughters aged 10–25. $\bar{x}$ = 5.3% and SE = 0.94 for males with daughters aged 10–25. $\bar{x}$ = 1.8% and SE = 0.56 for males without daughters aged 10–25. One-tailed *t*-test is significant at $p = 0.002$. Vertical bars represent 95% confidence intervals.



If the peak in the frequency of father–daughter interactions during ages 11–15 is at least partially due to an increase in 'daughter guarding' behaviors, then we might expect an increase in agonistic interactions (e.g. arguing and fighting; see Appendix) between fathers and their daughters that are at or approaching reproductive age. The seclusion or claustration of young women prior to marriage is common in many cultures (e.g. Dickemann 1981), and often is a period of considerable family turmoil (e.g. Daly and Wilson 1981, Wilson *et al.* 1982). Figure 11.3 indicates that the proportion of agonistic interactions between fathers and daughters peaks during the ages 11–15. Evidently there are important conflicts of interests at this time. These conflicts may arise from the relatedness asymmetry (parent–offspring conflict – Trivers 1973) or from differential experience (i.e. older, more experienced fathers know what is best for their daughters).

If the mating activities (realized or potential) of the daughter are a significant source of conflict, then we might expect fathers to be interacting agonistically with the daughter's potential suitors as well. This hypothesis suggests the prediction that males with daughters of reproductive age (11–25) have a higher frequency of agonistic interactions with unrelated males than do daughter-less males of similar ages.

The data in Figure 11.4 support the hypothesis that fathers were guarding their daughters. I once observed the father of a 16-year-old daughter waving a machete in the face of a young man, threatening to 'cut him up' if he did not cease courting his daughter. The threat evidently was effective, as I did not observe the young couple together again, although they might have been meeting clandestinely. Not all fathers were this forceful, and they probably attempted to break up only courtships they did not approve of.

The amount of time spent at home or under supervison by a family member provides an indirect measure of the extent to which females are guarded. Figures 11.5 and 11.6 indicate a high frequency of observations of teenage (11–20) females 'at home' (defined as the parental household where the offspring resided), in contrast to teenage males, who were observed 'at home' with decreasing frequency during these ages (because older males are more likely to con-

Figure 11.5 Histogram showing that the proportion of times that offspring are observed at home (no. of observations of an individual with their household locality code/total no. of observations of that individual) according to the age and sex of the offspring. Younger offspring are observed at home more often than older offspring. Males are indicated by triangles. Females with fathers resident in the village are indicated by black circles. Females without resident fathers are indicated by open circles.

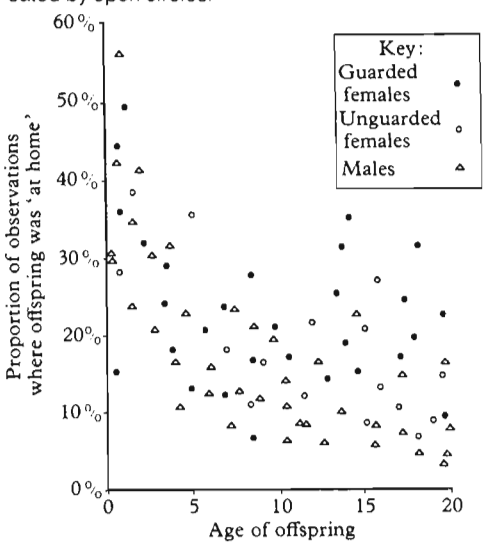
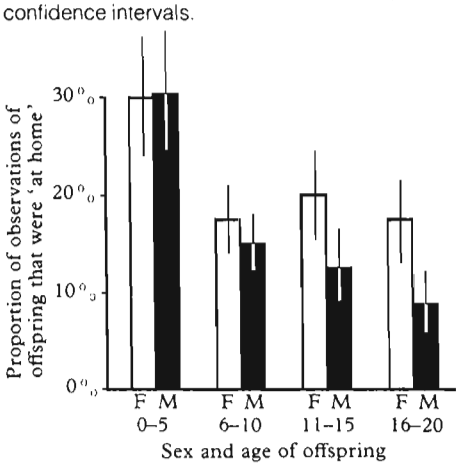


Figure 11.6 Histogram showing that older females (11–15 and 16–20) are more likely to be observed at home than are older males. For 11–15-year-old females $\bar{x} = 20.5$, SE = 2.8 vs. 11–15-year-old males $\bar{x} = 12.4$, SE = 1.8, $p = 0.24$, *t*-test; for 16–20-year-old females $\bar{x} = 17.6$, SE = 2.2 vs. 16–20-year-old males $\bar{x} = 8.2$, SE = 1.7, $p = 0.008$, *t*-test. Vertical bars represent 95% confidence intervals.



tinue their schooling at a school in a neighboring village, observations involving school attendance or transportation back from school were excluded). It is possible, however, that the difference between the sexes during these ages in the frequency of 'at home' observations is due to economic or other social factors besides guarding. Conversely, the economic roles adopted by teenage females may be influenced by parental constraints on their activities.

If fathers have a significant effect on their daughter's behavior, then we might expect that females with fathers resident in the village will have different patterns of behavior than females without resident fathers (see also Draper and Harpending 1982). Figures 11.5 and 11.7 indicate that teenage females without fathers resident in the village were observed 'at home' less frequently than teenage females with fathers resident in the village. Figure 11.8 indicates that females with fathers resident in the village were observed less frequently away from home 'unchaperoned' (i.e. no family member in the same location) than were females without resident fathers.

Villagers suggested that a primary reason why fathers guarded their daughters in Grande Anse was to increase the chances of a daughter achieving a stable mating relationship with a prosperous male. Stability (i.e. permanence) of a daughter's mating relationship reportedly was important because 'divorced' females with offspring were generally less attractive as mates, and more likely to be dependent upon their families (including fathers) for the financial support and child care that might otherwise have been provided by a mate (husband). Prosperity (i.e. land ownership and income) reportedly was an important criterion for a daughter's mate because prosperous males could better support their mates and offspring. Because prosperous males have higher reproductive success in this population (Flinn 1986; see also Irons 1979b, Essock-Vitale 1984, Hill 1984, Turke and Betzig 1985, Betzig 1986), daughter guarding leading to a mating relationship with a prosperous male would increase a guarding father's inclusive fitness via an increase in the reproductive success of his grandsons (assuming that the prosperity is inherited).

If guarding by fathers has a significant effect on young females' mating relationships, then we might expect 'guarded' females to have different mating relationships from 'unguarded' females. The comparison of females with and without resident fathers again provides a useful basis for

Figure 11.7 Histogram showing that older females (11–20) with resident fathers are more likely to be observed at home than are older females without resident fathers. For females with resident fathers $\bar{x} = 21.6$, SE = 2.2, vs. $\bar{x} = 14.3$, SE = 2.2 for females without resident fathers; $p = 0.027$, *t*-test. Vertical bars represent 95% confidence intervals.

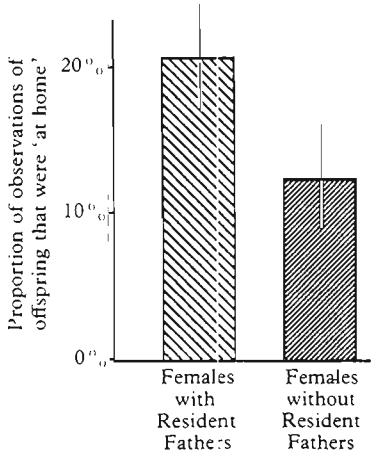
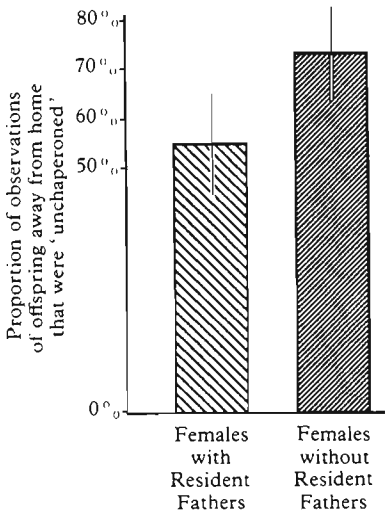


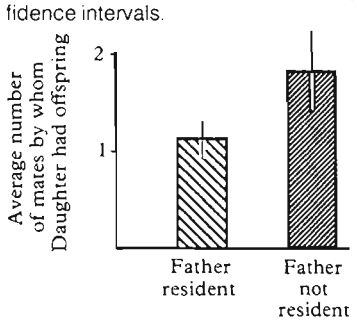
Figure 11.8 Histogram showing that older females (11–20) with resident fathers are less likely to be observed without a 'chaperone' (family member) when they are away from home than are older females without resident fathers. $\bar{x} = 52.0$, SE = 5.7 vs. $\bar{x} = 76.3$, SE = 7.1; $p = 0.033$, *t*-test. Vertical bars represent 95% confidence intervals.



evaluating the effect of fathers on their daughter's mating relationships. If fathers were guarding their daughters in order to increase the likelihood of a stable mating relationship with a properous male, then we can predict that (1) young females with fathers resident in the village have more stable mating relationships, and (2) young females with fathers resident in the village have mating relationships with more prosperous males. Both predictions are supported.

The data in Figures 11.9 and 11.10 indicate that the residence of father is associated with the stability of daughter's mating relationships, and the prosperity of her mate consistent with the hypothesis that fathers guard their daughters in order to increase the chances of a 'successful' mating relationship. An alternative explanation for this result is that fathers, through their social ties, are important for arranging mating relationships with prosperous males for their daughters. Thus, it might not be the guarding *per se* (and choice by prosperous males of chaste females) that increases the likelihood of a 'successful' marriage for guarded females, but rather it is the father's efforts at arranging such marriages. This explanation is consistent with the fact that the reproductive success of young adult males is much higher if they have a resident father (Flinn 1986), suggesting that the residence of father is an important social (and economic) asset in mating competition. This explanation, however, does not account for the differences in behavior indicative of 'guarding' of daughters compared to sons (Figures 11.2–11.8). It is likely that both guarding and social ties provided by resident fathers contribute to the success of a daughter's mating relationships. The data do not allow for precise distinction between these two factors.

Figure 11.9 Histogram showing that females with fathers resident in the village (or father was resident in the village until the daughter was at least 20 years old) have offspring by fewer mates than do females without fathers resident in the village. Sample includes all females under 50 years old who have had at least two offspring. These data suggest that residence of father increases the stability of daughter's mating relationships. $\bar{x} = 1.192$ and SE = 0.096 for females with resident fathers. $\bar{x} = 1.786$ and SE = 0.208 for females without fathers resident in the village. One-tailed t-test is significant at 0.007 Vertical bars represent 95% confidence intervals.



Discussion

Although parents and kin do not directly arrange marriages in Grande Anse, their influence nonetheless has significant reproductive consequences in this population. What initially piqued my interest in sex differences in parent–offspring interactions were the results of a study of the associations between parental residence and offspring reproductive success (Flinn 1986). In brief, demographic and residence data indicated that young adult males in the village with resident (living in the village) fathers had much higher reproductive success than young adult males without resident fathers. The reproductive rates of young adult females, however, were unaffected by the residence of father.

The issue raised by these data on paternal residence and reproductive success of offspring is, why are fathers bothering to be parental (e.g. guard) towards their daughters if there is no reproductive benefit? The answer suggested by the data presented in this paper is that there is a reproductive benefit realized in the grandoffspring generation. Daughter guarding ensures, or at least deceives others into believing, that

Figure 11.10 Women aged 18–28 with father resident in the village (or father was resident in the village until the daughter was at least 20 years old) are more likely to establish mating relationships and reside with prosperous males. $\chi^2 = 10.9$, $p = 0.01$

Mating relationship	Is father resident in village? Yes	No
Mate owns >8 acres	11	2
Mate owns <8 acres	5	3
Did not move in with mate	2	9

the daughter is chaste. Fathers increase the likelihood that their daughters will marry a wealthy male by guarding because prosperous males prefer chaste females. The reasons why prosperous males prefer virgin or chaste-appearing females include (1) males do not want to care for a woman's children from previous relationships, and (2) prosperous males have more to leave to their heirs, hence desire high confidence of paternity (Dickemann 1981, Flinn 1981). Marriage to a prosperous male may not increase a woman's reproductive success, but it is likely to increase the reproductive success of her sons, if they inherit their father's prosperity (because prosperous males have higher reproductive success in this population – Flinn 1983, 1986).

Thus, although guarding by a father does not increase his inclusive fitness by increasing daughter's reproductive success, it may increase his inclusive fitness by increasing the reproductive success of his grandsons, who will have higher fitness because of being more prosperous and having a resident father. Psychological factors underlying this strategy might include pleasure derived from seeing a daughter 'happily' married, and maintaining the family 'honor.'

Another possible benefit from daughter guarding could be that males gain power or material benefits by controlling who can mate with their daughters, which could allow a father to gain additional mates for himself or for his sons (see e.g. Strauss 1949, Bourdieu 1977, Chagnon 1979, 1980, 1981, 1982, Irons 1979a). This hypothesis is consistent with ethnographic accounts of mating arrangements in a number of societies that have cross-cousin marriage rules (Flinn and Low 1986). For example, consider Hart and Pilling's (1960: 15) description of mating arrangements among the Tiwi, a Australian Aboriginal society:

> Put bluntly, in Tiwi culture daughters were an asset to their father, and he invested those assets in his own welfare. He therefore bestowed his newly born daughter on a friend or an ally . . . or, the father might bestow an infant daughter on a man – or some close relative of a man – who had already bestowed an infant daughter on him, thus in effect swapping infant daughters.

Fathers in Grande Anse, however, did not have such a decisive role in arranging marriages, and did not 'bestow' their daughters. It is not clear from the data what the conflicts of interests were between fathers and daughters concerning mate choice. It would appear that fathers were acting in their daughters' best (inclusive fitness) interests, although a relationship with a 'good provider' may be more in the father's interest than the daughter's. It was quite common for daughters to leave their children from terminated mating relationships with their parents. By ensuring that the daughter establishes a stable relationship, parents may avoid having to care for grandchildren. Fathers also seemed more approving of their daughters establishing relationships with their (the father's) friend's sons, suggesting that the enhancement of reciprocal networks may be a factor in the manipulation of daughters' mating relationships (see also Bordieu 1977).

Summary

The data indicate that:

1. Fathers have high rates of interaction with their teenage daughters.
2. Fathers have high rates of agonistic interactions with their teenage daughters.
3. Fathers with teenage daughters have high rates of agonistic interactions with unrelated males (potential suitors of their daughters).
4. Teenage females are more likely to be observed at home than are teenage males.
5. Teenage females without a father resident in the village are more likely to be observed away from home unchaperoned than are teenage females with a resident father (potential guardian).
6. Young women with a father resident in the village are more likely to establish a stable mating relationship with a prosperous male than are young women without resident fathers.

These results suggest that parental control of offspring mating is a significant aspect of reproductive competition in this human population. Many of the more subtle aspects of parental control of offspring mating relationships, such as the influence of the mother, and offspring counter-strategies, await further field research.

Acknowledgements

I would like to thank Richard Alexander, Duncan Anderson, Laura Betzig, Robbins Burling, Martin Daly, Paul Sherman, Carol Ward, Margo Wilson and Richard Wrangham for helpful comments on the manuscript and Arinthia, Junior, Andre, Rampy and Susan for assistance with the fieldwork.

Appendix

The frequencies of interaction with different types of kin are presented in Figure 11.11.

The frequencies of the different categories of behaviors are presented in Figure 11.12.

The specific behavior codes and frequencies included in the category 'agonistic interactions' are listed below. Note that only 92 out of 1218 (7.5%) observations involved actual physical agonism, although in some cases physical agonism occurred before or after observed threats or verbal agonism.

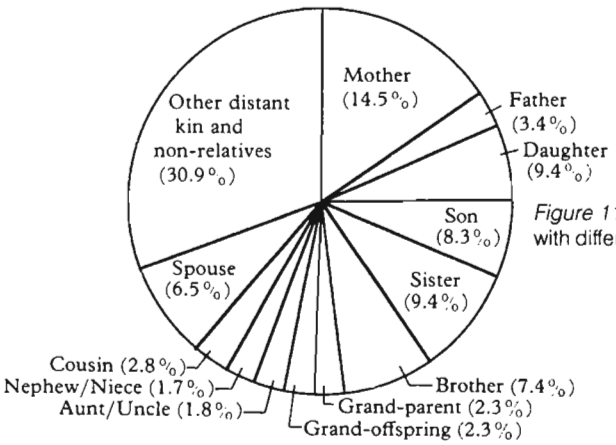


Figure 11.11 The observed frequencies of interaction with different kin.

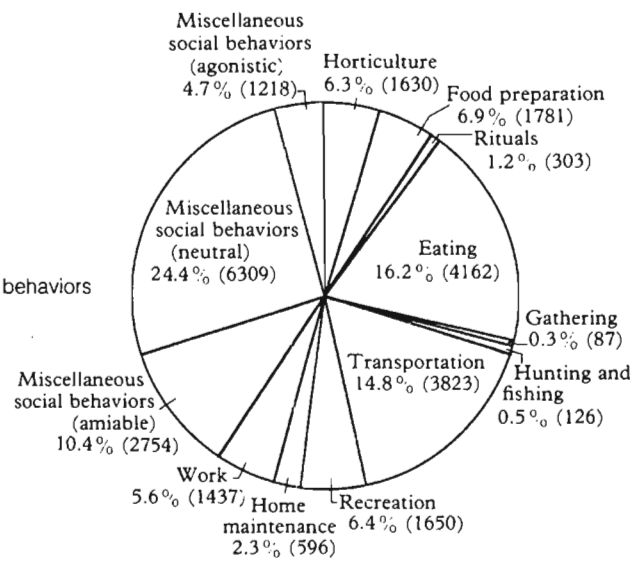


Figure 11.12 The observed frequencies of behaviors grouped into 13 major categories.

804 Fighting–serious (involving physical contact with the potential for substantial injury) with weapons (e.g. bottle, cutlass) (number of observations = 2,0.2% of all agonistic interactions)
805 Fighting–serious, but no weapons (e.g. fist fighting) (5, 0.4%)
806 Fighting–moderate (few substantial blows) (7, 0.6%)
807 Fighting–'play', but with some substantial blows or tumbles (cf. #515) (23, 1.8%)
808 Fighting by throwing stones (or using slingshot) (12, 1.0%)
809 Fighting using sticks (4, 0.3%)
813 Threatening to fight an individual (I.D.#) using weapons (verbal threats and gesturing with weapon) – in the presence of the threatened individual (3, 0.2%)
814 Threatening to fight an individual (I.D.#) using weapons (verbal threats and gesturing with weapon) – not in the presence of the threatened individual (5, 0.4%)
815 Threatening to fight an individual (I.D.#) in a non-serious way, e.g. just the threat of a slap – in the presence of the threatened individual (38, 3.1%)
816 Threatening to fight an individual (I.D.#) in a non-serious way – not in the presence of the threatened individual, e.g. 'I'm going to beat that girl when she gets home' (23, 1.8%)
817 Threatening to punish an individual (I.D.#) – not serious (e.g. a mother stating that she will not give 'candy money' to her child if . . .) (127, 10.4%)
818 Threatening to punish an individual (I.D.#) – serious (e.g. a father stating that he is going to physically punish a child if . . .) (52, 4.3%)
829 Glaring at someone (I.D.#) (14, 1.1%)
847 Arguing – insubstantial, but 'unfriendly', e.g. raised voices (251, 20.6%)
848 Arguing – substantial (e.g. concerning a debt) (44, 3.5%)
856 Insulting someone deliberately (I.D.#) (32, 2.6%)
857 Cussing someone (I.D.#) (38, 3.1%)
867 Family quarrel concerning extra-marital relations (16, 1.3%)
870 Criticizing someone (I.D.#) in their presence – trivial (132, 10.8%)
871 Criticizing someone (I.D.#) not in their presence – trivial (209, 17.2%)
872 Criticizing someone (I.D.#) in their presence – serious (e.g. accusation of theft or stinginess) (24, 1.8%)
873 Criticizing someone (I.D.#) not in their presence – serious (67, 5.5%)
875 Yelling at someone (I.D.#) (41, 3.3%)
876 Screaming with pain (17, 1.4%)
877 Crying (23, 1.8%)
990 Theft (3, 0.3%)
992 Deliberate damage to another's (I.D.#) property (6, 0.5%)

References

Alexander, R. D. (1974) The evolution of social behavior. *Annual Review of Ecology and Systematics*, **5**, 325–83.

Alexander, R. D. (1979) *Darwinism and Human Affairs*. Seattle: University of Washington Press.

Altmann, J. (1974) Observational study of behavior: sampling methods. *Behaviour*, XLIX, 227—66.

Beeson, J. (1979) Symbolic aspects of land in the Caribbean: The tenure and transmission of land rights among Caribbean peasantries. In *Peasants, Plantations and Rural Communities in the Caribbean*, ed. M. Cross and A. Marks, Department of Sociology, University of Surrey, and Department of Caribbean Studies, Royal Institute of Linguistics and Anthropology, pp. 86–116.

Betzig, L. L. (1986) *Despotism and Differential Reproduction*. New York: Aldine.

Betzig, L. and Turke, P. (1986) Parental investment by sex on Ifaluk. *Ethology and Sociobiology* **7**, 29–37.

Blake, J. (1961) *Family Structure in Jamaica*. New York: Free Press.

Bordieu, P. (1977) *Outline of a Theory of Practice*. Cambridge: Cambridge University Press.

Chagnon, N. A. (1974) *Studying the Yąnomamö*. New York: Holt, Rinehart and Winston.

Chagnon, N. A. (1979) Is reproductive success equal in egalitarian societies? In: *Evolutionary Biology and Human Social Behavior*, ed. N. Chagnon and W. Irons, pp. 374–401. North Scituate, MA: Duxbury Press.

Chagnon, N. A. (1980) Kin selection theory, kinship, marriage, and inclusive fitness among the Yąnomamö Indians. In: *Sociobiology: Beyond Nature–Nurture*, ed. G. W. Barlow and J. Silverberg, AAAS Special Symposium 35. Boulder, CO: Westview Press.

Chagnon, N. A. (1981) Terminological kinship, genealogical relatedness, and village fissioning among the Yąnomamö Indians. In: *Natural Selection and Social Behavior: Recent Research and New Theory*, ed. R. D. Alexander and D. W. Tinkle, pp. 490–508. New York: Chiron Press.

Chagnon, N. A. (1982) Sociodemographic attributes of neoptism in tribal populations: Man the rule breaker. In: *Current Problems in Sociobiology*, ed. King's College Sociobiology Group. Cambridge University Press.

Clarke, E. (1957) *My Mother Who Fathered Me*. London: Allen and Unwin.

Daly, M. and Wilson, M. I. (1981) Abuse and neglect of children in evolutionary perspective. In: *Natural Selection and Social Behavior: Recent Research and New Theory*, ed R. D. Alexander and D. W. Tinkle, pp. 405–16. New York: Chiron Press.

Denham, W. W. (1978) BEVRECS. In: *Alyawara Ethnographic Data Base*. New Haven: HRAF Press.

Dickemann, M. (1981) Paternal confidence and dowry competition: a biocultural analysis of purdah. In: *Natural Selection and Social Behavior: Recent Research and New Theory*, ed. R. D. Alexander and D. W. Tinkle, pp. 417–38. New York: Chiron Press.

Draper, P. and Harpending, H. (1982) Father absence and reproductive strategy: an evolutionary perspective. *Journal of Anthropological Research*, **38**, 255–73.

Essock-Vitale, S. (1984) The reproductive success of wealthy Americans. *Ethology and Sociobiology*, **5**, 45–9.

Flinn, M. V. (1981) Uterine vs. agnatic kinship variability and associated cousin marriage preferences. In: *Natural Selection and Social Behavior: Recent Research and New Theory*, ed. R. D. Alexander and D. W. Tinkle, pp. 439–75. New York: Chiron Press.

Flinn, M. V. (1983) Resources, mating, and kinship: The behavioral ecology of a Trinidadian village. Ph.D. Thesis, Northwestern University.

Flinn, M. V. (1986) Correlates of reproductive success in a Caribbean village. *Human Ecology*, **14**, 225–43.

Flinn, M. V. (1987) Mate guarding in a Caribbean village. *Ethology and Sociobiology* (in press).

Flinn, M. V. and Low, B. S. (1986) Resource distribution, social competition and mating patterns in human societies. In: *Ecological Aspects of Social Evolution*, ed. D. I. Rubenstein and R. W. Wrangham. Princeton, NJ: Princeton University Press.

Fortune, R. F. (1963) *The Sorcerers of Dobu*. New York: Dutton.

Hames, R. (1979) Relatedness and interaction among the Ye'kwana: a preliminary analysis. In: *Evolutionary Biology and Human Social Behavior*, ed. N. Chagnon and W. Irons, pp. 238–50. North Scituate, MA: Duxbury Press.

Harrison, D. H. (1979) The changing fortunes of a Trinidad peasantry: A case study. In *Peasants*, Plantations and Rural Communities in the Caribbean, ed. M. Cross and A. Marks. Department of Sociology, University of Surrey, and Department of Caribbean Studies, Royal Institute of Linguistics and Anthropology.

Hart, C. W. M. and Pilling, A. R. (1960) *The Tiwi of North Australia*. New York: Holt, Rinehart and Winston.

Hill, J. (1984) Prestige and reproductive success in man. *Ethology and Sociobiology*, **5**, 77–95.

Hrdy, S. (1981) *The Woman That Never Evolved*. Cambridge, MA: Harvard University Press.

Irons, W. (1979a) Investment and primary social dyads. In: *Evolutionary Biology and Human Social Behavior*, ed. N. Chagnon and W. Irons, pp. 181–212. North Scituate, MA: Duxbury Press.

Irons, W. (1979b) Cultural and biological success. In: *Evolutionary Biology and Human Social Behavior*, ed. N. Chagnon and W. Irons, pp. 257–72. North Scituate, MA: Duxbury Press.

Irons, W. (1981) Why lineage exogamy? In: *Natural Selection and Social Behavior: Recent Research and New Theory*, ed. R. D. Alexander and D. W. Tinkle, pp. 439–75. New York: Chiron Press.

Irons, W. (1983) Human female reproductive strategies. In: *Social Behavior of Female Vertebrates*, ed. S. Wasser and M. Waterhouse, pp. 169–213. New York: Academic Press.

Johnson, A. W. (1975) Time allocation in a Machiguenga community. *Ethnology*, **14**(3), 310–12.

Johnson, A. W. (1978) *Quantification in Cultural Anthropology*. Stanford: Stanford University Press.

Levi-Strauss, C. (1949) *Les structures elementaires de la parente*. Paris: Plon.

Munroe, R. H. and Munroe, R. L. (1971) Household density and infant care in an East African Society. *Journal of Social Psychology*, **85**, 3–13.

Munroe, R. L., Munroe, R. H., Michealson, C., Koel, A., Bolton, R. and Bolton C. (1983) Time allocation in four societies. *Ethnology*, **22**, 355–70.

Rogoff, B. (1985) Spot observation: An introduction and examination. *Quarterly Newsletter of the Institute of Comparative Human Development, Rockefeller University*, 2, 2C, 21–6.

Smith, M. G. (1962) *West Indian Family Structure*. Seattle: University of Washington Press.

Trivers, R. L. (1972) Parental investment and sexual selection. In: *Sexual Selection and the Descent of Man 1871–1971*, ed. B. Campbell. Chicago: Aldine.

Trivers, R. L. (1985) *Social Evolution*, Menlo Park, CA: Benjamin-Cummings.

Turke, P. and Betzig, L. L. (1985) Those who can do: Wealth, status, and reproductive success on Ifaluk. *Ethology and Sociobiology* **6**, 79–87.

Wilson, M., Daly, M. and Weghorst, S. J. (1981), Differential maltreatment of boys and girls. *Victimology*, **6**, 49–261.