University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Anthropology Department Theses and Dissertations

Anthropology, Department of

7-30-2010

Exploration into Human Polyandry: An Evolutionary Examination of the Non-Classical Cases

Kathrine E. Starkweather
University of Nebraska at Lincoln, kstark_8@hotmail.com

Follow this and additional works at: http://digitalcommons.unl.edu/anthrotheses

Part of the Anthropology Commons

Starkweather, Kathrine E., "Exploration into Human Polyandry: An Evolutionary Examination of the Non-Classical Cases" (2010). *Anthropology Department Theses and Dissertations.* Paper 6.
http://digitalcommons.unl.edu/anthrotheses/6

This Article is brought to you for free and open access by the Anthropology, Department of at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Anthropology Department Theses and Dissertations by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

EXPLORATION INTO HUMAN POLYANDRY:

AN EVOLUTIONARY EXAMINATION OF THE NON-CLASSICAL CASES

By

Kathrine E. Starkweather

Presented to the Faculty of

The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Master of Arts

Major: Anthropology

Under the Supervision of Professor Raymond B. Hames

Lincoln, Nebraska

August, 2010

EXPLORATION INTO HUMAN POLYANDRY:

AN EVOLUTIONARY EXAMINATION OF THE NON-CLASSICAL CASES

Kathrine Elizabeth Starkweather, M.A.

University of Nebraska, 2010

Adviser: Raymond B. Hames

Polyandry has occurred all over the world, among human societies at all levels of social stratification, employing all types of economic strategies. While the classical cases that appear in Southeast Asia among stratified, agricultural societies have been thoroughly studied, very little has been written on the non-classical cases. This thesis surveys fifty-two non-classical cases of polyandry and investigates the conditions under which non-classical polyandry most often occurs. This thesis also tests the following five sets of hypotheses, which were derived from theories related to both classical and non-classical polyandry: the Imbalanced Sex Ratio Hypotheses; the Prolonged Male Absence Hypotheses; the Adult Male Mortality Hypothesis; the Male Economic Production Hypothesis; and the Father Effect Hypothesis. Based on the results of these tests, a few trends seem to be descriptive of the non-classical polyandrous groups in this sample. First, the majority of the societies are egalitarian bands or tribes, practicing hunting and gathering and slash-and-burn horticulture. The presence of polyandry among these groups suggests that polyandry likely existed throughout human evolutionary history. Also, it seems that a skewed sex ratio in favor of males is an important factor contributing to the practice of non-classical polyandry, as are prolonged male absence, high adult male mortality, and high male economic production. Although prolonged male absence and adult male mortality seem to pose similar problems, the data and the case studies in this thesis suggest otherwise. It appears that non-classical formal polyandry is employed as a male reproductive strategy when instances of prolonged male absences occur, in that polyandry may function as a form of mate guarding while the primary husband is away. On the other hand, when adult male mortality is high, it seems that non-classical informal polyandry is a female reproductive strategy, utilized to ensure an investing father for children if the primary father should die. In all cases, however, it appears that non-classical polyandry is one possible solution for men to make the best of a bad situation.

Table of Contents

Chapter 1: Introduction	p. 1
Chapter 2: Methods	p. 41
Chapter 3: Results	p. 99
Chapter 4: Discussion	p. 106
Chapter 5: Conclusions	p. 117
Appendix	p. 126
References	p. 133

Figures and Tables

Figure 1: Types of Polyandry p. 4

Figure 2: Polyandrous Classifications p. 7

Figure 3: Formal and Informal Polyandrous Groups p. 98

Table 1: Data on all variables for all fifty-two non-classical polyandrous societies p. 126

Table 2: Summary of Type of Polyandry, Social Stratification, Partible Paternity, Type of Economy, Male Relationship, Prolonged Male Absence, and Stability of Unions p. 129

Table 3: Relationship between Stability of Unions and Adult Sex Ratio p. 130

Table 4: Relationship between Prolonged Male Absence and Male Relationship p. 130

Table 5: Relationship between Prolonged Male Absence and Male Relationship among Formal Polyandrous groups p. 130

Table 6: Relationship between Prolonged Male Absence and Male Relationship for Egalitarian Bands or Tribes p. 131

Table 7: Relationship between Prolonged Male Absence and Male Relationship among Groups That Do Not Practice Partible Paternity p. 131

Table 8: Relationship between Adult Male Mortality and Male Relationship p. 131

Table 9: Relationship between Father Effect and Male Economic Contribution p. 132

Table 10: Relationship between Father Effect and Stability of Unions p. 132

Table 11: Relationship Between Stability of Unions and Male Relationship p. 132

Chapter 1

Introduction

Polyandry is more common than the literature for the last eighty years has suggested. George P. Murdock's *Ethnographic Atlas* (1967) classifies only four societies, out of 1167, as polyandrous: the Tibetans, the Toda of India, the Sherpa of Nepal, and the Marquesans of Polynesia. Despite other mentions of polyandry throughout the literature (Westermarck 1926, Prince Peter 1963, Berreman 1962, and many others), over the last six decades these four groups have been touted countless times in anthropological textbooks and other publications as the only four societies in the world to allow polyandry. This thesis will dispel these misconceptions and show that although "rare" remains an appropriate description for the occurrence of polyandry, it is a form of marriage and pair bonding that has been found on every continent and among peoples with varying levels of social stratification. It will do so by showing that these rather neglected cases of polyandry may occur under circumstances such as resource scarcity, imbalances of operational sex ratios, and in cases in which at least one father is necessary to enhance the likelihood of child survival.

Murdock (1949) suggests that the extreme rarity of polyandry is nearly enough to regard it as an "ethnological curiosity" (p. 25), stating that only families in which the female is engaged in a socially sanctioned, culturally patterned marriage, which involves economic cooperation, residential cohabitation, and sexual rights with more than one man simultaneously may be considered polyandrous. Thus was the basis for his classification of only four societies in the *Ethnographic Atlas* (1967), as well as his exclusion of other

groups, such as the Pawnee (Murdock 1949). These four societies have been studied in-depth and share many social structural similarities, including agriculture, state-level political systems, stratified caste systems, and similar cultural expectations and rules about land and property inheritance. Also, aside from the Marquesans, these societies are geographically proximate and share similar ecologies.

Berreman (1962) and Prince Peter (1963) have recorded an additional twenty-eight polyandrous societies that are similar to Murdock's four societies on nearly all of the above accounts, in that they are state-level agriculturalists, living in the Southeast Asian regions in and around India, Tibet, and Nepal. The thirty-two total societies that share these characteristics will be referred to as "classical" polyandrous societies.

This thesis will show that there are at least fifty-two societies not included in the scope of Murdock, Prince Peter, or Berreman's studies that allow polyandry and that have at least one instance of polyandrous marriage or pair bonding, according to my definition, recorded in the literature. Westermarck (1926) mentions around fifteen groups or peoples that have been known to practice polyandry, and numerous other anthropologists recount cases as well. Although the stratification of these fifty-two groups varies somewhat, the majority of them live in small, egalitarian, band-level societies, practice foraging and slash-and-burn horticulture. These groups can be found all over the world in vastly different ecological conditions. Murdock (1949) said, " … polyandry is so infrequent a phenomenon that there is no justification for assigning to it … an important place in the evolution of social organization." The occurrence of polyandry among these egalitarian groups suggests that, in fact, it does hold an important place in human evolutionary history, making it crucial to understand as many aspects as

possible of polyandry in general, but especially the "non-classical" cases, to be examined and better understood. As of yet, a thorough account of non-classical polyandry has not been written.

The purposes of this thesis are to do a complete investigation of all known cases of polyandry, drawing attention to the non-classical cases, to test some of the current theories that were developed to attempt to help explain classical polyandry. New theories, that were developed based on all known cases, will also be suggested and tested. These theories will lead to a more in-depth understanding of the conditions under which non-classical polyandry is likely to occur and will attempt to give a better understanding of the practice of polyandry as a human reproductive adaptation.

Defining Polyandry

The term "polyandry" derives from the Greek words *poly* and *andros*, meaning "many men." Among avian and non-human mammalian species, polyandry is defined as the simultaneous pair bond between one female and more than one male (Jenni1974). However, for humans, the definition has been changed to necessitate marriage. Cassidy and Lee (1989) define it as the simultaneous marriage of one woman to more than one man. Although a great deal of contention has arisen about what, exactly, constitutes marriage in a polyandrous society (Westermarck 1926, Murdock 1949, Gough 1959, Prince Peter 1963), the standard definition of polyandry has remained more or less the same over time, as stated by Cassidy and Lee (1989). Incidentally, all of the classical societies fit under Cassidy and Lee's (1989) definition, and several of the non-classical groups do as well.

Levine and Sangree (1980) discuss the different kinds of polyandry and the relationships among men in a polyandrous union may fall under, including fraternal, associated, Nayar, and secondary marriage. Fraternal, or adelphic, polyandry and is referred to by Levine and Sangree (1980) as the "classic" form of polyandry. In its strictest form, co-resident brothers jointly marry a single woman in only one wedding and later form a single household. Associated polyandry may or may not include men who are brothers or other close male relatives, but is different from fraternal polyandry because the marriage always begins monogamously and additional husbands are incorporated into the pre-existing union later on. The last two types, Nayar polyandry and secondary marriage, describe specific polyandrous groups, and for the purposes of this thesis will not be referred to as separate types, but will fall under the general classification of informal polyandry and will be discussed in detail later. While the distinction of how and when marriage to additional husbands occurs is important in some instances, of main importance here are the relationships of the men to one another. For this reason, the term "associated polyandry" will not be used in this study, and the term "fraternal polyandry" will refer to a polyandrous union in which the men in it are brothers or close blood relatives, and "non-fraternal polyandry" will refer to a polyandrous union in which the men in it are not related in any way (See Figure 1).

Figure 1. Types of Polyandry

Type of Polyandry	Brothers	Married at the same time	Officially Recognized	Rights/ Responsibilities
Fraternal	yes	yes	yes	yes
Associated	possibly	no	yes	yes
Non-Fraternal	no	no	yes	yes
Cicisbeism	possibly	no*	no	no

*not married

Levine and Sangree (1980) also discuss the practice of cicisbeism, which they define as "extramarital liaisons," and distinguish it from polyandry. The term cicisbeism comes from the Italian word for lover, *cicisbeo*, and may be used to describe either male or female infidelity, however, it is commonly used throughout the classical literature to describe female behavior. The classical authors (Murdock 1949, Prince Peter 1963) are also in agreement that this practice of taking lovers while married should not be classified as polyandry. There are countless instances of women engaging in polyandrous behavior, in which they maintain simultaneous sexual relationships with more than one man, but in which neither party has any rights or responsibilities towards the other. These types of polyandrous mating relationships will be excluded from the data collection of this thesis, even though these relationships play an important role in understanding the dynamics of the male/female sexual relationship. Although there may not be socially or culturally sanctioned rights or responsibilities between a woman and her lovers, there is more often than not still some type of exchange between the parties that takes place. One example of this are the "meat for sex" practices in Amazonia (Siskind 1973) which basically suggests that male lovers bring a valuable resource, which is nearly always meat, for their female lovers in exchange for the females' own valuable resource, sex. This sort of pattern has been seen among the Mehinaku (Gregor 1977) and other groups (Siskind 1973) and is important because women in these groups, and in most groups, are responsible for the allocating food sources, therefore, her gifts of meat and other valuable resources will inevitably be passed down to her children. Therefore, even without formal social rules and regulations, the multiple sexual partners of females in most societies are still providing important subsistence resources to the female and her offspring.

As previously outlined, a distinction will be made between the classical and non-classical cases of polyandry. It is also important to distinguish the non-classical groups further, as the polyandry seems to be taking on a few very different forms within these groups. Therefore, non-classical polyandrous societies will be referred to as practicing either formal polyandry or informal polyandry. Polyandry will be considered "formal" when one woman is married to more than one man simultaneously. These marriages are socially recognized and sanctioned and all persons in the union have rights and responsibilities towards the others, as well as any offspring that may come out of the union. Many of the groups that do not fall under the classical umbrella are still engaging in what might be considered "formal" polyandry, such as the Yanomamö (for an in-depth discussion, see case study below). Informal polyandry, on the other hand, does not involve marriage but does necessitate that multiple men are simultaneously enjoying sexual access to the same woman *and* are recognizing responsibilities to care for her and her children. Informal polyandry often occurs in societies that believe in the possibility of partible paternity, which is the ability of more than one man to be biological fathers of the same child. However, it is important to note that not all cases of informal polyandry involve partible paternity beliefs and not all societies with partible paternity beliefs practice informal polyandry. Both informal polyandry and partible paternity will be discussed at greater length below (see Figure 2).

Considering the fact that polyandry has always been categorized as a type of marriage, it is necessary to discuss marriage and how it will be defined in this paper. Westermarck (1926) defined marriage as "a relation of one or more men to one or more women which is recognized by custom or law and involves certain rights or duties, both

in the case of the parties entering the union and in the case of the children born into it" (p. 1). He also suggests that marriage always includes sexual rights of spouses and is an economic institution, which assumes the duties of both husband/father and wife/mother as well as legitimization of children. Murdock (1949) echoes Westermarck's necessitation of economic and sexual aspects of marriage, as do Prince Peter (1963) and Levine and Sangree (1980). While Gough (1959), based on her studies of the Nayar, suggests that there should be one, parsimonious definition of marriage which should center on legitimization of any children born within the union of one woman to one or more other persons, Leach (1955) disagrees. Leach (1955) argues that no definition can be found that could apply across cultures to all cases which might be considered marriage. He instead offers ten classes of rights, which he suggests are a good template for determining whether or not marriage exists.

Figure 2. Polyandrous Classifications

Polyandrous Classification	Type of Society	Political Organization	Subsistence Strategy	Rights/ Responsibilities*	Necessitate Marriage
Classical	State-level	Stratified	Agriculture	yes	yes
Non-classical Formal	Mostly band-level	Mostly egalitarian	Foraging, horticulture, pastoralism, agriculture	yes	yes
Non-classical Informal	Mostly band-level	Mostly egalitarian	Foraging, horticulture, pastoralism, agriculture	yes	no
Partible Paternity	Band-level	Egalitarian	Foraging, horticulture	yes	no
Polyandrous Mating	Any	Any	Any	no	no

*Rights and responsibilities should be institutionalized and implicitly recognized by the union's societal group.

Leach (1955) says that a marriage may serve: to establish the legal father of a woman's children/ to establish the legal mother of a man's children; to give the husband a monopoly in the wife's sexuality; to give the wife a monopoly in the husband's sexuality; to give the husband partial or monopolistic rights to the wife's domestic and other labor services; to give the wife partial or monopolistic rights to the husband's labor services; to give the husband partial or total rights over property belonging or potentially accruing to the wife; to give the wife partial or total rights over property belonging or potentially accruing to the husband; to establish a joint fund of property – a partnership – for the benefit of the children of the marriage; to establish a socially significant 'relationship of affinity' between the husband and his wife's brothers. He follows this list by saying that "in no single society can marriage serve to establish all these types of right simultaneously; nor is there any one of these rights which is invariably established by marriage in every known society" (p. 183). His discussion of marriage leads to the important point that not all cultures have the same social, economic, or legal rules, and that the definition of marriage must take this into account and be flexible enough to encompass differing institutions that may be referred to as marriage. This thesis will work off of Leach's (1955) outline of a marital definition, which suggests that marriage assumes legitimization of children, sexual rights, and economic cooperation among spouses.

Previous definitions of polyandry have missed the idea, though, that there are cases of polyandrous relationships that are much more complex than just carrying on extra-marital sexual relationships with multiple men. This type of polyandrous pair bonding does not necessarily involve marriage, but is the simultaneous union of one

woman to more than one man, who she may or may not be married to, but who have socially recognized and institutionalized rights and responsibilities toward her and her offspring. These rights or responsibilities would include things like sexual access to the woman, legitimization of children, and requirements involving provisioning for the woman and her children, assuming there is a possibility that at least one of those children belongs to the man in question. These rights or responsibilities should be recognized by her, the men she shares them with, the society, and by her first husband, if she has one. These cases of polyandrous behavior will be referred to as "informal" polyandry. The Dieri, a group of hunter-gatherers in Central Australia, practice informal polyandry in that a man shares his wife with his unmarried tribal brothers. According to Howitt (1904), all of these men have sexual rights to the wife and are also all responsible for protecting her children.

Many societies that believe in the possibility of partible paternity fit into the informal definition of polyandry. Partible paternity is found mostly among the peoples of Lowland South America and is the belief that one child may have more than one biological father (Beckerman and Valentine 2002). Some beliefs about the process of contribution vary across societies, but the idea that more than one man can contribute to the formation and development of a fetus through subsequent seminal deposits has been noted in several societies. All cultures with partible paternity beliefs suggest that all men who have intercourse with a woman during her pregnancy share the biological fatherhood of her child. The woman's husband, if he cohabited with her during pregnancy, is usually considered the primary biological father and the lovers a woman took during her pregnancy are secondary fathers (Beckerman et al. 2002). The Barí are an excellent

example of a group that practices informal polyandry and believes in partible paternity. As Beckerman et al (2002) report, the Barí believe that successive sperm deposits "build" a baby inside of a woman. Therefore, every man that a woman takes as a lover during her pregnancy is thought to contribute to the biological makeup of the baby and, therefore, is considered to be a biological father of the baby. After the child is born, any men that the mother recognizes as fathers of the baby are responsible for providing continual gifts of meat and other valuable resources to the child and will also step in and take over the duties of the primary father if he dies.

Several of the Lowland South American non-classical formal polyandrous groups, like the Yanomamö and the Ache, also adhere to beliefs of partible paternity and in these instances, it is easy to see how polyandry and partible paternity could go hand-in-hand. However, it is not always the case that the people of societies that believe in partible paternity will recognize multiple fathers therefore, it is important to make the distinction between groups that believe in partible paternity and who, through it, are practicing a form of informal polyandry and those that believe in partible paternity, but are not considered polyandrous because their behavior does not fit into any definition of polyandry.

Groups like the Cashinahua of southeastern Peru and the Kulina of western Brazil are not known to practice formal polyandry, however, they do believe in partible paternity and put it into practice in such a way that justifies its classification as informal polyandry. First, occasionally the primary and secondary fathers are brothers or close relatives and often cooperate socially and economically. Secondly, and probably most importantly, in all cases of partible paternity that are considered polyandry, the primary

and secondary fathers have rights and responsibilities toward the mother and her offspring. Rights include public acknowledgement of biological responsibility of the offspring and the most important responsibility of fathers is to provision for the mother and her offspring. Secondary fathers, whether married to the mother or not, may provide meat and other valuable resources to the pregnant mother and to the offspring throughout their childhood (Beckerman et al. 2002, Hill and Hurtado 1996). They may also help prevent death of a child due to infanticide or juvenilicide, as is the case with the Ache (Hill and Hurtado 1996). From what is known of the meat for sex exchange, it should not be surprising that if the eventual secondary fathers are not married to the mother, they were likely providing her with some resources even before she conceived (Kensinger 2002). These types of societies meet all of the conditions of informal polyandry and therefore will be classified as such.

Other groups in Lowland South America, such as the Curripaco of the Northwest Amazon (Valentine 2002) believe that multiple fathers are possible on the biological level but not on the social level. Therefore, women are unlikely to publicly name any secondary fathers of her children, which means that these men do not receive any paternal recognition, nor any rights over nor responsibilities for the child. These cases of partible paternity beliefs do not result in practice that resembles informal polyandry in anyway and therefore will not be included in the examination of informal polyandrous societies.

For the most part, the informal cases are functioning in much the same way as the non-classical formal and even the classical cases are, in that although there is no socially sanctioned marriage, many of the same expectations apply. For this reason, it is

necessary to redefine polyandry in order to encompass the classical, the non-classical formal, and the informal groups. Therefore, for the purposes of this paper, polyandry will be defined as *the simultaneous bond of one woman to more than one man in which all parties involved have sexual rights and economic responsibilities toward each other and toward any children that may result from the union*.

Evolutionary Background of Polyandry

Most biological theories promote the ideas of "coy" and "choosy" females and "ardent" and "competitive" males. Based on the idea that male reproductive success is more variable than female reproductive success, Darwin (1871) and Bateman (1948) suggest that males gain more in reproductive success than females from repeated matings. They also asserted that males are more eager to mate and less discriminating when choosing partners than females are. Trivers (1972) was the first to suggest that because females invest more in their offspring, from the production of the egg to breastfeeding to the care they give throughout childhood and in some cases adolescence, they should be far more concerned about the quality of their offspring, and therefore be the choosier sex, requiring quality, indicated by genes and/or investment, in a mate and mate less readily than males. Trivers (1972) also felt that due to this imbalance of investment, the variance in reproductive success, and female choice, males should compete with one another for opportunities to mate with females, but females should not compete for males.

Hrdy (1981, 1997, 2000), Zeh and Zeh (2001), and Brown et al. (2009) argue against the singular view of females as coy and choosy and propose that females may employ different strategies in order to benefit their reproductive fitness. Hrdy (2000)

points out that females with fewer and less competitive options for mates do not have the luxury of being overly choosy and therefore, must employ other strategies to increase the quality of their offspring. This pattern has been seen across insect (Arnquist and Nilsson 2000), avian (Jenni 1974, Graul et al. 1977, Chao 1997), and mammalian species (Altmann 1980, Goldizen 1990, Schaffner and French 2004) and may manifest itself through extra-pair copulations (Gowaty 1985; Birkhead et al. 1987; Westneat et al. 1990; Palombit 1994) or through polyandrous mating. In fact, Griffith et al. (2002) show that extra-pair copulations are found in approximately 90% of bird species and that, on average, over 11% of birds' offspring are the result of extra-pair paternity. Evidence is mounting supporting the idea that both extra-pair copulations, which have been shown to result in greater number of fertilizations (Palombit 1994), and polyandry may be an active mating strategy that enhances female reproductive success for multiple animal species, as well as for humans (Zeh and Zeh 2001, Brown et al. 2009). However, Zeh and Zeh (2001) point out that polyandry as a pervasive feature of natural populations challenges this view of females as coy, choosy, and non-competitive because it suggests that females are actively seeking multiple mates and, as is the case with some non-human primates (Hrdy 1981) and undoubtedly in some groups of humans as well, females may be competing heavily with other females for access to the highest quality or most investing males. In order to fully understand human polyandry, it is important to take a closer look at the conditions under which it occurs among non-human species.

Avian polyandry

Chao (1997) classifies avian polyandry into two groups: classical and cooperative. The classical cases, also known as non-cooperative, occur most commonly

among birds and differ markedly from everything that is known about human polyandry. Typically, the females are larger and more aggressive than males (Jenni 1974). One female will mate with several males within a very short time span, with each male responsible for his own nest. After the female mates with and lays the eggs of one male in his nest, she leaves to regain the energy she lost during gestation and laying of the eggs and then finds another male to repeat the pattern with. Each male cares for his own set of eggs and for the chicks after they hatch, with females investing nothing beyond the laying of the eggs. These differences are important to highlight because they speak to the very different life history strategies of some birds from humans in that female birds are capable of producing multiple clutches in a short time period, whereas human females have long gestation periods and are incapable of producing multiple offspring in such a short amount of time.

Cooperative, also called simultaneous (Graul et al. 1977), polyandry among birds is much more similar to human polyandry. In these instances, a female pair bonds with more than one male and together, sometimes along with other females (although the males always outnumber the females), they provide for one nest and share parenting duties. Interestingly, in some species, such as the Tasmanian native hen, it is not uncommon for the cooperative males to be related. Graul et al. (1977) suggest that one of the reasons birds may practice cooperative polyandry is to deal with very scarce food resources. This is similar to a theory suggested for human polyandry and also relates to the need for “helpers at the nest” which was based on avian species and necessitates extra helpers to care for and provide subsistence for young (Emlen 1978).

Non-human primate polyandry

Polyandry among non-human primates is best known to be practiced by golden lion tamarins and marmosets (Schaffner and French 2004, Goldizen 1990), although female savanna baboons (Altmann 1980) have also been known to construct multiple male pair bonds through paternity confusion. All of these tend to be cooperative breeders, which supports Hrdy's (2000) general assertion that polyandry should be more likely to occur among cooperative breeders.

Among tamarins and marmosets, two or more males, each with substantial probability of paternity, communally rear the offspring of one female. Many similarities can be found between tamarin and marmoset polyandry and human polyandry. For example, Baker et al. (2002) found that coresident males were closely related in a majority of tamarin unions that he studied and Bales et al. (2006) found that groups with related males were more stable than groups with unrelated males. They also noticed that in a polyandrous union, there was almost always one dominant male, which had sole sexual access to the female while she was in estrus, while the submissive males were only allowed access when the female was not in estrus. These examples are particularly interesting because they will be seen as relevant trends in human polyandry.

Among all species there should be certain different circumstances for males than for females under which polyandry should increase one's reproductive fitness. Graul et al. (1977) suggested that among bird species, polyandry should be the best option for males when the benefits of parenting outweigh the costs, which would include giving up mating opportunities with other females. This should be true for males in all species, including humans. It should also be the case that for polyandry to be a lucrative choice

for human males, the benefits of sharing a wife with other men and caring for her offspring, for which paternity may be uncertain, must outweigh the costs associated with not marrying or mating. For men, polyandry is likely to be an instance of making the best of a bad situation, just as polygyny may be for women. Specific circumstances under which it pays for a man to make the best of a bad situation by engaging in polyandry include: a sex ratio skewed in favor of males, so that there aren't enough females for every man to have one mate; when an increase in paternal investment increases likelihood of child survival; when increased resources provided by the men could lead to a decrease in birth interval for the mother, thereby increasing her fertility and therefore the chance for all men to father at least one child; or when the men in the union can benefit their own inclusive fitness by providing for their brother's children.

Circumstances under which the benefit of polyandry should outweigh the costs for females are different because, as Symons (1982) pointed out for humans, confusion of paternity could possibly result in negative consequences, which may range from lowered or lack of investment on the part of the doubting male to infanticide or juvenilicide, for the female and her offspring. Wolff and Macdonald (2004) suggested that under the following circumstances, females stand to gain the most in terms of reproductive fitness: when confusion of paternity leads to decreased chance of infanticide; when increased genetic variability in offspring may lead to a better chance of some offspring, namely the ones with better genes, surviving in harsh environments; when mating with multiple males in a single reproductive cycle may lead to the best sperm winning out and therefore, better quality of offspring, as is the case among a group of small Australian marsupials (Fisher et al. 2006); when more males provisioning for one female and her

offspring should increase the health and survival opportunities of her offspring; and when mating with multiple males can guard against potential male infertility.

Human polyandry

In order to discuss the biological background of human polyandry, it is necessary to first examine the evolutionary underpinnings of the behavior and recognize that this behavior, like all others, has the potential to be an adaptation as well as to be adaptive. Symons (1992) suggests that a behavior is only an adaptation if at least one psychological mechanism was designed by selection specifically to produce it. An adaptive behavior, on the other hand, is one that may or may not have been specifically worked on by any type of selection, but that increases an individual's reproductive fitness.

The idea of polyandry as an adaptation is contested. Symons (1992) suggests that it is an adaptation only if "at least one psychological mechanism owes its form to the greater reproductive success of individuals who married polyandrously, in certain circumstances, in ancestral populations" (p. 147). He points out that the specific environmental features under which Crook and Crook (1988) have shown polyandry to be adaptive, such as agricultural estates, animal husbandry, primogeniture, monasticism, aristocracies, landlords, governments, and taxation, were not present in the environment of evolutionary adaptedness (EEA), and therefore, polyandry cannot possibly be an adaptation. He tries to make the point that due to the fact that humans quite likely did not evolve under such circumstances, a cognitive mechanism specific to polyandry could not have been formed, and therefore, polyandry could not possibly have been selected for in the EEA.

However, it is not polyandry that should be considered as an adaptation, but human pair-bonding and marriage. Pair bonding is a universal human trait, which is often expressed through the institution of marriage (Brown 1990). Although it is unclear which psychological mechanism was designed by selection to produce pair bonding or marriage, the fact that they can be found in nearly every known human culture, would suggest that such a mechanism exists, therefore, suggesting that pair bonding and marriage are in fact adaptations. Polyandry fits in because it is a form of these adaptations, along with polygyny, monogamy, and group marriage, to name a few, and as Crook and Crook (1988) and Smith (1998) argue, the ability of humans to be flexible with these different forms of pair bonding and marriage may also be an adaptation.

Crook and Crook (1988, p. 98) suggest, "The adaptive relationship between marital systems and their environments arise … because the behavior of the individuals comprising them is flexible with respect to the types of sexual union and labour imposed by contrasting systems." They do not attempt to argue that there is a psychological mechanism designed specifically to produce polyandry, or any other form of marriage, but instead that a cognitive mechanism was designed by selection that affords an individual a certain amount of flexibility, which "allows reproductively optimizing behavior to vary with context" (p. 99). In other words, it is not the differing forms that pair bonding and marriage take that are the adaptations, but marriage itself and humans' ability to adapt to their environment.

Smith (1998) agrees that polyandry may not be an adaptation, based on the likelihood that it cannot be linked to specific genes and "a dedicated polyandry-only cognitive mechanism" (p. 243). However, his logic is similar to that of Crook and Crook

(1988) when he argues that the facultative ability of humans to make decisions in an adaptive manner is the hypothesized adaptation, rather than polyandry itself. He goes on to suggest instead that a better explanation may be that polyandry is "an expression of one or more psychological mechanisms that allow humans to track local environmental conditions and vary mating and kin-affiliation strategies according to fitness-correlated payoffs" (p. 244).

Symons (1992) also argues that the data collected by Crook and Crook (1988) is not anthropologically significant with regards to the general practice of polyandry because the data do nothing more than show fitness benefits of polyandrous marriage in "certain highly unusual circumstances" (p. 147). As Smith (1998) points out, though, these circumstances (those listed above) may not be as unusual as Symons believes. If, rather than looking at them so specifically, these circumstances are put in more abstract terms like resource scarcity, protection of valuable land, kin cooperation, and parental control of mating choices, it becomes quickly apparent that some version of these circumstances exist around the world and could easily have been an issue in the EEA.

The fact that, as this thesis is going to show, of the fifty-two societies in this sample, forty-one hunter-gatherers and simple slash-and-burn agricultural groups are known to practice some form of polyandry offer strong arguments against both of Symons' (1992) main points. Modern foraging groups are often assumed to be the best living representation of how humans may have lived in the EEA (Tooby and Cosmides 1992), and many of these groups appear to be utilizing polyandry as either some type of long term insurance policy, which ensures that should the primary husband or father travel for long periods of time, be unable to procure enough resources to care for his

family, or die, another husband is available to provide protection, resources, and care, or as a possible solution to a shortage of women. Circumstances like these have undoubtedly existed throughout the evolutionary history of humans, which suggests that individuals would either need to develop a solution and make the best of a non-ideal situation or die out. Therefore, Symons' (1992) charges against the need for polyandry in the EEA, as well as his suggestions that Crook and Crook's (1988) findings were applicable only to an isolated incident appear wrong. It appears that there is adequate evidence, which will be presented in this thesis, to suggest that polyandry, along with all other types of marriage and pair bonding, may be an adaptation.

As for polyandry being adaptive, Crook and Crook (1988) gathered data that showed Tibetan polyandry maintains the fitness of males and females in the union, as well as the fitness of the grandparents of those in the union. Smith (1998) has used mathematical modeling to suggest that under some classical circumstances polyandry may benefit male reproductive fitness. It is important to acknowledge that polyandry may be adaptive in varying degrees, not only across different types of societies, but also for men and women. In other words, there may be different conditions for men than for women that should favor the practice of polyandry.

In Tibetan polyandry, as is the case for other classical societies, Goldstein's (1971) monomarital principle, which indicated that there is only one marriage per generation in a family, is related to the practice of primogeniture, in which valuable land and property are often passed down to the eldest brother. The subsequent brothers may do better by marrying the same wife as the oldest brother, therefore, benefiting from his inheritance, investing in children that are at least closely related if not their own children,

than they would do marrying monogamously or taking the risk of not marrying at all. In most non-classical societies, however, land and property inheritance are non-issues because there is very little of either to pass down. Therefore, an important motivating factor to marry or pair bond polyandrously may be offspring survival or quality, although the circumstances under which polyandry should be most beneficial are perhaps likely to hold true across classical and non-classical societies alike.

When considering potential benefits to males who practice polyandry, one of the major issues of importance is that the assumption is being made that men are making significant contributions to the household that directly or indirectly benefit the children. There is no question among the classical scenarios, in which men are responsible for nearly all of a family's food production, that the male contributions are very important to a child's wellbeing and that these contributions are made with parental effort as motivation. However, among foraging groups, this is an issue of great contention. While Lancaster and Lancaster (1983), Hewlett (1992), Hill and Hurtado (1992), Marlowe (2003), Geary (2000), Wood and Hill (2000), and Scelza (2010) have all argued the point that the contributions of fathers are of great importance to child survivorship and well-being and that these contributions are based on parental effort, Hawkes (1987, 1990, 1991, 1993; Hawkes et al. 1982; Hawkes and Bird 2002; Hawkes et al. 1991, 1997, 2001) counters that male provisioning, through hunting and with mating effort as their primary motivation, is a way for males to display their fitness, thereby increasing their future opportunities for sexual partners; this is known as the "show off hypothesis."

Hawkes tests her theory with the Ache of Paraguay (Hawkes 1987, 1990, 1991 and Hawkes et al. 1982) and the Hadza of Tanzania (Hawkes et al. 1991, 1997, 2001).

For the Hadza, she reports that a smaller percentage of calories brought in by males from big game hunting go to his family than to other families in the group. Hawkes suggests that this must indicate male intentions to increase mating effort, while disregarding parenting effort; several have argued against this assertion. Marlowe (1999) found that Hadza men both provide care as a parenting effort and provision as mating effort when a possibility to mate presents itself. Using a cross-cultural sample of hunter-gatherers, Marlowe (2001, 2003) also showed that male provisioning is benefiting females by enhancing their reproductive success and that male contribution to the diet becomes most critical when children are very young and females are unable to provision for themselves. He also found in this case that males are providing mostly honey to mothers of infants, which is a less widely shared resource, suggesting no intent to "show off." Wood (2006) found that the Hadza men and women share interest in the value of family provisioning. Finally, Gurven and Hill (2009) argued that there is little empirical support for the idea that men hunt for signaling benefits alone; in reality their intentions are far more complex.

Hawkes et al. (2010) also argue that if Ache men were truly interested in providing for their families, they would focus less on meat, which is an irregular and uncertain resource, and more on a more calorie-dense resource, like palm starch. Wood (2000) again found that the reported intent of Ache males was to provision for their families rather than increase their prestige within the group. He also found evidence to suggest that while men may begin their careers as show offs, they seem to shift their focus to provisioning for their families once they have a wife and children. Hill and Hurtado (1992) do not address the intent of Ache men, but the outcome of the loss of a

father. Strong evidence suggests that Ache children with multiple fathers are far more likely than children with one or no fathers to live to reproductive age. Furthermore, if a child's primary father dies, the secondary father(s) step in to provide the child with subsistence and play the role of father. The secondary father may also protect against infanticide and juvenilicide, both of which have been known to occur among the Ache (Hill and Hurtado 1992).

For the purposes of the discussion of polyandry, the intentions of fathers, whether they be to show off, to provide for their families, or somewhere in between, are not as important as their actual behavior and its outcomes. Although it is unlikely that the effect of fathers will ever come close to the effect of mothers (Sear and Mace 2008), evidence exists across cultures suggesting the role of fathers in egalitarian foraging societies is important to the survival, quality, and well being of their children. In order for polyandry to have an adaptive component, multiple fathers must provide more of a benefit to the survival and quality of offspring than a single father, which presupposes that one father must offer a benefit greater than zero. One of the contributions of this thesis will be to examine in more detail what the fathers in polyandrous unions are really doing.

Instability of Polyandrous Unions

While it there are certain circumstances under which it appears that polyandry may be adaptive for men, like those that suggest it is necessary for men to make the best of a bad situation, fluctuations of these circumstances such as an increase in available women may lead to instability in the unions. Levine and Silk (1997) suggest that there are certain stressors in a polyandrous union that lead to instability: tensions among co-husbands; disparity in age among wives and secondary husbands; and non-fraternal

relationships among the co-husbands. Levine and Silk (1997) argue that fraternal polyandrous unions should be more stable than non-fraternal polyandrous unions. Levine and Silk (1997) also questioned the Nyinba about factors that may cause their polyandrous unions to dissolve, and include those reasons as well.

According to Levine and Silk (1997), tensions among co-husbands may be the result of a number of situations, including the dominance of the first husband over the secondary husbands. In other words, the first husband is typically the head of the household and is able to exercise dominance and control over his co-husbands, and the level to which he does this may have some effect on tensions within the co-husband relationship and, ultimately, the stability of the marriage. Dominance or control over land rights and access may be a concern for secondary husbands, although not as great a concern as dominance and control over access to the wife. It has been reported among several groups, including the non-classical Pawnee (Lesser 1930), that the first husband monopolizes the wife sexually, with the secondary husbands gaining sexual access only when the first husband is away or when the wife is not thought to be ovulating.

Disparity in age among wives and secondary husbands may be a problem either for reasons of male choice or female reproductive capability (Levine and Silk 1997). Buss (1989) found that cross-culturally, men prefer women who are younger than themselves, which he attributes to an evolutionary shaping of human psychology. Also, due to the fact that men remain fertile much longer than women, a husband who is much younger than his wife may be concerned about her ability to produce children in the future.

As might be expected, it appears that unions in which the co-husbands are brothers are more stable than unions in which they are not. This is supported by kin selection theory, which predicts that unreciprocated altruism will be restricted to kin, therefore, making the degree of relatedness among males who share access to a wife very important (Levine and Silk 1997). So, based on the kin selection theory, brothers are more likely than non-brothers to help each other, to cooperate economically, and to provision for each other's children, among other things, because of inclusive fitness gains. These fitness gains occur if a man is investing in a child that is biologically either his or his brothers, the child will be related to him by .25 at a minimum, therefore, he is increasing his own fitness.

Finally, when asked by Levine and Silk (1997) which factors may undermine polyandrous marriages and lead to their dissolution, the Nyinba, a polyandrous group of ethnic Tibetans living in Nepal, mentioned the following: size of sibling group; closeness of kinship among co-husbands; extent of landholdings or ease of access to reclaimable land; success of the relationship with the common wife; and presence or absence of "own children" within the marriage. All of these reasons have the potential to negatively affect the reproductive fitness of the co-husbands. The first three likely fit in with Levine and Silk's (1997) suggested stressors "tensions among co-husbands" and "non-fraternal relationships among the co-husbands," while "success of relationship with the common wife" is related to Levine and Silk's (1997) "disparity in age among wives and secondary husbands."

It seems that polyandry is a far more unstable form of marriage or union than is polygyny, although there are no exact numbers to do a proper comparison. Assuming

this disparity in stability is true, what is it about polyandry that is causing this? What makes polyandry so unstable, compared to polygyny? It serves to reason that some of the major stressors reported for men in polyandrous unions would be similar for women in polygynous unions. For example, it is known that the first wife is typically of a higher status in the marriage than the secondary wives and commonly is in a position of power over the other wives (Josephson 2002). Also, Jankowiak et al. (2005) show that non-sororal polygyny is related to stress and dissatisfaction in the union for females, just as Levine and Silk (1997) suggest non-fraternal polyandry should be for males. So, why do more polyandrous unions than polygynous unions dissolve? One explanation may be that men in polygynous societies have the social resources or physical power to force women to stay. However, it simply may be that men stand to lose more by being a secondary husband in a polyandrous marriage than women stand to lose by being a second or third wife in a polygynous marriage. This can be illustrated by examining the differential effect on reproductive fitness of Levine and Silk's (1997) stressors on men and women.

There are three primary ways in which a man's fitness may be effected differentially from a woman's. First, it is known that the sexual access of husband to wives is typically controlled by the husband, not by the first wife (Strassman 1997). Second, as discussed above, due to the longer period of reproductive ability of men, as compared to that of women, younger co-wives should be less likely to be concerned with disparity in age from their husband than young co-husbands should be with their shared wife. Within reason, and an exception might be found among the Tiwi of Australia (Hart et al. 1988), an older husband should be sufficiently capable of impregnating his wife and therefore, she does not experience such a risk to her fitness as a younger husband with an

older wife might. Finally, when conditions are stable, women are available, and resources are not depleted, it makes sense that male fitness would suffer in a polyandrous marriage. While it is true that female fitness has been known to suffer in a polygynous marriage (Josephson 1993), and that a woman could do equally as well or better with regards to reproductive fitness in a monogamous marriage, just as a man would, again, women do not stand to lose as much as men. Consider the fact that a female has a finite number of offspring that she is capable of producing and the fact that her biological capabilities are not necessarily based on how many husbands she has. A male's reproductive abilities, however, vary greatly across types of marriage or unions, and are limited (again when all else is equal and when male infertility is not an issue) by women. A man in a polygynous union can father as many children as all of his wives are capable of mothering. A man in a monogamous union will be limited to only the number of children his one wife can produce, assuming he is faithful. But a man in a polyandrous union, especially if he is a secondary husband, may not father any children with his wife at all, due to his co-husbands' monopolization of her reproductive abilities. Therefore, while women's reproductive fitness is undoubtedly an important factor to consider in the discussion of polyandry, which this thesis will do, it seems that the stability of the union may be greatly affected by male concerns for limitations of reproductive fitness.

Jealousy may also affect the stability of a polyandrous union. Jealousy has been labeled as a psychological adaptation that functions to keep one from losing the resources provided by one's partner (Daly et al. 1982; Wiederman & Allgeier 1993; Buss et al. 1992; Buss & Haselton 2005). While females are at risk of losing protection and provisioning from a male partner, males are at risk of losing sexual access to their female

partner, or worse, of being cuckolded and providing resources for children that are not their own. Jealousy may lead to mate protecting behaviors, including coercive constraint of female sexuality through the threat of male violence (Daly et al. 1982), and this may be due largely to paternity uncertainty. Daly et al. (1982) suggest that sexual jealousy functions to defend paternity confidence and, therefore, should be a male adaptation. Buss et al. (1992) confirm empirically that males have been found to be more jealous than females over sexual infidelity committed by their spouse, and studies by Wiederman and Rice Allgeier (1992), and Buss and Haselton (2005) support this idea. In a polyandrous union, co-husbands must deal with the fact that their wife is allowed some sort of sexual access to each of them (amount and timing of sexual access varies greatly across cultures), and that children born within the union may or may not belong to a specific husband. In light of this and based on kin selection theory as discussed above, more sexual jealousy, and therefore greater instability, would be expected in the case of non-fraternal polyandry, while less sexual jealousy, and subsequently less instability, should be found among fraternal polyandrous unions.

Human females provide a different set of trade-offs than males. The Ache (Hill and Hurtado 1992) and the Barí (Beckerman et al. 2002), as well as several of the classical cases, provide excellent examples of how increasing the number of provisioning men would benefit a woman and her reproductive fitness. However, Symons (1982) suggested that confusion of paternity would lead to diminished paternal investments or even to infanticide. He questioned, “Why should a female be better off with … three males, each of which invests one-third unit [than] with one male which invests one unit?” He concluded that there is “no evidence that women anywhere normally tie up multiple

male parental investments by confusing the issue of paternity." One notable flaw in this argument is Symons' assumption that a woman only receives one unit of investment, no matter how many males are investing. There is no evidence to suggest that each of three males wouldn't invest three-fourths or one whole unit each. Hrdy (2000) countered Symons, suggesting that increased confusion should lead to investment by all possible fathers, especially if the man, or men, in question are brothers. This is illustrated especially well by partible paternity societies and by the high frequency of related males in polyandrous unions across species and across human cultures. Hrdy (2000) also argues that paternity confusion should be more likely to lead to investment by all fathers in communal breeding societies. This should be due to the fact that mothers need help to successfully rear offspring, therefore, it may benefit males more to invest than to seek other mating opportunities.

Hrdy (2000) also suggests that polyandrous behavior is far more common than the percentage suggested by the *Ethnographic Atlas* (1967), which she attributes to mothers "making do." Hrdy argues for a lack of evidence or strong theoretical basis for assuming that women's sexuality or their sexual attractiveness evolved to ensure male provisioning after birth, citing as evidence a woman's increased libido during pregnancy, decreased postpartum sexual desire and men's concurrent lack of attraction to pregnant women. Interestingly, this increased libido early in pregnancy may support the idea that human females have evolved to generate paternity confusion, and therefore offer further evidence for the utility of partible paternity. In other words, if human females evolved with low male provisioning after she gives birth, her best bet may be to confuse paternity, thereby enlisting help from more than one man. Mating with multiple men may also

offer a woman the opportunity to increase the quality of her offspring through sperm competition.

Hrdy (2000) makes several important points, but focuses a great deal on female autonomy and polyandry as an expression of that. She points out that in very few societies do females have full autonomy, therefore, making "informal" (her version of the term) polyandry far more common than the type of "formal" polyandry, which is practiced among the classical societies. This means that due to a lack of autonomy in marriage decisions, along with a lack of total control over her own sexuality may leave a female with only indirect methods of controlling which genes her offspring get and how much the potential fathers will invest in her and her offspring. This thesis will attempt to look into female control in all of the known polyandrous societies, however, given that this is a sparsely discussed topic, female control may be excellent grounds for future research.

Theories on Polyandry

Given the relative rarity of polyandry, it is no surprise that a number of theories have been proposed that attempt to explain the circumstances under which polyandry might be more likely to occur. Also, not surprisingly, the majority of these theories have been developed based mostly on what was known about the classical polyandrous societies. While one or two apply only to classical cases, referencing specific conditions of classical societies, others are not as particular and may be discussed in reference to the non-classical cases as well. The theories are related to four different factors: land and property division, operational sex ratio, economic issues, and husband absence.

One theory that appears numerous times throughout the literature and has been suggested in different ways by several different scholars is the land division theory. The basic idea behind this theory, as Cassidy and Lee (1989) explain, is that among the classical societies, in which land inheritance is a common practice, the marriage of all brothers in a family to the same wife allow plots of family-owned land to remain intact and undivided; if each brother were to marry his own wife, the land would be fractioned to accommodate each couple, eventually resulting in very small or non-existent pieces of land for future sons and their families. Such is one of the main purposes for Sri Lankan polyandry, as Tambiah (1966) suggested that polyandry helps preserve parcels of land. Chandra (1987), Majumdar (1962), Parmar (1975), and Saksena (1962) similarly argue that polyandry in India leads to less land fragmentation, and Goldstein (1978) reports that, among ethnically Tibetan people in the community of Limi in northwestern Nepal, polyandry is practiced to avoid dividing family estates. He argues that this might also help to solidify wealth and class advantages, especially when external economic opportunities are limited. Alexander (1974) takes a somewhat different approach, suggesting that polyandry is related to low and reliable productivity of farms, with more men providing for a low number of children while maintaining a plot of land.

The issue of land division is an important one to consider in state-level, agricultural societies, like India and Nepal, and polyandry offers a logical solution. However, in band-level, foraging societies or egalitarian tribal societies that practice little more than slash and burn horticulture, families rarely, if ever, own land and own very little personal property, making inheritance a non-issue. Therefore, land division cannot possibly be a concern that would lead most non-classical societies to turn to polyandry.

Although, if land division is examined in broader terms, as Smith (1998) suggests might be useful, and discussed as limited land and resource availability, it would not be out of the question at all to suggest these as common correlates amongst even the smallest scale polyandrous societies.

Westermarck (1926) proposed a set of coexisting predictors for polyandry across different types of societies, including skewed sex ratio favoring males, resource limitations, geographical circumscription, and prolonged absences of husbands from home. Interestingly, nearly all of these factors have since been suggested by numerous other scholars, for both classical and non-classical cases of polyandry, however, the most commonly recurring theories have been skewed sex ratio, resource limitations, and prolonged absences of husbands from home.

Availability of women, or lack thereof, seems to play an important role in several polyandrous societies. An imbalanced sex ratio may originate at birth, with more females being born than males, which the Trivers-Willard Hypothesis (Trivers and Willard 1973) suggests should occur under conditions of environmental strain and scarce resources. Preferential female infanticide may also result in a higher infant ratio of males to females, as is the case among many of the Inuit groups in this study (Balikci 1967; Kjellstrom 1973) as well as the Yanomamö (Chagnon 1968). A shortage of marriage-aged females may also be the result of a prevalence of polygyny in a society, adult female abduction, greater adolescent and adult female mortality rates, or females marrying up, choosing either older men with more prestige and resources or men from more socially complex neighboring groups. Whether the imbalanced sex ratio occurs at birth or later in life, a shortage of females and surplus of males poses a reproductive problem for the males of

the society, for which polyandry offers a possible solution. In some cases, entering into a polyandrous union may be a better option for men than entering into no union at all. Among the Pahari, a classical polyandrous group in Northeastern India, the only notable difference that set them apart from the neighboring monogamous Garhwal was a chronic, drastic sex ratio imbalance (Berreman 1962). And, as Kim Hill (2008, personal communication) reported for the Ache of Paraguay, and Peters and Hunt (1975) reported for the Yanomamö, when there were not enough women to go around, it was not uncommon for a younger brother to temporarily marry into his older brother's family as a co-husband. It serves to reason, then, that a chronic imbalance in a society may lead to more stable polyandrous unions, and a general societal trend that endures over generations, while a variable sex ratio should result in less stable, more impermanent unions.

A limited economy with a restricted carrying capacity (Crook and Crook 1988) has also been suggested to contribute to polyandry and, as suggested previously, may also be related to land division in the classical cases. As Cassidy and Lee (1989) explain, polyandry is an extremely effective means of controlling population growth, as multiple men with the same wife will produce a much smaller number of offspring than the same number of men, each with their own wife. In cases where the land can only support a low-density population, such as one with limited or unpredictable resources, polyandry may provide an institutionalized way to keep growth in check (Chandra 1987; Majumdar 1962; Parmar 1975; Prince Peter 1963; and Saksena 1962). Polyandry in an area of limited resources may also provide much needed extra help from the additional husbands and fathers (Hill and Hurtado 1996; Hrdy 2000; Tambiah 1966), especially in the form of

providing subsistence and protection for mothers and children. While there are countless societies all over the world with limited resources, polyandry may be just one way of dealing with a few of the problems such an economy may produce.

Prolonged absences of husbands, especially first husbands, from home has been reported among classical polyandrous societies in Sri Lanka (Tambiah 1966) as well as the non-classical Pawnee of Native North America (Lesser 1930). A benefit of having a second or third male in the union, who are typically brothers of the first male, is that when the first husband is absent for long periods of time, the others can remain at home to provide and protect for the wife and their children. It may also be a way to decrease the chances of the female being unfaithful while the first husband is away.

Cassidy and Lee (1989) also suggest that "a relatively limited role for women in the productive economy" (p. 6) often coincides with polyandry, although, they base this mostly on the conditions in the classical cases. The idea here is not that women do not contribute anything to the economy, but simply that a family may not benefit from having more than one woman in the household, as is the case with Inuit groups. Therefore, as Cassidy and Lee (1989) discuss, polyandry should tend to be found among groups in which males dominate the major subsistence or food producing activities and in which one female should be able to adequately perform all of the necessary female duties.

This thesis will also examine two new theories, which are based on previous theories, as well as preliminary research (Starkweather 2009). The first might be called the Male Absence Hypothesis. Although the issue of prolonged absences of the primary husband has been addressed, death, another type of absence, has not. In the case of the death of a primary husband, a secondary husband would step in and take over the role of

primary husband, therefore assuming the responsibilities of protecting and provisioning for his wife and her children. In a society that has either chronically high adult male mortality, such as in the case of the Netsilik Eskimo (Balikci 1967), or in which male mortality is unpredictable but an ever-present threat, as is the case in many societies that engage in warfare on an irregular basis, polyandry may be the best option for both males and females. In the case of females, having two husbands who are more often than not brothers or close relatives, could ensure a rapid replacement of the primary husband by another man who has already been investing in the wife and her children, which means that there will be no lapse in protection or provisioning for by a male and may also decrease the chances of infanticide or juvenilicide by the hands of an unrelated male, as is the case for the Ache (Hill and Hurtado 1996). The secondary husband may also be related to some or all of the woman's children, which may increase the likelihood that he will continue to protect and provide for them. Males may benefit from this scenario in one of two ways. First, if the male in question is the primary husband and his wife has a secondary husband who is interested in the well-being of her children, any children the primary husband may have fathered with her may be more likely to live to reproductive age, thereby increasing the dead primary husband's reproductive fitness. Second, if the male in question is the secondary husband, his own reproductive fitness will benefit as he continues to care for his own children and his inclusive fitness will benefit as well if he cares for his brother's children.

The next theory might be called the Father Effect Hypothesis. In the majority of societies in which polyandry is allowed, the presence of one or more fathers should be beneficial to the likelihood of their children surviving to reproductive age. At the most

basic level, in order for polyandry to be adaptive for both the males and the female, at least one of the fathers must have a positive impact on the ability of their wife's children, and presumably theirs as well, to survive and reproduce. This impact may come in the form of protection in a society that has a high instance of violence, raiding, or warfare. It may also come in the form of subsistence provisioning, as is the case for the Ache (Hill and Hurtado 1996), or as Scelza (2010) found, in the effect the presence of a father has on his son's eventual ability to find a wife. In societies that have a high rate of adult male mortality, it may be possible for only one husband to be immediately necessary, while the other husband or father serves as a sort of insurance policy should the primary father die. However, for many of the societies in which adult male mortality is less of an issue, more than one husband should positively affect the chances of child survival.

Hypotheses

Based on the theories that have been outlined above, five major sets of hypothesis will be tested for this sample of fifty-two non-classical polyandrous societies: the Imbalanced Sex Ratio Hypotheses; the Prolonged Male Absence Hypothesis; the Adult Male Mortality Hypotheses; the Male Economic Production Hypothesis; and the Father Effect Hypotheses. As mentioned before, nearly all of the theories about polyandry were developed with the classical polyandrous societies in mind. However, factors such as a scarcity of marriageable women, prolonged absence of husbands, or the contribution of men to the subsistence economy, may also be contributing factors in the non-classical polyandrous cases. The aims of these hypotheses are to better understand some of the main factors that are related to the practice of polyandry and to lead to a more complete understanding of polyandry in general.

Imbalanced Sex Ratio Hypotheses. Both classical (Berreman 1962) and non-classical (Kim Hill, personal communication) societies have offered skewed sex ratio as a possible reason for polyandry being practiced at a given time. In some cases it appears that a surplus of men is a temporary situation, while in others the imbalance, favoring men, is a constant and endemic problem that may begin at birth and continue over several generations. In order to better understand how the demographic situation of the non-classical societies is related to their polyandrous behavior, this thesis will test two hypotheses related to sex ratio imbalance. The first hypothesis is: *Overall, non-classical polyandrous societies should have sex ratios, whether at birth or in adulthood, that are skewed in favor of males.* The point of testing this hypothesis is to show that a surplus of men plays a major role in the practice of polyandry for non-classical societies. The second hypothesis is: *Societies with unstable polyandrous unions should be negatively correlated with an adult sex ratio that is skewed in favor of males*. This hypothesis suggests that an imbalanced population, with more marriageable males than females, should increase the stability of the union, due to a lack of available females. Conversely, when females are available, polyandrous unions should be less stable because the males should choose to have their own wife whenever possible.

Prolonged Male Absence Hypothesis. Westermarck (1926) hypothesized that prolonged absences of husbands from home should be a predictor of polyandry, and Lesser (1930) and Tambiah (1966) have shown that this circumstance is indeed found in some polyandrous societies. As discussed above, the reasoning behind this idea is that a secondary husband should guard the wife and provide for her children and, based on kin selection theory, this would be most beneficial to both husbands if they are brothers.

However, when prolonged male absence is prevalent in a society, polyandry as a mate guarding strategy may also be beneficial to both men in the union even when they are not related. While inclusive fitness would not be a source of motivation for the co-husbands to stay in the union and protect and provision for children that may not be related to them in any way, the secondary husband would benefit from caring for the wife and children while the primary husband is away because the secondary husband would be allowed sexual access to the wife, therefore increasing his chances of fathering a child of his own. The secondary husband may also benefit from the union by demonstrating to other women that he is capable of caring for a wife and family and is a desirable mate, which could increase the likelihood of him securing a wife of his own. Likewise, the primary husband would benefit from returning from his absence and investing in children that are not, or may not be, his own because the presence of the secondary husband, who protected the joint wife, ensures that the primary husband has a wife and his own children to return home to, and that were not abducted or killed.

For the majority of societies in which prolonged male absence occurs, though, the strongest motivating factor in the practice of polyandry should be inclusive fitness and therefore, it is expected that the majority of prolonged male absence societies should practice fraternal polyandry. In order to find out whether or not this theory is supported, this thesis will test the following hypothesis: *Fraternal polyandry should be positively correlated with prolonged male absences.*

Adult Male Mortality Hypotheses. As discussed above, high incidence or threat of adult male mortality may function in much the same way as prolonged male absence. If women in a society are at risk of losing a husband, and children their father, polyandry

may be a type of insurance policy, to ensure that a man who already has an interest in the wellbeing of the woman and her children is prepared to step into the role of primary father. Based on this line of thinking, this thesis hypothesizes: *Overall, adult males in non-classical societies should have high mortality rates.* Also, and again similarly to the Prolonged Male Absence Hypothesis, this should be an especially useful strategy when the men are brothers. Therefore, the following hypothesis will be tested: *Fraternal polyandry should be positively correlated with high adult male mortality.*

Male Economic Production Hypothesis. Cassidy and Lee (1989; see also Alexander 1974) suggested that polyandry should be found among societies in which men dominated economic production. While this may be mostly true for the classical societies in which men were responsible for the majority of the agricultural work, it is unclear whether or not this will be the case for many of the non-classical, horticultural or hunter-gatherer societies. While most of the classical societies share geographical and environmental conditions, the non-classical cases are spread around the globe and are located everywhere from the Amazon Rainforest, to the top of the Arctic Circle, to the Great Plains of the United States, and into the Kalahari Desert in Africa, and face extreme differences in climate, available resources, and environmental change. However, when the economy is such that men produce more resources than women, as is the case with all of the Inuit groups as well as the Ache and several other South American groups, women and children may benefit significantly from having more than one man invest in them. Therefore, Cassidy and Lee's (1989) hypothesis will be tested among non-classical societies: *Overall, non-classical polyandrous societies should have economies in which men contribute more to the subsistence economy than women.*

Father Effect Hypotheses. Based on the theoretical perspective outlined above, in the majority of non-classical polyandrous societies, the presence of a father should have a significant effect on the survival and eventual successful reproduction of his children. Therefore, this thesis hypothesizes: *On average, non-classical polyandrous societies should show a father effect for the offspring.* The effect of fathers should be especially high in societies in which the males are responsible for most of the economic production. Put another way, the loss of a father would be greater for a child if that father is producing most of the child's calories than if the calories are also coming from the mother or another source. Therefore, the following hypothesis will be tested: *The presence of a father effect should be positively correlated with high male economic production.* Also, based on the idea that a positive father effect should benefit the fitness of not only the father, but the mother as well, it may mean that all parties involved would be less likely to leave the union. This thesis hypothesizes: *The presence of a father effect should be positively correlated with stability of the union.*

Chapter 2

Methods

This section will provide the criteria used to select cases for this study, based on the definition of polyandry. In order to be considered polyandrous and included in this study, a society must have at least one account in the literature of a polyandrous union taking place and the union must meet the criteria outlined in this section. In the introduction, the following factors were argued to be responsible for leading a group to practice polyandry: imbalanced sex ratio, high adult male mortality, prolonged male absence from home, land and resource scarcity, low female contribution to the subsistence economy, and effect of father presence on survival and reproduction of offspring. This section will also include a description of each of the variables collected to test the contribution of these factors to the occurrence of polyandry in the societies of this study.

The cultures used in this study were found through extensive literature searches, the eHRAF, and personal communications. While there were a number of groups returned from the search, these specific ones were chosen based on a set of criteria so that they supported the definition of polyandry: *the simultaneous bond of one woman to more than one man in which all parties involved have rights or responsibilities toward each other and toward any children that may result from the union*. First and foremost, when searching for cultures to include, the author's classification of type of union was taken into consideration; in other words, did the author classify any of the unions practiced by the group as polyandrous or refer to the belief of partible paternity? Without some sort of initial label of polyandry assigned to a culture or group, it would be extremely difficult to

locate such a group. However, this classification alone was not sufficient for group inclusion in this study. Presence of marriage within the polyandrous marriages was taken into consideration. Presence of marriage of all male parties to the female in the union indicated an instance of formal polyandry, and groups that fit this criteria were coded as such.

If, however, the unions did not always involve marriage among all individuals, as was the case with some partible paternity societies and other informal polyandrous groups, other conditions needed to be met in order for the group to be categorized as a case of informal polyandry and be included in this study. The following are the set of criteria used to determine whether or not a specific case should be classified as informal polyandry: more men than women involved in the union, the unions occur simultaneously, the woman recognized more than one man as her husband or biological fathers of her child in partible paternity cases; the woman's first husband, assuming she is considered to be married to at least one man, knows about the other men and recognizes them as her legitimate partners or potential fathers of her children; societal acknowledgement of the union(s); all of the men in the union have institutionalized rights and or responsibilities, which includes sexual access to the woman by the men and expectations and responsibilities of provisioning and protection, towards the woman and her children. Cases must meet every one of these criteria in order to be included in this study.

A quick note on two types of cases that were not included in this study. As mentioned, cases of both group marriage and serial polyandry were excluded from this study. In either case, the unions could just as easily be classified as polygyny or in some

other way, such as serial monogamy, presenting a difficult classificatory problem. Serial polyandry also poses another problem: every culture that allows divorce and requires the ex-husbands and fathers to continue providing for their children in some way may be considered polyandrous. The purpose of this thesis is not to examine such a complex circumstance, although it would be a very interesting topic for future research, therefore, it is left out. In order to determine group marriage, the following two questions were asked: Were men simultaneously married to, or in socially recognized unions with, more than one woman while women were simultaneously in marriages or unions with more than one man? Were there an equal number of or more women in the marriage or union than there were men? If the answer to the first question was "no," the group may be considered polyandrous and may be included in the study. If the answer to the second question was "yes" the union was considered to be a group marriage and was excluded from the study. Simultaneity of the union was also considered, in that if the union of one woman to more than one man occurred simultaneously, it could be considered polyandry, but if the unions were successive and not simultaneous, they were excluded.

Based on these exclusion criteria, several cases were not included in this study despite the fact that the researcher or author labeled them as polyandrous. The Kogi of South America (Reichel-Dolmatoff and Muirden 1949, p. 229), the Iroquois of North America (Morgan 1901, p. 270), the Pimbwe of Tanzania (Borgerhoff Mulder 2009), and the Yapese of the western Pacific Ocean (Salesius 1906, p. 140) were excluded because they all represent some form of serial marriage and cannot clearly be categorized as polyandry. The Ainu, an indigenous Japanese people, were excluded because they seem to have been practicing group marriage, in which a set of brothers married a set of sisters

(Bachelor 1927, p. 133). The Comanche (Wallace 1953, p. 138-139) were also not practicing polyandry based on the definition used for this study, but instead a sort of fraternal group marriage, in which brothers and their wives are known to cohabitate and all wives are thought to belong to all of the brothers. The cases of Inuit spouse exchange (Burch 1975, p. 106; Damas 1972, p. 31, Kjellstrom 1973, p. 157), in which two unrelated men and their wives exchanged spouses for periods of time, were also excluded. This is an interesting form of marriage in that it serves to form alliances beyond kinship and functions as a type of insurance policy for both families engaged in the exchange (Kjellstrom 1973, p. 157). Any children born after the couples have been merged typically refer to both men as 'father.' While spouse exchange is commonly thought of as an Inuit practice, the Ga'ddang in the Philippines have also been known to practice it (Wallace 1969, p. 183), as have the Chuckchee of Russia (Bogoras 1909, p. 457 & 603-604). Spouse exchange may either be considered to be a form of group marriage, as the number of women in the union always equals the number of men, or a marriage form all its own. Several groups were described as practicing polyandry by the authors who wrote about them, but upon closer inspection, and according to the definitions of polyandry used in this thesis, they were actually cases of cicisbeism. These groups included the Bapedi (Junod 1962, p. 99) and the Boers (Theal 1887, p. 19) of southern Africa, the Malagasy of Antangena (Sibree 1880, p. 253), the Nunamiut (Pospisi 1964, p. 411), and the Santa Cruz Islanders (Davenport 1964, p. 63).

Based on the aforementioned criteria, these are the fifty-two societies that are included in this study: !Kung, Ache, Aleut, Alutiiq, Aymara, Bahuma, Bang Chan, Barí, Blackfoot, Canarians, Canela, Cashinahua, Cherokee, Chuuk, Copper, Cubeo, Dieri,

Gilyaks, Hawaiians, Hephthalites, Innu, Kulina, Lele, Maasai, Mackenzie River Eskimo, Malekula, Mehinaku, Mongolians, Nayar, Netsilik, Northern Nigerians, Northwest Alaskan Eskimo, Paliyans, Panoan Matis, Paviotso, Pawnee, People of the Lamotrek Atoll, Point Hope, Polar, Pomo, Punan, Sakai, Semang, Shoshoni, Southern Australians, Subanu, Tikerarmiut, Tlingit, Utes, Yanomamö, Yokut, Zo'e.

With these groups, and based on the hypotheses that were outlined in the introduction, information on the following variables has been collected: sex ratio at birth, or shortly thereafter; sex ratio at the time of the union(s); rates of adult male mortality; prolonged male absence; male relationship; type of economy; resource scarcity; land availability; female subsistence contribution; father effect; and stability of union. In the following paragraphs, these variables will be discussed in relation to the hypotheses they will be used to test. Criteria used to operationalize each variable will be outlined and the statistical tests used to test they hypotheses will be discussed.

Imbalanced Sex Ratio Hypothesis

In order to test the first Imbalanced Sex Ratio Hypothesis, frequencies will be run for the variables *sex ratio at birth* and *adult sex ratio* in order to understand whether or not skewed sex ratios are common among polyandrous societies. A non-parametric chi-square will then be conducted on both variables in order to determine if the occurrence of more males than females in a society is statistically significantly different from that of either more females than males or equal number of males and females.

The second Imbalanced Sex Ratio Hypothesis will be tested using a chi-square test of independence to determine the relationship between the variables *adult sex ratio*

and *stability* (measured on a five-point Likert scale and discussed in more detail below). The bivariate chi-square test of independence will also be compared across different sub-populations in this study, including type of polyandry, social stratification, economic strategy, and male relationship. These comparisons will allow a closer look at how adult sex ratio and stability relate differently for formal and informal polyandrous groups, groups of different stratification levels, groups with different economic strategies, and groups that practice fraternal and non-fraternal polyandry.

Sex ratio at birth. The variable *sex ratio at birth* will be used to test the Imbalanced Sex Ratio Hypothesis and will help explain whether or not an imbalanced sex ratio at birth is correlated with a society's practice of polyandry. Demographic data of societies' sex ratios at birth was rarely available for many of the populations, therefore, will not be included in the analysis. However, when available, specific demographic information will be included in the case studies below. For this variable, accounts of sex ratio at birth in the literature will be used and will be coded with a 1 when the author indicates that the sex ratio is skewed in favor of males, or if the author indicates an exact number, there should be more than 110 males for every 100 females, due to the fact that a normal sex ratio at birth is 104 males for every 100 females; a 2 will be used when the author indicates either no or minimal skewing, which should be between 100 and 110 males for every 100 females; a 3 will be coded when the author indicates a skewing that favors females, or when there are less than 100 males for every 100 females; and a code of 0 will indicate that there was no information available regarding sex ratio at birth.

Adult sex ratio. The variable *adult sex ratio* is also critical to testing the Imbalanced Sex Ratio Hypothesis. Rather than describing an imbalance that occurs at

birth, though, this variable will directly record the operational sex ratio, or the ratio of men to women at the time the union is occurring. The data for this variable will be recorded in the same manner as for the variable *sex ratio at birth*. Specific demographic information will be included in the case studies below. Again, 1 will be used when the author indicates that the sex ratio is skewed in favor of males, or when there are more than 100 males for every 100 females, 2 when the author indicates either skewing, with 100 males for every 100 females, 3 when the author indicates a skewing that favors females, with fewer than 100 males for every 100 females, and a code of 0 will indicate that there was no information available regarding sex ratio at the time of the union.

Prolonged Male Absence Hypothesis

In order to test this hypothesis, first a non-parametric binomial test will be conducted on the variable *prolonged male* absence in order to determine whether or not a statistically significant difference exists between societies in which males are absent for long periods of time and societies in which males are not absent. Next, a chi-square test of independence using the variables *prolonged male absence* and *male relationship* will determine whether or not a significant association between the two variables exists. The bivariate chi-square test of independence will also be compared across different sub-populations in this study, including type of polyandry, social stratification, economic strategy, and male relationship. These comparisons will allow a closer look at how prolonged male absence and male relationship are differentially associated for formal and informal polyandrous groups, groups of different stratification levels, groups with

different economic strategies, and groups that practice fraternal and non-fraternal polyandry.

Prolonged Male Absence. This variable will be used to test the Prolonged Male Absence Hypothesis. It will measure the likelihood of one or more males being away from the family's primary residence or away from the wife and children for long periods of time. This variable will be categorical and will be coded in the following ways: 1 will indicate that prolonged male absence was mentioned in the literature; 2 will indicate that the literature suggested males were present nearly all of the time; 0 will indicate that there was no information regarding either male absence or presence in the literature.

Adult Male Mortality Hypotheses

In order to test the first Adult Male Mortality Hypothesis, frequencies will be run for the variable *adult male mortality* in order to understand whether or not most of these fifty-two non-classical polyandrous societies experience high adult male mortality. A non-parametric binomial test will then be conducted on the variable in order to determine if the number groups with high adult male mortality is statistically significantly different from the number of groups in which it is not.

In order to test the second Adult Male Mortality Hypothesis, a chi-square test of independence, using the variables *prolonged male absence* and *male relationship*, will determine whether or not a significant association between the two variables exists. The bivariate chi-square test of independence will also be compared across different sub-populations in this study, including type of polyandry, social stratification, economic strategy, and male relationship. These comparisons will allow a closer look at how adult

male mortality and male relationship are differentially associated for formal and informal polyandrous groups, groups of different stratification levels, groups with different economic strategies, and groups that practice fraternal and non-fraternal polyandry.

Adult Male Mortality. The variable *adult male mortality* will be used to test the Adult Male Mortality Hypothesis. Quantitative data of rates of adult male mortality was rarely available for the populations, therefore, will not be included in the analysis. However, when available, specific quantitative information will be included in the case studies below. the available information on adult male mortality for the societies in this study will mostly be categorical and coded in the following way: with 1 indicating that the literature mentions high adult male mortality, 2 indicating that the literature mentions low adult male mortality, and 0 indicating that information on adult male mortality was not available.

Male Economic Production Hypothesis

The Male Economic Production Hypothesis will be tested by first running a frequency analysis for the variable *male contribution* to describe how males and females contribute differentially to the subsistence economy in polyandrous societies. A non-parametric chi-square will then be conducted on the variable in order to determine whether or not there is a statistically significant difference between the different levels of contribution.

Male Contribution. The variable *male contribution* is critical to testing the Male Economic Production Hypothesis. This variable will tell about the level to which males in a given culture are directly contributing to the subsistence economy, through hunting,

fishing, foraging, farming, etc. The data on this variable will be coded on a five-point Likert scale, based on the author's description of male contribution. While numeric data is obviously preferred and is available occasionally, the majority of the information available is categorical and does not go beyond the author's verbal accounts of their observations. Location on the scale will be determined in the following way: 1 indicates that males contribute nothing to the subsistence economy, with females contributing everything and a case will be coded this way if either the author uses phrases like "males contribute nothing," "men are responsible for almost none of the economic production," "very little," or "hardly anything" or if numerical values of male contribution indicate between 0% and 20% ; 2 indicates that males contribute less than females, but are playing an active role in production, and a case will be coded this way if either the author uses phrases like "slightly less than females" or "male contribution is low" or if numerical values of male contribution fall between 20% and 40%; 3 indicates that males and females contribute approximately the same amount to the subsistence economy, and a case will be coded this way if either the author uses words like "equal," "the same amount as," or "approximately the same," or if numerical values of male contribution fall between 40% and 60%, which leaves some room for error of estimation or differing ways of categorizing contribution; 4 indicates that males contribute more than females, but that females still make important contributions, and a case will be coded this way if either the author uses phrases like "slightly more than females" or "male contribution is high," or if the numerical values indicate that the males are contributing between 60% and 80%; 5 indicates that males contribute nearly all of the food to the economy of a group and a group will be coded this way if the author uses phrases like "everything," "all,"

"extremely high," or "entire" to describe male economic contribution, or if the numerical values of male contribution fall between 80% and 100%; 0 will be used to code a case in which there is no information given regarding male economic contribution. When exact quantitative data is available, it will be discussed in the case studies below.

Father Effect Hypotheses

There are three hypotheses regarding the effect of fathers on their children's ability to survive and reproduce. To test the first hypothesis, a frequency analysis will be run on the variable *father effect* and a non-parametric binomial test will be conducted on the variable in order to determine if the number of groups that have father effects is statistically significantly different from the number of groups that do not have father effects. Also, due to the small number of groups for which data on a father effect was available (n = 22), frequencies will also be compared across different sub-populations in this study, including type of polyandry, social stratification, economic strategy, and male relationship.

The second Father Effect Hypothesis will be tested with a chi-square test of independence using the variables *father effect* and *male contribution*, which will determine whether or not a significant association between the two variables exists. This bivariate association will also be compared across sub-populations related to type of polyandry, social stratification, economic strategy, and male relationship. These comparisons will allow a closer look at how father effect and male contribution are differentially associated for formal and informal polyandrous groups, groups of different

stratification levels, groups with different economic strategies, and groups that practice fraternal and non-fraternal polyandry.

In order to test the third Father Effect Hypothesis, a chi-square test of independence between the variables *father effect* and *stability* will examine whether or not these variables are significantly associated with one another. This chi-square test will also be compared across the sub-populations in this sample that are related to type of polyandry, social stratification, economic strategy, and male relationship. These comparisons will help to better understand how the association between the variables may be different for the different sub-populations.

Father Effect. The variable *father effect* will be critical to testing the Father Effect Hypothesis and will tell about the known effect of fathers on the ability of their children to live to reproductive age and ultimately to reproduce. While there is little data available on this variable, any exact quantitative data will be included below in the individual case studies, while all available data will be coded categorically, based on the author's description of the effect of fathers on their children's ability to stay alive and to reproduce. The majority of the data for this variable will be deduced from the author's account. A code of 1 will be given when the author indicates that there is no effect of fathers, which will be based either on numerical data that show no significant effect of the loss of a father on his children or based on the author using phrases such as "the loss of a father has no effect" or "when a father dies, children are cared for by other family members," or if the author describes the society as matrilocal, indicates that someone other than the father, typically the mother's brother, is primarily responsible for the wellbeing of the children, or indicates that should the father die, the patriline will absorb

and take care of the children. A code of 2 will be given when the author indicates that there is a known effect of fathers on their children's ability to survive and reproduce. This will be based on the author's descriptions such as "fathers are critical to children's survival," "children cannot survive without a father," "children die soon after their father dies," or "children rely mostly on father's provisioning for survival," or any description that suggests that either infanticide or juvenilicide may be more likely in the absence of a father. A case will also be coded as a 2 if there is statistical evidence to suggest that a father effect exists. A code of 0 will be given to indicate that there is no information provided for a society with respect to fathers' effects on their children's survival and reproduction.

Here I will indicate which statistical analysis I'll use to test both Father Effect hypotheses and will indicate how I'll use the variables, etc.

Descriptive Variables

Each of the following variables will be used to give a better understanding of how polyandry is associated with economic formation, social complexity, and other factors. A frequency analysis will be run for each and the results will contribute to a more holistic picture of non-classical polyandry. These variables will also be used to test some of the hypotheses above. The variables *type of polyandry, social stratification, partible paternity, male relationship,* and *type of economy* will also be used as population variables to compare the above bivariate correlations across different subsets of the entire population.

Type of Polyandry. The variable *type of polyandry* will describe whether the polyandry practiced in a specific society is formal or informal, according to the definitions of each given in the Introduction. The codes will be assigned based on the author's assessment of the union, and since most authors do not use the terms "formal" or "informal" to describe a society, their description of the union will have to suffice. This variable will be coded in the following ways: 1 will indicate that the society practices formal polyandry; 2 will indicate informal polyandry; 0 will indicate that no information was given regarding what type of polyandry was practiced.

Social Stratification. The variable *social stratification* will describe the level of stratification within each polyandrous society. These descriptions are fairly straightforward in the literature, and therefore, the author's description of a society's stratification will be used to code each case. The coding for this variable is based on Service's (1971) fourfold classification of societies, however, rather than adhere to the categorization of "bands" and "tribes," this coding will reflect egalitarianism and stratification of tribes because it is pertinent to this thesis to do so. The following codes will be used: 1 will indicate an egalitarian band or tribe; 2 will indicate a stratified tribe, with a clear hierarchy of dominance; 3 will indicate a chiefdom; 4 will indicate a state-level system; 0 will indicate that no information was given regarding a society's social stratification.

Partible Paternity. The variable *partible paternity* will indicate whether or not a specific society believes in and practices partible paternity. The groups in this sample were chosen based on their agreement with the criteria for informal polyandry (see discussion in the Introduction), therefore, the literature was very clear for these groups

regarding their practice of partible paternity, and this variable will be coded in the following way: 1 will indicate that partible paternity is practiced; 2 will indicate that partible paternity is not practiced; 0 will indicate that not enough information was given to properly determine whether or not partible paternity was practiced.

Male Relationship. The variable *male relationship* will tell about the relationships between the men in the polyandrous unions of a given society. It will be coded in the following ways: 1 will indicate that a society practices fraternal polyandry, meaning that the men in the union are brothers or very close male relatives; 2 will indicate that a society practices non-fraternal polyandry, meaning that the men in the union are not genetically related; 3 will indicate that a society practices both fraternal and non-fraternal; 0 will indicate that no information was given for that society regarding the relationship between the men in the unions. This variable will be used to test both the Prolonged Male Absence Hypothesis, which suggested that Fraternal polyandry should be positively correlated with prolonged male absences when all other variables are held constant, and the second Adult Male Mortality Hypothesis, which stated that Fraternal polyandry should be positively correlated with high adult male mortality, holding all other variables constant. Frequencies of the different types of male relationships will also be reported in order to have a more in-depth understanding of the polyandrous relationships in this sample.

Type of Economy. Economic factors, more than any other factor, have been hypothesized to lead to the practice of polyandry. These factors include land division and land and resource scarcity. Hypotheses regarding land division will not be tested in this thesis, as it relates only to the classical societies. However, scarcity of land and resources

is a much broader umbrella under which land division falls, and is an issue that can be considered for every type of society. The variable *type of economy* will be analyzed in order to understand the frequencies of the different types of economies throughout the non-classical cases of polyandry. Economy type will be determined by authors' labeling and will be coded in the following way: 1 will indicate a hunting and gathering economy; 2 will indicate slash-and-burn horticulture, mixed with hunting and gathering; 3 will indicate primarily farming; 4 will indicate pastoralism; 5 will indicate agriculture.

Stability. The variable *stability* will tell about the general stability of polyandrous unions in a given society. It will be used to test the Father Effect Hypothesis, which states that father effect should be positively correlated with stable unions, and frequencies of stability will be analyzed and reported in order to give a better understanding of how stable the unions are among the societies in this sample. This variable will be based on reports of stability in the literature and will be coded in the following way on a five-point Likert scale: 5 will indicate that the unions in the respective society are very stable, meaning that once the unions are established, they are nearly always permanent; 4 will indicate that the unions in the society are moderately stable, meaning that unions rarely dissolve and described by the author using phrases like "more stable than not" or "usually fairly stable"; 3 will indicate that the unions in the society are a mixture of stable and unstable, and described by the author as "both stable and unstable" or "equally likely to dissolve as to be permanent"; 2 will indicate that the unions in the society are moderately unstable, meaning that unions commonly dissolve and described by the author as "usually unstable," "don't commonly last long," or "unlikely to stay together"; 1 will indicate that the unions are very unstable, meaning that

unions nearly always dissolve and described by the author as “temporary,” “highly unstable,” or “don’t last long”; 0 will indicate that there was no information available for a given society regarding the stability of the polyandrous unions in it.

After gathering as much data as possible on the fifty-two societies in this sample, a table has been compiled, including all of the available data for all of the variables listed above. This table, Table 1, along with a more succinct coding guide, can be found in the Appendix. While the data is critical for empirically testing the hypotheses in this thesis, data alone cannot give a complete picture of each of the fifty-two non-classical polyandrous societies. In order to do that, a description of each of the societies, with as much information as possible regarding their polyandrous practices, is included below.

Case Studies of Non-Classical Polyandrous Groups

Following is a case-by-case synopsis of every polyandrous group included in this study. These case studies will offer a more complete and well-rounded understanding of how polyandry has been practiced for each society, as well as some of the variables that have been hypothesized in this thesis to be factors related to polyandry. While the literature has left much to be desired with regards to discussion of polyandry in most of these societies, the few that have been described in-depth give a rich, holistic view of how polyandry functions. The case studies are divided by location; Figure 2 categorizes each society as formal or informal, and indicates whether or not a society practices partible paternity.

Africa

!Kung. The !Kung are a widely known egalitarian hunting and gathering group that lives in the Kalahari Desert in Southern Africa. Richard Lee (1972) reports that in

1964 there was a population density of 41 people per 100 square miles. While this number is high for desert hunter-gatherers, overall, it indicates that land was not terribly scarce. Also, while there were seasonal fluctuations of resource scarcity, referring to both food and water, there were enough available vegetables to feed people during the scarce months (Lee 1968), and food sharing among the !Kung functioned as a form of insurance to be sure that people had needed resources most of the time.

Lee (1968, 1972) reports that !Kung women, through gathering of mongongo nuts and other plant resources, provide over half of the daily calories consumed by a family. Hawkes and O'Connell (1971) argue that this is not the case, however, it is probably safe to assume, based on Lee's (1968) data, that women are contributing an amount that is approximately equal to men. Lee (1972) also mentions that either the husband or the wife may be away from camp while visiting friends or family for extended periods of time, indicating prolonged absences from one another.

In 1964, there was one known case of polyandry among the !Kung (Lee 1972, p. 358), of which no further information was given. At the time of this study, there were more women than men in the group, with the women outnumbering men in every age group except for the adult group, which ranged in age from fifteen to fifty-nine. In this age group, there were 102 males for every 100 females. It is not reported whether or not this imbalance was a factor that lead to the polyandrous union.

Bahuma. The Bahuma of the Uganda Protectorate Lake Region were egalitarian pastoralists at the time polyandry was practiced among the group (Roscoe 1932). Men provided all of the food for the group and women contributed nothing to the subsistence economy. Therefore, as Roscoe (1932) suggested, a man must be able to provide a wife

with enough milk, which was the staple resource for the Bahuma. Polyandry was common, according to Roscoe (1932, p. 33), due to the inability of a number of men to own enough cows to both pay the marriage fee and afterwards to supply a wife and family with milk. Marriages in the society were fairly unstable.

Canarians. The Canarians of 1402 were living under a chiefdom as small-scale horticulturalists in the Canary Islands, located just off the northwest coast of mainland Africa (Bontier & LeVerrier 1872). Men contributed more than women to the subsistence economy through hunting and fishing, and during the early 1400's, at the time polyandry was reported by Bontier and LeVerrier (1872, p. 139), men were often away from home for extended periods of time. Adult males also had a high mortality rate, due to increasing contact with Europeans. Polyandry was practiced on the island of Lancerote. Bontier and LeVerrier (1872, p. 139) reported, "Most of (the women) have three husbands who wait upon them alternately by months, the husband that is to live with the wife the following month waits upon her and her other husband the whole of the month that the latter has her, and so each takes his turn."

Lele of the Kasai. The Lele of the Kasai River are a slash-and-burn agricultural group, living in small, relatively impermanent villages in Western Congo (Opler 1943). Both the men and women help contribute to the subsistence economy, although overall, men produce slightly more than women. Unity between villages is a defining factor of great importance for the Lele; their semi-nomadic lifestyle, as well as their informal polyandrous practices reflect that (Tew 1951).

Polygyny is a widely accepted and high status form of marriage for the Lele. Polyandry occurs when the village acquires a *hohombe*, or a village wife. The village

wife comes from another village, either by force, seduced, taken as a refugee, or betrothed from infancy, and is treated with “much honor” (Tew 1951, p. 3) by the people in her new village. A village wife is married to all of the men in the village, who may or may not already be married. The position is very prestigious for a woman, as is evidenced in her honeymoon period. in which she does no heavy work. During this honeymoon period, the village wife sleeps with a different man in her hut every two nights, and may have relations with any village member during the day (Tew 1951). Tew (1951) reports that when the honeymoon period ends, the village wife is allotted a certain number of husbands, sometimes as many as five. She is expected to cook for these men and have sexual relations with them. She may eliminate husbands from her household, and usually does so until she has just two or three. However, this informal polyandrous arrangement is not permanent and by the time the village wife reaches middle age, she will have only one husband who lives with her and for whom she cooks. According to Tew (1951), though, it seems that a village wife will forever be expected to be sexually available to all men in the village and any children she has will be considered children of the village, belonging to all men in the village.

Maasai. The Maasai are a well-known East African nomadic pastoralist group living in Kenya and Tanzania. They are primarily a tribal egalitarian people in which men provide nearly all of the subsistence to their families. Spencer (1988) reported that marriages among the Maasai are fairly stable and that possibly due to a high incidence of polygyny, there is typically a shortage of marriageable women (p. 25). Spencer (1988, p. 228) also emphasizes the role of the father in a son’s life. Fathers are very important in that they are responsible for arranging their son’s marriage. Spencer (1988, p. 236) also

notes that if a man is left without a father to negotiate bridewealth for him, the man may have no wife at all. Hollis (1905, p. 312) reports informal polyandry in the form of women cohabitating with any man belonging to her husband's age group.

Northern Nigerians and Irigwe. The Northern Nigerians of the Jos Plateau consist of several groups of tribal peoples whose primary subsistence strategy is farming. According to Sangree (1980), among these groups alliances through marital ties are extremely important to maintaining tribal solidarity. Non-fraternal polyandry functions in a way that provides marital ties between several families, as both a woman and a man in a non-fraternal polyandrous marriage will have several sets of in-laws. A wife in a Northern Nigerian society will have at least three husbands and as many sets of in-laws. A husband will have sets of in-laws from his wife, their co-resident sons, and out-marrying daughters. These alliances are so important that they may be maintained after a husband's death, through the levirate (Levine and Sangree 1980).

Polyandry among the people of the Jos Plateau takes the form of what Levine and Sangree (1980) call secondary marriages. Secondary marriage was defined by Smith (1953) as the marriage of a woman, during the lifetime of her first or primary husband, to one or more secondary husbands, which neither necessitates nor implies divorce or annulment of previous or temporarily co-existing marriages. In the case of the Northern Nigerians, a woman does not live with all her husbands at the same time, but is simultaneously wed to all of them, and maintains her right to have children with any of them (Levine and Sangree 1980). Muller (1980) distinguishes "primary marriage," the first marriage of a girl, from "secondary marriage," any of the girl's subsequent marriages and offers further support for the idea of the importance of alliances for the

Northern Nigeria tribal people. He says, "The basic principle of these Nigerian systems is to allow or even to obligate a woman to be simultaneously the wife of two or more husbands belonging to differing groups. Then the circulation of women does not link two groups only; rather it links at least three groups through a single woman" (Muller 1980:361).

The Irigwe of Nigeria are one specific example of a Northern Nigerian group that practices polyandry in the form of primary and secondary marriages (Sangree 1980, p. 339). The parents of the couple typically arrange the primary marriage while the bride- and groom-to-be are young children. The parents are usually either distant kinsmen, or the fathers are friends (Sangree 1980). Once consummated, the primary marriages typically do not last longer than a few weeks, nor produce any offspring. The secondary marriages are initiated by the couples themselves, are relatively inexpensive, and nearly always function to produce offspring (Sangree 1980). A woman is able to decide at any time which engagements she would like to honor and which she would not. She may also choose which husband to live with at any given time and will typically rotate between husbands on a fairly regular basis (Sangree 1980).

Asia

Bang Chan. The Bang Chan are a group of villagers living in Central Thailand. During the mid-1900's, the villagers subsisted mainly off of rice agriculture, however, it was also common for men in the village to be away from home four or five months of the year earning money elsewhere (Phillips 1965). Out of 296 families that Phillips (1965) studied, most were monogamous, with only 2 cases of polyandry (p. 26). Although Phillips (1965) was unable to learn the true divorce rate in the village, over 20% of the

marriages in the sample were dissolved within 4 months, indicating a very high divorce rate.

Gilyaks. The Gilyaks were a group of semi-nomadic hunter-gatherers living near the Amur River in the northern part of Sakhalin, Russia (Czaplicka 1914). Men contribute slightly more than women to the subsistence economy, fishing and hunting seal, duck, saber, and otter, while women gather berries, wild leeks, and nuts. In 1897, during the time that polyandry was known among the Gilyaks, the census recorded 122 Gilyak males for every 100 Gilyak females (Czaplicka 1914).

In 1905, Lev Sternberg reported meeting a family in the village of Tangi in which two brothers lived regularly with one wife, in an instance of formal polyandry (cited in Czaplicka 1914, p. 101). It seemed, according to Czaplicka (1914, p. 101), that Gilyak polyandry may have been related to the practice of the levirate; after a man's death, his wife and children were passed to his younger brother and the brother cares for the children as if he were their father. Czaplicka (1914, p. 44) also said of a man's wife, "… nominally and even actually, she was already her husband's younger brother's wife and his children her children." Spouse sharing was also practiced among a man's brothers (Czaplicka 1914, p. 99-100). It was common practice for a wife to be allowed sexual access to a man's brothers when her husband was away. There is not enough information about this practice, however, to determine whether it may stand alone as a form of polyandry.

Hephthalites. The Hephthalites, also called the Ephthalites or the White Huns, were a pastoralist group living in 5th and 6th Century China (Christian 1998). They originally lived north of the Great Wall as a nomadic group. The Hephthalites engaged

frequently in warfare and had high adult male mortality rates (Christian 1998). It is reported in the Encyclopedia Britannica (2007) that the Hephthalites practiced polyandry, but no more is known of their practices.

Mongolians. The people of Mongolia have been nomadic cattle-breeders for centuries. They typically lived in tribal groups and governed themselves, while also adhering to the law of the State. The tribes were independent nearly all of the time, except when coming under the threat of the state, at which times, three to four tribes may band together to defend their homes and way of life (Riazanovskii 1965). Warfare was not necessarily common, but was an ever-present threat, as men were expected to fight for the State as well. Over the last three centuries, nearly all Mongolian peoples were patriarchal, however, pre-17th Century, some families were matriarchal (Riazanovskii 1965). It was during this time that polyandry was known to occur (Riazanovskii 1965, p. 235). While little is known of the details of Mongolian polyandry, Riazanovskii (1965) reports that a custom among matriarchal Mongolians was giving sons as sons-in-law into the house of the wife or betrothed bride, suggesting that the polyandry was typically fraternal.

Nayar. The Nayar are a matrilineal, avunculocal Hindu caste of landholders living in Central Kerala in India who practiced a rare form of informal polyandry (Gough 1952). The polyandrous unions were almost always non-fraternal and functioned mainly to maintain status of the wife and her family and to legitimize and ascribe status to her children (Gough 1959). Due to the nature of the matrilineal, avunculocal family structures, fathers had very few care-taking responsibilities towards either their wife or

children and therefore, there was unlikely to be any effect on children's ability to survive or reproduce, should their father die.

In this type of informal polyandry, a Nayar girl customarily had several husbands. The first was a ritual husband, given to her just before puberty in a ceremony referred to by Gough (1959) as the *tali*-rite. The purpose of the ritual husband was to bring the ritual bride to maturity in honor instead of in shame. After the ceremony, the ritual husband and his bride were secluded together for three days, during which sexual relations may take place. When this period was over, the ritual husband left the girl and had no further obligations to her, however she was obligated to observe death-pollution, a traditional death ritual, for him, as were all of her biological children. Gough (1959) interpreted this responsibility as a mark of proof that the woman had once been married in the correct manner and that this ritual relationship had retained significance for her throughout her ritual husband's life.

After the *tali*-rite, and after the girl achieved puberty, she began accepting a number of visiting husbands; sometimes as many as twelve. Gough (1959) reported that these husbands did not cohabitate with her, arriving in the evening after dinner and leaving before breakfast in the morning. Similar to the ritual husband, the visiting husbands did not hold any rights in the women or their children, however, they had a few responsibilities and served an important purpose to her. The visiting husbands allowed their wife the right to have it openly acknowledged that her child had as biological father a man of required ritual rank (Gough 1959). In other words, they functioned to maintain the status of the woman and children that was gained with the marriage to the ritual husband. The visiting husbands were responsible for giving their wife gifts of high

prestige value at festivals, which Gough (1959) suggested helped to establish her as a woman that was well favored by men. The visiting husbands were also responsible for paying the expenses for the birth of their own children, which allowed the children to enter the world as members of the father's lineage and caste. While Gough (1959) reports that the visiting husbands had more than one wife, the unions of the men are not discussed in detail. It is unknown how many wives a man was visiting and whether or not a man typically had more wives than a woman had husbands. Therefore, the Nayar will be considered as an informal polyandrous group, in line with Kathleen Gough's categorization of them as such.

Paliyans. The Paliyans are a group of hunter-gatherers that live in the hilly ranges of peninsular India. According to Gardner (1972), they are a peaceful group who chooses to avoid contact with the more developed peoples who live around them. While the terrain of the area may seem harsh, resources are not typically scarce. The Paliyans subsist mainly off of yams, some fruits, hunted game, and honey, and leave a number of potential food sources untouched in favor of preferred sources. Females and males seem to contribute equally to the subsistence economy, and Gardner (1972) points out that couples may temporarily live separately and both the lone man and lone woman are capable of providing for themselves. Also, while there was a finite amount of land available to all who chose to remain in the hunting and gathering lifestyle, until recently, there was little outside competition for land.

Gardner (1972, p. 421) reports two instances of polyandry for the Paliyans, which come from his sample of 153 total marriages. In both cases, a woman remained in an economic and residential union with an ill partner who was, therefore, sexually incapable,

while simultaneously taking part in stable and publicly acknowledged sexual relations with another man. Gardner (1972) states that these unions were long-term and while the primary husbands were displeased, they tolerated the unions to avoid losing their wives. Also, in each case, people outside the union referred to both men as husbands and traced kinship relationships through both of the woman's husbands. One of the polyandrous relationships observed by Gardner (1972, p. 421) involved residential unity and some economic cooperation between the two husbands. Both cases of polyandry were non-fraternal.

Sakai. The Sakai of Sengalor, also known as the Orang Tanjong, are a small tribe of Semang people living in the lowland area of the Malay Peninsula (Skeat & Glagden 1966). At the time polyandry was reported among the Sakai, they were living as hunter-gatherers, with men and women in the group contributing nearly equally to the subsistence economy. Very little has been written about Sakai polyandry, however Skeat and Blagden (1966, p. 68) reported that women were allowed to have more than one husband and that one woman who was living in Bandar Kanching was known to have four husbands.

Semang. The Semang are a group of egalitarian slash-and-burn horticulturalists living inland on the Malay Peninsula. They supplement their diets with hunting and gathering, with men and women contributing nearly equal amounts to the subsistence economy (Schebesta 1954). Semang marriages are temporary until children are born, at which time they become much more stable. Due to political issues the Semang have been restricted to a difficult landscape where resources are hard to come by (Schebesta 1954). Unfortunately, there is very little information regarding Semang polyandry, although

Schebesta (1954, p. 244) reported that it was only known to be practiced among the Lanoh, a small sub-group of Semang.

Subanu. The Subanu are an egalitarian small-scale farming group living in the Philippines. Men and women contribute nearly equally to the subsistence economy, with men providing animal protein through hunting and women cultivating most of the vegetable foods (Finley 1913). Very little is written of the Subanu, however, Finley (1913) reported that marriages in the group are stable and that polyandry is occasionally practiced where men are too poor to provide the bridewealth necessary to secure a wife (p. 29).

Middle East

Israelis. Polyandry among the Israelis was a very brief and experimental practice, according to Spiro (1975, p. 112), and took place within the context of the Kibbutz. These unions were highly unstable and were practiced, along with polygyny, as an attempt to make marriage a more lasting bond (Spiro 1975). It is also worth noting that the sex ratio at the time of this experimentation was nearly 2 males for every 1 female (Spiro 1975), or a ratio of 200:100. The Kibbutz provided an interesting background for marital practices, as it required parents to have little to no responsibilities towards their children from the time just after birth until adulthood. Thus, women in the society were free of child-rearing duties and were able to maintain jobs and economically support themselves. This society is quite different from most of the others in this study, as at the time of polyandrous practices, it was a developed, complex socialist society that depended on agriculture and a cash economy (Spiro 1975).

North America

Inuit groups

Aleut. This group of hunter-gatherers lived on the Aleutian Islands, on the western part of the Alaskan Peninsula. Men were responsible for nearly all subsistence economic production and were the primary political actors in the chiefdom as well (Lantis 1984). At the time that polyandry was practiced, hunting and fishing were the main economic activities, supplemented by seasonal gathering (Jones 1976). Polyandry was reported for the Aleut by several authors (Jochelson 1928, p. 418; Jones 1976, p. 21; Lantis 1970, p. 285; Lantis 1984, p. 176) and was always fraternal (Jochelson 1928, p. 418). A census taken in the mid-1800's indicated more females than males in the group, which Lantis (1984) attributed to the high adult male mortality due to hunting.

Alutiiq. At the time the Alutiiq were known to practice polyandry, they were a hunting and gathering group living on Kodiak Island in Alaska (Hrdlicka 1975). While men provided the majority of the food to the household, women gathered seasonally and had other important duties like childcare and sewing clothes. Davydov (1812, p. 50) reported, "Some of the women have two husbands; the first is the real one and he selects the second with the consent of his wife. The second husband plays largely the role of a servant, and can assume the role of a husband only when the first is absent." Hrdlicka (1975, p. 78) also recorded cases of polyandry among the Alutiiq. Hrdlicka (1975) reported sex ratios for the Alutiiq as well, noting fluctuations from one century to the next; in 1796 there were 3,221 males to 2,985 females (p. 19), a ratio of 108 males for

every 100 females, and in 1825 there were 1,351 males to 1,468 females (p. 20), which is a ratio of 92 males for every 100 females.

Copper Eskimo. The Copper Eskimo are primarily a hunting and fishing people that live in Northern Canada's Kitikmeot and Inuvik Regions. Although some of their diet consists of foraged goods during the summer months, they live on extremely difficult terrain with winter temperatures that get as low as -50˚ F and summers that threaten freezing temperatures, therefore making vegetable foods hard to come by (Damas 1972). Men did the majority of the hunting and fishing, and the main sources of animal protein came from caribou, musk oxen, ringed seal, and different types of fish. While these resources were typically sufficient to maintain the Copper population, they were also delicate and could be easily depleted (Damas 1972). Women were responsible for child rearing, cooking, preparing animal skins for clothing, putting up camp, pulling sledges with the dogs, and occasionally for fishing and helping the men with caribou drives.

Preferential female infanticide was known to occur among the Cooper Eskimo, creating an imbalanced sex ratio at birth and among the early age groups (Damas 1975). Between 1880 and 1930, Smith and Smith (1994) reported a sex ratio of 224 boys for every 100 girls and 104 adult males for every 100 adult females. Homicide was a frequent occurrence, as well, though, and with the main target usually being males, was thought to balance out the sex ratio for adults, although a 1964 census shows a clear predominance of males over females among the adult population (Damas 1975). While polyandry seems like a solution to this imbalance, Damas (1975) points out that according to a 1923-1924 census, there were slightly more polygynous unions than polyandrous ones, although neither type of union was very stable. However, polyandry

was an acceptable form of marriage that occurred on a regular basis among the Cooper Eskimo (Damas 1975, p. 412).

Innu. The Innu are a hunting and gathering group that reside in Quebec and Labrador, Canada. The family serves as both the hunting and economic unit (Lips 1947). Men cooperate to hunt moose and caribou and trap fur animals like beaver and lynx, and possibly because of this post-marital residence is typically patrilocal. In the cases of matrilocal post-marital residence, the husband will cooperate with his father-in-law on hunts, but, as Lips (1947) reports, the man is usually not as productive as he is when hunting with his own father and brothers. The Innu women spend the majority of their time caring for young children, cooking, and doing other household duties, and also gather a few seasonal plant foods. Little is known of Innu polyandrous marriages except that they are always fraternal in nature (Lips 1947, p. 419). Marriages among the Innu are somewhat stable and termination of a marriage is an acceptable cultural practice. Loss of a father is unlikely to affect his children's survival or reproduction because in the case of death or divorce, a woman and her children are absorbed back into her natal family and cared for there (Lips 1947).

Mackenzie River Eskimo. The Mackenzie River Eskimos lived in the Northwest Territories in Canada. Men provided the majority of the diet through hunting and fishing and were expert whalers (Stefannson 1922). They were often away from home for prolonged periods of time due to whaling expeditions and warfare. Not surprisingly, adult male mortality was high among the Mackenzie River Eskimos (Stefannson 1922). Stefannson (1922, p. 466) reported that both polygyny and polyandry were practiced

equally among the Mackenzie River Eskimo before the whites arrived, however, both were fairly rare, with monogamous marriages being the norm.

Netsilik. The Netsilik are an Inuit group living along the Arctic coast of Northern Canada, who subsist primarily off of seal hunting for six months of the year (Balikci 1970). During the rest of the year, they hunt caribou and a few other game animals, fish, and gather the few plant resources, such as berries, that are available during the summer months. There is a very strict sexual division of labor followed by the Netsilik, with men engaging in hunting and fishing, as well as preparation of their own tools and weapons for such tasks. Women provide very little, if any, subsistence resources to the household, but are nevertheless invaluable as they take on all household tasks, like cooking and childcare. However, as Balikci (1970) points out, the Netsilik women's most important job is to make the clothing worn by her husband, children, and herself.

Infanticide is thought to be a common practice among Inuit peoples, and the Netsilik are no exception (Balikci 1970). Preferential female infanticide causes the sex ratio at birth to be skewed in favor of males, with a ratio of 209 boys for every 100 girls in 1902 and 200 boys for every 100 girls in 1923 (Smith and Smith 1994), and this skewing of the sex ratio occasionally carries over into adulthood with a surplus of marriageable men, with only 97 adult men for every 100 adult women in 1902 but 106 adult men for every 100 adult women in 1923 (Smith and Smith 1994). Balikci (1970, p. 156) reports that the occasional practice of polyandry among the Netsilik is due, in part, to this imbalanced sex ratio. When polyandry occurs, it is typically non-fraternal and very unstable, relative to other types of Netsilik unions. Male jealousy is suggested to be

a problem and to lead to the dissolution of polyandrous unions. The Netsilik also practice spouse exchange (Balikci 1970, p. 103).

Northwest Alaskan Eskimo. The Northwest Alaskan Eskimo were a hunting and gathering group, with men providing almost all of the big game and fish (Burch 1975). Women were important to subsistence activities, too, though. Along with their incredibly important job of skin sewing, or making clothes and other materials out of animal skins, and other typical female duties like childcare and housekeeping, the Northwest Alaskan Eskimo women were also responsible for processing the game their husbands killed, including retrieving, skinning, butchering, storing, cooking, and serving. The women also contributed a fair amount of small game and foraged for vegetable products like berries, greens, leaves, and roots (Burch 1975).

Interestingly, while there are no known reports of the effect of fathers on their children's likelihood of living to reproductive age and eventually reproducing, Burch (1975) notes that if a child's father died, a grandfather, uncle, or close male relative would fill in and take on the duties of a father. This indicates that the kinship network of the Northwest Alaskan Eskimos provided the aid necessary to prevent the loss of a father from effecting the child too drastically.

Burch (1975) reports that over the last two centuries, there have consistently been slightly more men than women among the Northwest Alaskan Eskimo. Polygyny may have contributed to a sex ratio that was artificially skewed even more, with a reported one in every six marriages being polygynous (Burch 1975). Polyandry occurred as well, although not as frequently, and the unions were not as stable as polygynous unions (Burch 1975, p. 105). Burch (1975) suggested that the instability may occur because of

the difficulty one wife would have keeping two or more husbands clothed and fed, or because a polyandrous arrangement would suggest that neither men were successful enough hunters to provide for their own woman, resulting in an additional source of stress.

Point Hope Eskimo. The Point Hope peninsula in Alaska is the westernmost extension of the North American continent, north of the Bering Strait. In the past, the Eskimo of Point Hope lived primarily as egalitarian hunter-gatherers (VanStone 1962). Men were responsible for nearly all of the subsistence provisioning, with the majority of the diet coming from resources in the ocean, such as fish and whales. Men were typically gone for long periods of time on whaling expeditions and adult male mortality was high. Little is known of polyandry among the Point Hope Eskimo except that it was known to be practiced during "aboriginal times" (VanStone 1962, p. 90).

Polar Eskimo. The Polar Eskimo live near Smith Sound, within 13˚ of the North Pole, which is farther north than any other people on earth (Weyer 1959). At the time that polyandry was known, the Polar Eskimo were living as semi-nomadic egalitarian hunter-gatherers. Men were responsible for providing the majority of the subsistence economy, hunting seals and other sea mammals (Weyer 1959). Adult males also had high mortality rates, therefore, if a child's father died or the child was orphaned, relatives of either the mother or father would care for it. All marriages among the Polar Eskimo were fairly unstable, according to Weyer (1959), and while the group primarily married monogamously, a few cases of polyandry were reported (Weyer 1959, p. 46).

Tikerarmiut. The village of Tigara, Alaska is within eight miles of Point Hope, Alaska. The Tikerarmiut Eskimo who lived in Tigara at the time polyandry was

practiced were egalitarian hunter-gatherers, depending primarily upon sea mammals, particularly bowhead whales, for subsistence (Rainey 1947). The females of the group lived in the permanent village year-round while men were frequently away from home on whaling trips. Rainey (1947) recorded a skewed sex ratio in favor of females, due to both low male birth rates and high adult male mortality. Divorce was common before children were born, however, once children came into the family the unions were much more stable. Polyandry typically occurred when two men, typically brothers who were unable to support their own wives, took one wife (Rainey 1947).

Tlingit. The Tlingit are a group of Native North Americans that live on the Pacific Northwest Coast of Canada and the United States. Prior to contact with the Europeans, they were a hunting and gathering group that subsisted mainly off of fish, some meat, and some plant food. Heavy rain and snowfall 200 days out of the year along with a difficult terrain meant that the territory was not capable of maintaining a large population (Krause 1956). While a fairly small population maintained itself in Tlingit territory for hundreds of years, there were still occasionally families that had a hard time making a living (Jones 1914). Men contributed the most food to the family, providing the hunted game and fish, and women spent the majority of their time cooking, caring for children and the household. However, women did partake in seasonal gathering of potatoes, berries, and other plant foods, as well as some fishing. After contact with the Europeans, trade became increasingly important to the Tlingit and men were frequently away from home on long trading trips (Krause 1956).

The Tlingit are a matrilineal society, which means that children belong to the totem of their mother and the maternal uncle has more authority over the children than

does their father. In the case of death of one or both of the parents, the children become the responsibility of the mother's tribe (Jones 1914).

Polyandry was not thought to be widespread among the Tlingit, but did occur from time to time. According to Krause (1956, p. 154), it was always the case that co-husbands were either brothers or close male relatives. De Laguna (1972, p. 489) reported an instance of a woman being married to a man and his nephew. Krause (1956) also pointed out that if a man was caught seducing a woman, he was made to pay for the offense with gifts, presumably to the woman and her husband. If this man was a close relative, he became the second husband and was required to contribute to the support of the woman.

American Indian groups

Blackfoot. The Blackfoot were a hunting and gathering group of American Indians, living on the plains of the north central United States. Men in the society were responsible for nearly all of the subsistence economy (Dempsey 1986). Little is known about the Blackfoot practice of polyandry (Dempsey 1986, p. 423), however, Dempsey (1986) reported that in the case of male death or divorce, the wife and her children returned to her family, making it unlikely that the loss of a Blackfoot father would have a significant impact on his children's ability to survive. Adult male mortality was high among the Blackfoot and because of this, there were more women than men in the population (Dempsey 1986).

Cherokee. Prior to the arrival of the Europeans in the New World, the Cherokee were an egalitarian tribal group living in the southern Appalachian mountain range in the Southeastern United States (Fox 2009). Their primary subsistence strategies were

horticulture, hunting, and fishing, with supplemental gathering taking place seasonally. Cherokee men were responsible for hunting deer, turkey, bear, and other animals as well as for fishing. Women tended the fields, where the main crops included beans, squash, pumpkins, sunflowers, and tobacco, gathered food and herbs, and cared for the children and the household (Fox 2009).

When the Europeans first contacted the Cherokee, they were a matrilineal, matrilocal group (Reid 1970). After marriage, a woman's husband typically moved into her family's household, where he worked and provided food. Marriages dissolved easily at that time, and in the case where a woman's husband left her and her children, the woman's brother, her children's uncle, was responsible for caring for and provisioning for her and her family. Reid (1970, p. 119) suggested that this matrilocal clan system made polyandry possible, in that since any children that resulted from the union belonged to their mother's clan, making fatherhood nearly obsolete. Reid (1970) also hypothesized that during times when the sex ratio was imbalanced, polyandry may have been more prevalent.

Pawnee. The Pawnee are an American Indian tribe who lived in villages across the Great Plains of the United States until the mid-1800's. For nearly 700 years, they subsisted off of seasonal hunting of buffalo and small game as well as small-scale horticulture (Weltfish 1977). While the men were primarily responsible for hunting, women cared for the children and the household, taking on daily chores like cooking and cleaning. Pawnee women were also skilled horticulturalists, however, and were in charge of tending to the gardens in which the main crops were corn, pumpkins, squash, and beans.

The primary husband frequently had to leave home for long periods of time for hunting, trading, and warfare. In order to provide protection for the wife, as well as to maintain some sort of control over her sexual encounters, the husband's younger brother was often married into the family as a secondary husband (Grinnell 1891). The younger brother was taught to think of his older brother's wife as his own wife, and usually was invited to live with the couple once he became a young man (Lesser 1930). The secondary husband was allowed sexual access to the wife at the discretion of the primary husband, possibly after the younger brother demonstrated his bravery and prowess on the warpath (Lesser 1930). The younger brother usually stayed with his older brother's family for a few years until he married a wife of his own, thus it was common for polyandrous marriages among the Pawnee to be impermanent.

It was also common among groups of Pawnee brothers to set up a joint household, sharing wives and property. In these cases, the children in the household referred to all of the adult brothers as "father" and all of the adult females as "mother," and while a specific father effect is not known, Weltfish (1977, p. 21) states, "… a child gained considerable security from this multiple parenthood." Sex ratios are also unknown for the Pawnee, however, given the frequency of warfare, exposure to disease, and dangers of hunting, it is known that adult males had a higher mortality rate than adult females.

Pomo. At the time that polyandry was known among the Pomo, they were a complex hunting and gathering group living in the Hopland Valley in Northern California (Aginsky 1939). Men hunted antelope, deer, and smaller game and women gathered plant foods (Gifford 1928). Although Aginsky (1939) reports that resources, including pine nuts, acorns, berries and fish, seemed plentiful, he also states that the Northern Pomo

attribute their practice of polyandry to their fear of food shortage or famine (p. 210). Unfortunately, no further information is given as to how the Pomo believe that the practice of polyandry may be beneficial in times of famine. It does seem, though, that in the case of a father's death, there would be little to no effect on the child's wellbeing as Gifford (1928) reports that women and children return to her family, where they are cared for.

Yokut. The Yokut were a group of hunter-gatherers living in central California in the San Joaquin Valley at the time polyandry was known to be practiced (Gayton 1948). Males and females contributed equally to the subsistence economy, with males providing animal protein through hunting and fishing and females providing gathered vegetable foods. Gayton (1948, p. 105) reported one case of polyandry among the Yokut. A woman had "two men at the same time and they all slept together" (Gayton 1948, p. 105). It is unlikely that there was a father effect for Yokut children, as females returned to their own family with their children after the death of a husband and were allowed to remarry after one year (Gayton 1948).

Shoshonian language groups

Paviotso. The Paviotso, better known as the Northern Paiute, were a group of hunter-gatherers living in Nevada at the time the practices of polyandry were known to occur (Park 1937). Men and women both contributed significantly to the subsistence economy with women gathering vegetables and plants and men hunting to provide meat. While polyandry was not necessarily a common practice for the Paviotso, it was known to occur from time to time (Park 1937, p. 367) and was suggested by Park (1937) to be

the result of an occasional shortage of available marriageable females, due a high incidence of polygyny.

Paviotso polyandry was always fraternal, always involved only two husbands, and the unions were almost always permanent, as were the monogamous and polygynous ones. Park (1937, p. 367) recalls an account of a monogamous marriage between a man and woman in which the man's younger brother later joined the union and was considered to be a co-husband. The three lived together until the woman's death and when a child was born to the wife, both men were recognized as fathers (Park 1937). In another instance, the parents of a girl arranged a marriage for her with two brothers, and upon reaching an agreement, the brothers moved into their now in-laws' home. Among the Paviotso, when a man and a woman, or several men and a woman, or several women and a man, are known to be living together and having sexual relations, they are considered by the society to be married (Park 1937).

Shoshoni. At the time they were known to participate in polyandrous marriages, the Shoshoni were an egalitarian hunting and gathering society. Steward (1936) said that both men and women contributed equally to the household, with men responsible for the hunting, while women gathered vegetable foods, had nearly identical roles in plural marriages, and had no property rights. Steward (1936, p. 562) also described the people by saying they were "simple" and "uncomplicated by clans, societies, age classes, or other groupings" and the only real exception to the class-free society was the presence of a village headman, who was the only man with any advantage.

Steward (1936) reported that polyandry among the Shoshoni was usually fraternal, which is probably due, in large part, to the fact that the levirate was prevalent in

the society. The levirate requires that when widowed, a woman marry her deceased husband's brother. For the Shoshoni, it also required that if a woman takes a second husband while her first husband is still alive, the second husband must be a brother of the first (Steward 1936). The levirate requirements, then, allowed for an easy transition when the first husband passed away, and encouraged fraternal polyandry within the society.

In a study done on several groups of Shoshoni, Steward (1936) found, with one exception (the Shoshoni of the Little Smoky Valley), that polyandrous marriages were contracted with intentions of permanency. He says that brothers in the union were of equal status, both men were called "father" by their children, and biological paternity was not of any relevance. Steward (1936) also reports of Shoshoni polyandry that it seemed "not to have been uncommon … and carried no social stigma" (p. 564). He suggested that a possible function of fraternal polyandry among the Shoshoni was that while one husband was away from the home hunting, another was present at home with the wife. According to Steward (1936) the sex ratio was fairly balanced at all ages.

Utes. Prior to the mid-1800's, when colonization of the Utes began, they were an egalitarian group of hunter-gatherers, living in Colorado, New Mexico, Utah, and Wyoming (Marsh 1982). Ute men and women both contributed significantly to the subsistence economy. Marriage was an economic partnership and each sex played an important role. In an economy that was heavily dependent on the roles and provisions of both sexes, it was difficult for a single person to thrive, therefore, a single or widowed individual would usually attach themselves to a nuclear family until they were able to find a spouse (Smith 1974). It was also the case that when men were traveling for long

periods of time, due to warfare or trade, women and their children stayed with close family members. There was a widespread feeling that neither a man nor a woman should live alone (Smith 1974). Interestingly though, Ute marriages of all types were almost always temporary.

Polyandry was allowed for the Utes and the few known cases involved a woman marrying two brothers or a man and his father's brother (Smith 1974, p. 131). These marriages, like all the rest, were highly unstable. It would make sense, based on the reported sexual division of labor for there to be some effect of father's death on his children. However, it appears that the close kinship ties and the absorption of women back into their own kin groups after divorce would prevent such an effect from materializing.

Oceania

Chuuk. The Chuuk are a small-scale horticultural group located in the Caroline Islands in Micronesia. Similarly to the people of the Lamotrek Atoll, who the Chuuk are located very near, the Chuuk have a very limited land area as well as limited animal resources and therefore, rely almost completely on plant and marine resources for subsistence. Their primary and most consistent source of subsistence is the breadfruit, with yams, taro, and manioc making up important parts of the diet as well (Goodenough 1951). Men are responsible for cultivating the gardens, collecting breadfruit, and some fishing. Women fish in groups and provide the majority of the marine resources to the Chuuk diet (Goodenough 1951).

The Chuuk are a matrilineal people and all children are considered members of a matrilineal corporation (Goodenough 1951). Goodenough (1951) reports that divorce is common until a couple has children, at which point marriages become more stable and permanent. Both fraternal (Bollig 1927, p. 109) and non-fraternal (Goodenough 1951, p. 123) polyandry have been reported among the Chuuk. In the case of non-fraternal polyandry, a man was known to have made a payment of goods to another man, in order to receive permission to share his wife (Goodenough 1951, p. 123). Goodenough (1951) points out that among the Chuuk, any kind of marriage is allowed, however monogamy is always the most common form.

Dieri. The Dieri are a group of complex hunter-gatherers living east and southeast of Lake Eyre in Central Australia. They are a matrilineal people who practiced informal polyandry, according to Howitt (1904, p. 224). Howitt (1904) reported that a man may share his wife with his unmarried tribal brothers. The wife is considered to be formally married to only her husband, but calls the other men "husband" and her children call all of the men "father" (Howitt 1904, p. 224). All of these men have sexual rights to the wife and all of the men are responsible for protecting her children.

Hawaiians. During the late 19th and early 20th centuries, the native people of the Hawaiian Islands were mostly egalitarian horticulturalists (Linnekin 1990). Men in this society were responsible for the majority of the subsistence production, taking on most of the farming work, while women cared for children and manufactured personal ornaments and mats and tapa cloth. Around the same time, native contact with Europeans was becoming more and more prevalent and because of this, the native Hawaiians were suffering major depopulation (Linnekin 1990). For reasons unreported by Linnekin

(1990), this resulted in differential female mortality and more men than women in every census from 1850 – 1890 and among every age group in nearly every district (p. 209-211).

Linnekin (1990, p. 122 & 124) notes the practice of fraternal polyandry among the Hawaiians of the time and well as the Hawaiian term for a woman married to brothers, *punalua* (p. 149). Some polyandrous unions were stable while others were not, with the more stable unions being formed for the purpose of creating and maintaining affinal ties, according to Linnekin (1990). While little is known about these polyandrous unions, it is known that Hawaiian men were often away from home for long periods of time, traveling abroad or going out to sea (Linnekin 1990).

Malekula. The Malekula live in the New Hebrides group of islands in the Pacific Ocean, just northeast of Australia. Due to the scarcity of wild animals on the island, they subsist off of a mostly vegetarian diet with yams being the staple, supplemented by some fish and shellfish as well as occasional wild pig meat (Deacon 1934). Thus, small-scale horticulture is the primary economic activity, and Malekula men are responsible for cultivation of the crops, as well as hunting and fishing, while women collect shellfish, but spend most of their time caring for their children (Deacon 1934).

Polyandry among the Malekula is typically non-fraternal (Deacon 1934, p. 141-143). According to Deacon (1934), the Malekula recognize both physiological and sociological fatherhood, with sociological taking precedence over physiological. When a child is born to the union, both men are considered fathers and the child belongs to both fathers' clans. This dual clan membership has been reported by Deacon (1934) to cause some problems for children when it comes time to choose a mate, in that because of the

restrictions against endogamous marriage, the child can have very limited mate choices. However, having more than one father was shown to be quite beneficial in the case of one child who lost his first father, his mother's primary husband, to death. Deacon (1934, p. 142) recounted the instance under which the secondary father was responsible for the child and eventually stepped in and arranged a marriage for the boy. This was particularly interesting because it was a clear case of the second father positively affecting the boy's ability to obtain a mate and possibly to successfully reproduce.

People of the Lamotrek Atoll. The Lamotrek Atoll is located in the Western Caroline Islands of Micronesia and is a part of a group of islands on which differing groups of people share social structures, centering around chiefdoms, and interact regularly (Alkire 1965). Land is restricted in the area and people often live under threat of their homes being devastated by tropical storms. The islands are quite limited in variety with regards to plant food, therefore, the people rely mostly on domesticated animals, small-scale agricultural practices and some fishing for subsistence. Men do the majority of the fishing and some cultivation of crops while women gather marine foods like shellfish and cultivate a separate set of crops from the men (Alkire 1965).

Alkire (1965) reports that the main characteristic of social organization of the islands is flexibility in adapting to changing conditions through the recognition of legitimate alternative forms of action. This is such an interesting description of the group because while monogamy is the most prevalent form of marriage, polygyny and polyandry are both known to occur occasionally. According to Alkire (1965, p. 55), polyandry is always fraternal and a man's brother will often look after and enjoy sexual access to his wife when he is away from home for long periods of time. In 1962, the sex

ratio was nearly equal on the island, with 56 adult males and 59 adult females (a ratio of 95:100), as well as 43 males and 43 females (a ratio of 100:100) that were age 16 and under (Alkire 1965). It seemed that this was a common trend.

Punan. The Punan were an egalitarian nomadic hunting and gathering people at the time polyandry was known. They were living in the jungle areas of Borneo and according to Hose and McDougall (1912) were a very peaceful people. Men, as hunters, contributed nearly everything to the subsistence economy, while women gathered occasionally and took care of the children and cooked. Marriages among the Punan were very stable. Hose and McDougall (1912, p. 183) reported that polyandry generally occurred in cases where a woman was married to an older man and was unable to have children with him. A younger husband was added to the family to give the wife children and to take over hunting duties.

South Australian Aborigines. The complex hunter-gatherers of Southern Australia are not known to practice formal polyandry. However, they may be practicing informal polyandry and possibly even partible paternity. Although there was simply not enough information to provide certainty of either of these practices, and therefore necessitating excluding the case from analysis, it is relevant enough to be included in these case studies.

Berndt and Berndt (1951, p. 81) reported that the South Australian Aborigines believed that to impregnate a woman, five to six ejaculates on successive days were required. The ejaculates must come from the woman's husband, and any deposits from men that were not her husband would negate the pregnancy. In the footnotes, Berndt and Berndt (1951, p. 81) said, "Some natives say it is alright for her to have coitus with (men)

who stand in relationship to her husband as 'brother.'" This indicates that both the husband and men considered to be his brothers were thought to contribute semen, which helped grow the baby. Of the belief of a husband finding a spirit child once his wife is pregnant, Berndt and Berndt (1951, p. 83) said, "The principle behind this spiritual interpretation of fatherhood stresses the importance of a child's membership in the patriline. Theoretically a spirit child for a man's wife cannot be found by a man other than the actual spouse, but exceptions to this are made in the case of husband's brothers, actual or (those of the same moiety) who will not destroy the child's true image." In order to determine whether or not this group is practicing informal polyandry, it would be necessary to know how the father's brothers behave towards the child once it is born and whether or not the men who could have contributed ejaculate to the baby have any rights or responsibilities after their initial contribution.

South America

Ache. The Ache are a group of small-scale horticulturalists living in Paraguay. They were living strictly as hunter-gatherers until around 1980, but learned slash-and-burn agricultural techniques and began to raise some domestic animals during the early 1980's (Hill and Hurtado 1996). They were previously living in small bands and were very mobile. They now live in stationary mission/reservation settlements, although they take every opportunity to travel to other settlements in attempt to maintain some mobility, and in 1993 they made a return to small-scale foraging in the areas around their settlements (Hill and Hurtado 1996).

Monogamous marriages among the Ache were by far the most stable, as Hill and Hurtado (1996, p. 229) classified nearly all polygamous marriages as transitional states, rather than stable unions. Although it seemed that polyandry was fairly uncommon among the Ache, Hill and Hurtado (1996) found that eleven out of eighteen men the interviewed that were over 30 years of age had been involved in a polyandrous marriage at some point in their lives. Hill (2008, personal communication) stated that Ache polyandry was usually non-fraternal and speculated that polyandry occurred among the Ache due to shortages of women, either due to demographic issues or to sometimes high rates of polygyny practiced by other men. The unions typically dissolved when one of the two co-husbands left the marriage to seek his own wife (Hill and Hurtado 1996). There is no indication as to why polyandry was practiced among the Ache, however according to Hill (2008, personal communication), it appeared to occur as a last resort.

The Ache also believe in partible paternity. Hill and Hurtado (1996, p. 249-250) report that females generally copulate with several males during their pregnancy and announce the multiple paternity of a child at its birth. While the primary fathers are most likely to be the ones that take serious parenting roles, secondary fathers of Ache children also played extremely important roles in the child's life (Hill and Hurtado 1996, p. 249). The secondary father is responsible for stepping in and acting as a primary father if the child's original primary father dies or abandons the mother and child. The secondary father is also responsible for bringing occasional gifts of meat and other resources to the mother and child. Children may benefit later in life from a secondary father, as well; through a secondary father's relatives, the child can rely on important kin networks (Hill 2010, personal communication).

Death of a father, which is common, given the high adult male mortality rate among the Ache, when a child has no secondary father, results in a childhood mortality rate that is three times higher than normal (Hill and Hurtado 1996, p. 424). This may be due to the fact that Ache men provide about 87% of the calories to the diet, most of those coming from meat (Hill and Hurtado 1996, p. 65). It also may be due to infanticide or child homicide, which a child seems to be at greater risk of if his or her father is dead (Hill and Hurtado 1996, p. 434). According to Kim Hill (2010, personal communication), children with only one father are often buried alive with their father if he dies. Juvenilicide is also an increased threat when the father of the victim is either absent or dead. Hill (2010, personal communication) indicated that secondary fathers often end up raising the child. Hill and Hurtado (1996, p. 438) show that children with secondary fathers may be less likely to be victims of child homicide than those with only a single primary father and that, overall, there is a significant difference in mortality between children with no secondary father and those with one secondary father (p. 444).

Aymara. The Aymara were primarily a farming group living on the Lake Titicaca Plateau of Bolivia. The men of the group supplemented the cultivated crops with hunting and fishing, and the women gathered as well. According to LaBarre (1948, p. 133), men and women contributed equally to the subsistence economy. The Aymara's political system was interesting, and at times conflicting, as they lived in a chiefdom during their daily life, but often came into contact with the larger state system of Bolivia.

The Aymara were known to practice fraternal polyandry in the past (LaBarre 1948, p. 132). Around the same time, the 1900 census indicated that there were 203,910 males and 193,733 females living in the population (LaBarre 1948, p. 35), which is a

ratio of 105 males for every 100 females, and that more males were typically born in the society than females (p. 45). It is unlikely that the loss of a father would negatively impact Aymara children, as LaBarre (1948) recorded that family was quick to adopt a child in need.

Barí. The Barí are a horticultural people, living in the southwestern lobe of the Maracaibo Basin in Venezuela. They subsist primarily off of manioc, with fishing and hunting providing protein supplements. Dufour (1994) points out that while a diet consisting mainly of manioc is probably sufficient for adult males, one much higher in animal protein is necessary for children and pregnant and lactating women. Barí women do most of the horticultural work and some fishing, however, men are responsible for the provisioning of nearly all fish and game (Beckerman et al. 2002).

Adult mortality is high for the Barí, due to disease and chronic war (Beckerman et al. 2002), but is especially high for reproductive-age men (Beckerman and Lizarralde 1995). Professional "Indian killers" were often hired by the region's landowners, oil companies, and homesteaders to kill off the Barí, and the most common victims were men. Men were also more exposed to the dangers of the rainforest than were the women. Beckerman et al. (2002) report that over one-third of the Barí women in their sample were widowed while they had dependent children.

The Barí are primarily a monogamous people, with polygyny occurring occasionally, but with formal polyandry, according to Beckerman et al. (2002) occurring never. They do, however, believe in partible paternity. Beckerman et al. (2002) report that most Barí women, both during pre-contact times and currently, took one or more lovers during at least one of their pregnancies. These lovers were believed to contribute

to the development of the fetus with their sperm deposits and considered to be secondary fathers of the child. Women's husbands were aware of the lovers and did not seem to object. Once a woman gave birth, she named the fathers of her child and, once notified of their fatherhood, the secondary fathers had responsibilities towards their child. The most notable responsibilities were the gifts of fish and game, and sometimes manioc, they were supposed to provide.

Beckerman et al. (2002) tested the hypothesis that multiple, or partible, paternity functioned as an insurance policy on a woman's husband, providing an additional male with spousal and parental obligations if the primary father died. Analysis of a database that contained the reproductive histories of 114 post-reproductive women and their 916 pregnancies showed a survival advantage to children with one secondary father. Interestingly, the presence of a secondary father seemed to make the most difference in a child's probability of surviving to adulthood before birth. Beckerman et al. (2002) proposed that this lower percentage of fetal wastage was due to gifts of fish and game that the secondary father gave to the mother in exchange for her sexual favors.

Canela. The Canela are a matrilocal people living in the center of the Brazilian state of Maranhão. Prior to Western contact, the Canela were semi-nomadic hunter-gatherers (Crocker 2002). Men provided the majority of the food to the group, as they were responsible for hunting and cultivating manioc and other crops, while women controlled food distribution, cooked, and cared for children (Crocker 2002).

The Canela have long practiced partible paternity, believing that more than one man may contribute to the development of a fetus and therefore, be biological fathers to the child. The mother's husband was considered by the Canela to be more important to

the development and welfare of the fetus and child than any of the other fathers, although the other fathers are known to bring gifts of meat to the mother and child (Crocker 2002). Crocker (2002) argues that, as of the mid-1900's, the other fathers have no impact on the well-being of a fetus or child. However, he also suggests that "other fathers" must have been beneficial to children at some point in history in order for the beliefs and practices of partible paternity to have remained (Crocker 2002, p. 102).

Cashinahua. The Cashinahua of the eastern Peruvian Amazon are an egalitarian tribe of primarily slash and burn horticulturalists. Cashinahua men build the gardens, while women harvest the vegetables. Men also supplement the diet with animal protein through hunting and fishing.

The Cashinahua have not been known to practice formal polyandry, but they do believe in and practice partible paternity (Kensinger 2002). It is common for Cashinahua women, both married and single, to take lovers, and although male lovers provide their partners with gifts of meat and other resources, it is rare for a woman's husband to acknowledge that she has a lover. Therefore, shared paternity, or partible paternity, among the Cashinahua is not always publicly recognized, due to the risk of public disruption (Kensinger 2002). The risk is greatly reduced, however, if the co-father is from the same moiety as the woman's husband (Kensinger 2002, p. 19), and interestingly, men from the same moiety are typically brothers or close relatives (Kensinger 2002, p. 15). Public recognition of a secondary father also increases the chances that he will continue to supplement the household's meat supply on a regular basis through his gifts to the mother and child (Kensinger 2002, p. 20-21).

Cubeo. The Cubeo, also known as the Tukano, are a small-scale horticultural group living in the Northwest Amazon, along the Vaupés River, near the Brazillian border. Men fish on the river daily and hunt sporadically, as needed or wanted while women are responsible for producing and cultivating manioc, which is the staple food in the Cubeo diet (Goldman 1963). Women also gather occasionally, although most of their time is consumed with manioc production. Even though women provide more than half of the daily calories among the Cubeo, men are seen as the most important, economically, because fish is viewed as the most important food (Goldman 1963).

In this patrilineal, patrilocal society, all types of marriages are typically unstable during younger years, but become more stable as people age and when children are born. The Cubeo are known to practice preferential female infanticide and at the time Goldman (1963) was completing his study, there was a shortage of marriageable women in the group (p. 188). While polyandry seems to be rarely practiced, it is typically fraternal. In the case recounted by Goldman (1963, p. 147), a man added his brother to the marriage because the brother was unable to find a wife of his own. The wife fed both men and was available as a sexual partner to the secondary husband only when the primary husband was away from home for long periods of time.

The Cubeo also believe in partible paternity (Chernela 2002); deposits of sperm are thought to build the fetus, therefore, making it possible for more than one man to be recognized as biological fathers of a child. The patrilineal nature of the Cubeo dictates that all children born into the patriclan are provided for by all of the clan brothers collectively. Chernela (2002, p. 173) reports that each man in the clan labors daily for all of the children of a village. Interestingly if a woman identifies a clan brother as a

secondary father of her child, little attention is paid (Chernela 2002, p. 174). However, if a secondary father is a man from outside the patriclan, major problems can arise, and therefore, secondary fathers that are not clan brothers of the woman's primary husband are rarely recognized.

Kulina. The Kulina are an egalitarian tribe living in the Brazilian Amazon. They practice slash and burn horticulture, with women harvesting the vegetable crops and gathering other foods, and men hunting and fishing (Pollock 2002). The Kulina also believe in partible paternity. They believe that semen accumulates in a woman's womb until it forms a fetus, and that men are solely responsible for formation and development of the fetus, with women making no contribution to the child's development until after birth (Pollock 2002). The Kulina consider every sexually active woman to be at least a little pregnant throughout her adult life.

While co-paternity of a Kulina child is not kept secret, the secondary fathers are typically fairly discrete about their contributions (Pollock 2002). According to Pollock (2002, p. 55) it seems that it is common for a co-father to be the husband's brother, and co-paternity aside, Kulina brothers are an important source of social and nutritional support for their brother's children. This support is critical to Kulina children, who have a mortality rate that is estimated to be anywhere from forty to sixty percent (Pollock 2002, p. 57). Pollock (2002, p. 57) reports that the presence of several adult males in a household ensures a better supply of protein for children, and that lower infant and childhood mortality rates coincide with larger, more socially complex households. Pollock (2002, p. 58) concludes, "… the overlapping categories of 'other fathers,' which include father's brothers as well as ethnobiologically related men, provide most children

with a range of adult men who can be called upon for various forms of social support, including food."

Mehinaku. The Mehinaku of the Upper Xingu region of Brazil are slash-and-burn horticulturalists, hunters, and fishermen. Gregor (1977, p. 26) reported a shortage of marriageable women among the Mehinaku, and while formal polyandry has not been reported for the group, they do practice partible paternity. Among the Mehinaku, extramarital affairs are quite common, although they are typically kept as secret as possible (Gregor 1985). The Mehinaku men typically perform an act known as "alligatoring" in which they hide behind a woman's hut, waiting for her to come out so that he can solicit sex. He then takes his lover to his "alligator area" where they quickly and privately have intercourse (Gregor 1985). Men almost always bring gifts for their lovers, but only rarely are these men recognized by the woman as secondary fathers of her child, as exogamous marriage rules can make it extremely difficult for a child with more than one father to find a mate. However, when men are recognized as secondary fathers, they observe abbreviated versions of the father's birth taboo and also accept some of the obligations of the in-laws when the child grows up and gets married (Gregor 1985, p. 88).

Panoan Matis. The Panoan Matis of the Javari Basin in Brazil practice partible paternity (Erikson 2002). Severe depopulation of the group in the mid-1970's led to an imbalanced ratio of adults to children, with very few adults remaining. According to Erikson (2002), this resulted in marriage rules being bent and several different forms of marriage being practiced. It is unclear whether any type of formal polyandry was ever practiced among the Panoan Matis, however, the belief of partible paternity prevailed.

Erikson (2002, p. 134) argues that secondary fathers were not necessarily positively affecting children's ability to survive. It was unclear from Erikson's (2002) work how partible paternity worked among the Panoan Matis, how it may have benefited anyone, or how it was related to the severe depopulation.

Yanomamö. The Yanomamö are an interesting case because they practice both formal and informal polyandry. According to Peters and Hunt (1975, p. 201 & 203), formal polyandry seems to fluctuate with the sex ratio, which may be influenced by things like preferential female infanticide, high male death rate, or acquisition of females from other groups. For 1958, Peters and Hunt (1975) report a sex ratio of 149 males for every 100 females, at which time polyandry was a very common, and occasionally the most prevalent, form of marriage practiced among the Yanomamö. By 1972, the sex ratio had become more even, with 108 men for every 100 women and out of the 37 total marriages in the group, only one was polyandrous.

Peters and Hunt (1975) point out that unmarried Yanomamö men over the age of 20 cause a great deal of concern among the people in the group. Therefore, a man in this circumstance was often invited to join his older brother's family as a co-husband. The younger male was responsible for most of the hunting , while the primary husband handled the gardening. If the secondary husband is a good hunter, he is likely to have more sexual opportunities with the wife, although any children born to the wife are considered to belong to all husbands (Peters and Hunt 1975, p. 202). Fraternal polyandry appears to be the most common for the Yanomamö, and although non-fraternal polyandry was also practiced, Peters and Hunt (1975, p. 202) reported that it caused a great deal more intra-marital conflict than did fraternal polyandry, and may have even contributed

to instability of the union. It should be noted, though, that all Yanomamö polyandrous marriages were fairly unstable, with the secondary husband leaving the union to acquire his own wife when a woman was available for him to do so.

The Yanomamö also believe in partible paternity and practice informal polyandry in that context. Conception is believed to occur over the span of several acts of intercourse and subsequent sperm deposits, therefore, the Yanomamö believe that it is possible for more than one man to contribute to the development of the fetus and thereby become fathers of the child (Peters and Hunt 1975). Catherine Alès (2002) reports that after the child is born, the mother receives food from all of the men believed to be fathers of the child. These gifts will continue whether the woman's primary husband recognizes the co-fathers or not, however the cases in which the secondary fathers are recognized are the ones considered to be informal polyandry. Alès (2002) refers to this as "unofficial polyandry," and reports that in approximately 40% of the cases of partible paternity in her study the secondary fathers are brothers of the woman's husband. A secondary father will only be granted the title of 'younger father' if he is a brother of the husband and all of those that are not brothers are not recognized by the husband and either stays hidden or is denied. According to Hames (2010, personal communication), the younger father was often more attentive to the child than the primary father and women commonly stated that the child resembled the younger father more than the primary father.

Zo'e. The Zo'e live in the Amazon in Northern Brazil. They are an egalitarian hunting and gathering group that also practices slash-and-burn horticulture. Zo'e men are responsible for providing most of the food to their families and just as it is common for men to have more than one wife, it is common for Zo'e women to have more than one

husband. The husbands are not typically brothers and have different responsibilities. The younger husband does nearly all of the hunting for the family, while the older husband gathers, fishes, and cultivates produce from the farm (Dutilleux 2007).

Figure 3. Formal and Informal Polyandrous Groups

Formal Polyandry		
!Kung	Hawaiians	Polar Eskimo
Ache*	Hephthalites	Pomo
Aleut	Innu	Punans
Alutiiq	Lamotrek Atoll	Sakai
Aymara	Mackenzie River Eskimo	Semang
Bahuma	Malekula	Shoshoni
Bang Chan	Mongolians	Subanu
Blackfoot	Netsilik	Tikerarmiut
Canarians	Northwest Alaskan Eskimo	Tlingit
Chuuk	Paviotso	Utes
Cubeo	Pawnee	Yanomamö*
Gilyaks	Point Hope Eskimo	Zo'e
Informal Polyandry		
Barí*	Kulina*	Yokuts
Canela*	Lele	
Cashinahua*	Maasai	
Cherokee	Mehinaku*	
Cooper Eskimo	Nayar	
Dieri	Paliyans	
Irigwe	Panoan Matis*	
Israelis		

***Indicates partible paternity**

Chapter 3

Results

After conducting the analyses discussed in Chapter 2, some interesting trends were discovered for this sample of fifty-two non-classical polyandrous groups. The sample is made up mostly of egalitarian hunter-gatherers and slash-and-burn horticulturalists that practice formal polyandry, with nearly half of societies consisting of fraternal unions. The majority of the fifty-two societies have high adult male mortality and males who are often away from home for long periods of time, which is particularly interesting considering that in most of the societies men contribute more to the subsistence economy than women do. Along with these univariate findings, a few of the bivariate results were particularly informative. For example, prolonged male absences were significantly associated with fraternal polyandry, however, high adult male mortality was not significantly associated with fraternal polyandry. Also, there were no significant associations of father effect with either male economic production or marital stability. Sample sizes were very small for many of the variables and tests, with the sample size for the variable *sex ratio at birth* equaling eleven and the sample size for the chi-square tests of the second and third Father Effect Hypotheses totaling twenty-two and nineteen, respectively. In some cases small sample size could have contributed to non-significant results.

Descriptive analyses have been completed for all of the variables in this study in order to better understand the characteristics of the fifty-two polyandrous societies in this study. Simple associative tests were also run to test the hypotheses having to do with the causes of polyandry. The Imbalanced Sex Ratio Hypothesis predicts that the majority of

non-classical polyandrous societies should have an imbalanced sex ratio, either at birth or among adults, with more men than women in the society. These imbalances should also lead to greater stability within the polyandrous unions. The Prolonged Male Absence Hypothesis is based on kin selection theory and proposes that in societies in which males are often away from home for long periods of time, the men in the polyandrous unions should be more likely to be brothers than unrelated. The Adult Male Mortality Hypothesis predicts that the majority of non-classical polyandrous societies have high male mortality, therefore, making a secondary husband or father important. Also based on kin selection theory, men in polyandrous unions in societies that have high male mortality should be more likely to be brothers or close relatives than to be unrelated. The Male Economic Production Hypothesis predicts that the majority of non-classical societies should have economies in which men contribute more than women to the subsistence economy, therefore, making the secondary husband useful, and in some cases necessary, to the wellbeing of the children born to the union. The Father Effect Hypothesis proposes that most of the non-classical polyandrous cases in this study should be ones in which the presence of a father is critical to their child's ability to survive and reproduce. This should coincide with high male economic contribution and greater stability of the unions.

Frequency analyses were computed for each of the variables in this study. Table 2 summarizes the univariate statistics for each of these variables. For the variable *type of polyandry*, there are thirty-six formal (69.2%) and sixteen informal (30.8%) cases (N = 52), which is a significant difference, based on a binomial test ($p = .003$). The results of the non-parametric chi-square test for *social stratification* also showed a significant

difference in that the majority, or thirty-seven of the fifty-two societies (71.2%) in this study are egalitarian bands or tribes (p = .000). The results for *partible paternity* show that forty-two of the fifty-two societies (80.8%) do not practice partible paternity, which is a significant binomial difference (p = .000). *Type of economy* was dominated by twenty-five hunter-gatherer societies (48.1%) and sixteen slash-and-burn horticulturalists that also hunt and gather (30.8%) (N = 52), and based on a non-parametric chi-square test, these differences were significant (p = .000). The variable *male relationship* showed that seventeen of the unions, which account for nearly half of the sample (N = 35), were fraternal (48.6%), of the other half, twelve were non-fraternal (34.3%), with only six groups practicing both fraternal and non-fraternal (17.1%), however, based on a non-parametric chi-square test, these differences were not significant (p = .074). The variable *stability* showed that the unions in most groups were either somewhat stable, fifteen groups (38.5%), or somewhat unstable, thirteen groups (33.3%) (N = 39) and were significantly different, according to a non-parametric chi-square test (.002). The frequencies for the other variables will be discussed as they pertain to different hypotheses below.

In order to test the first Imbalanced Sex Ratio Hypothesis, univariate frequencies were obtained for the variables *sex ratio at birth* and *adult sex ratio*. These frequencies showed that there were seven societies with skewed sex ratio favoring males at birth (63.6%), however, the sample size was very small (N = 11) and based on a non-parametric chi-square the difference was not significant (p = .078). With a larger sample size (N = 22) for *adult sex ratio*, a higher percentage of groups, seventeen out of the twenty-two, had adult sex ratios that were skewed in favor of males as well (77.3%),

while unskewed groups, with a count of only 1 (4.5%), and groups skewed in favor of females, with a count of four (18.2%), accounted for a much smaller percentage. These differences were significant, according to the non-parametric chi-square test, $X^2(2) = 19.727$, $p = .000$.

A cross-tabulation analysis was run to test the second Imbalanced Sex Ratio Hypothesis (see Table 3). A chi-square test of independence revealed that there was not a significant association between *adult sex ratio* and *stability*, $X^2(1) = 2.804$, $p = .833$. This potential association was also compared across groups pertaining to the following categories: type of polyandry, social stratification, economic strategy partible paternity, and male relationship. None of these results were significant.

A univariate count for the variable *prolonged male absence* revealed that more societies experienced prolonged male absence, twenty-four out of thirty-seven (64.9%), than societies that did not, thirteen out of thirty-seven (35.1%). Based on a 1-tailed non-parametric chi-square test, this difference was significant ($p = .045$). A cross-tabulation analysis was run to test the Prolonged Male Absence Hypothesis (see Table 4). A chi-square test of independence showed that there was a significant positive association between *prolonged male absence* and *male relationship* in that societies with prolonged male absences were likely to practice fraternal polyandry, $X^2(1) = 6.406$, $p = .041$. This association was also compared across sub-populations in this sample: type of polyandry, social stratification, economic strategy, partible paternity, and male relationship. The association was found to be significant with a chi-square test of independence for formal polyandrous societies, $X^2(2) = 8.311$, $p = .016$ (see Table 5), for egalitarian societies, $X^2(2) = 6.752$, $p = .034$ (see Table 6), and for societies that do not practice partible

paternity, $X^2(2) = 7.20$, $p = .027$ (see Table 7). This means that for formal societies, egalitarian societies, and societies that do not practice partible paternity beliefs, when prolonged male absence was a regular occurrence, the men in the polyandrous unions were more likely to be brothers.

In order to test the first Adult Male Mortality Hypothesis, univariate frequencies were obtained for the variable *adult male mortality*. The data (N = 36) showed that twenty-seven non-classical polyandrous societies had high adult male mortality (75%), with significantly fewer societies, nine out of the thirty-six (25%), that did not have high adult male mortality, according to the non-parametric binomial test ($p = .004$). When these frequencies were compared across populations, the results were the same. A chi-square test of independence was used to test the second Adult Male Mortality Hypothesis (see Table 8). The results for the crosstabulation were not significant, $X^2(1) = .268$, $p = .875$. None of the comparisons across sub-populations of polyandrous types, social stratification, economic strategy, partible paternity, and male relationship were significant either.

Univariate frequencies were used to test the Male Economic Production Hypothesis. The data showed that in the majority of the societies (N = 52), males contributed either nearly everything to the subsistence economy, twenty-one of the fifty-two (40.4%), or slightly more than females, thirteen of the fifty-two (25%), while in seventeen (32.7%) of the societies, males and females contributed equally. A non-parametric chi-square test showed that these differences were significant, $X^2(2) = 17.231$, $p = .001$.

In order to test the first Father Effect Hypothesis, univariate frequencies were obtained for the variable *father effect*. These data showed that for the relatively small sample size (N = 24) fifteen non-classical polyandrous societies did not show a father effect (62.5%), while only nine did show a father effect (37.5%), however, according to the non-parametric binomial test, these differences were not significant ($p = .307$).

A cross-tabulation analysis was used to test the second Father Effect Hypothesis which suggested that a father effect should be found among societies in which males are responsible for most of the food production. A chi-square test of independence showed that there was no significant association between *father effect* and *male economic production*, $X^2(1) = 4.343$, $p = .227$ (see Table 9). When this association was compared across different sub-populations in this study, including type of polyandry, social stratification, economic strategy, and male relationship, there were still no significant relationships found.

A chi-square test of independence was also used to test the third Father Effect Hypothesis, which hypothesized that the presence of a father effect should make the polyandrous unions in a society more stable. The results showed no significant relationship between *father effect* and *stability*, $X^2(1) = 6.708$, $p = .152$ (see Table 10). When this association was compared across different sub-populations in this study, including type of polyandry, social stratification, economic strategy, and male relationship, there were still no significant relationships found.

Levine and Silk's (1997) hypothesis that fraternal polyandrous unions should be more stable than non-fraternal polyandrous unions was also tested (see Table 11). A cross-tabulation of the variables *male relationship* and *stability* was run and was not

significant, $X^2 = 4.499$, $p = .609$. This indicates that among these fifty-two non-classical polyandrous cases, there is no significant relationship between the stability of the union and the relatedness of the men in the union. In other words, this study does not support the claim that fraternal unions are more stable.

Chapter 4

Discussion

The results from both the univariate counts and the associative analyses are informative about the practice of polyandry in non-classical societies. The results outlined above have important implications for the hypotheses they tested and for possible directions of future research. The frequency analyses listed above and discussed below also help to describe the majority of the non-classical polyandrous groups and have implications of their own. While fifty-two, the number of non-classical societies in this study, is a robust number, relative to the four classical societies Murdock (1967) mentions, the data required to test the hypotheses in this thesis were difficult and often times impossible to gather. This frequently led to a sample size much smaller than fifty-two, making significant statistical results hard to come by. In one respect, this indicates that the significant findings that *were* found must be very descriptive. On the other hand, the unavailable data leaves much room for error, in that relationships that may be there cannot be found. There are also obvious limitations to coded categorical data. Complex statistical analyses cannot be performed and truly descriptive pictures are left incomplete. Such coding also leaves much up to interpretation: interpretation from the author of the original work and interpretation by the author of this thesis. Despite these problems, however, the findings of this thesis offer a far more in-depth explanation of non-classical polyandry than exists to this point.

Descriptive variables

One of the important trends revealed in the descriptive analysis by the non-parametric chi-square test is that the majority of these non-classical societies are

egalitarian bands or tribes (p = .000) who practice hunting and gathering as well as slash-and-burn horticulture (p = .000). This trend strongly challenges Symons' (1992) claim that polyandry is a relatively new phenomenon, which likely did not exist in the EEA. Based on the case studies of these societies, it seems that polyandry was practiced as a way to ensure that children were not left without a father, in the case of death or long absences, or as a response to a shortage of marriageable women, both of which would likely have existed in the EEA. According to Tooby and Cosmides (1992), modern hunter-gatherers are the best living representation of EEA hunter-gatherers; therefore, this data supports the notion that polyandry would have existed in the EEA.

The descriptive analysis of the variable *male relationships* showed a slight trend toward fraternal polyandry, but, based on the non-parametric chi-square test, the differences between the number of fraternal, non-fraternal, and groups practicing both were not significant (p = .074). In any case, the fact that among nearly half of the groups for which data was available on this variable polyandry was most commonly practiced among brothers suggests a few things. First, it supports the idea that kin selection is an important factor in the practice of polyandry, which would suppose that men would be more likely to invest in children that belong to their brother than children that are unrelated. The prevalence of fraternal polyandry may also indicate that brothers are better at sharing a wife than men who are not brothers. Or, in these societies where men are contributing a great deal to the subsistence economy and are primarily doing that through hunting, the cooperation of a brother may increase their chances of success. The true anomalies are the 34.3% of societies that practice non-fraternal polyandry. It seems from the case studies that the men in the non-fraternal cases may simply be making the

best of a bad situation. With more complete data, information regarding the reason behind polyandry, or quantitative data on how frequently polyandry occurs in a society, one could examine the importance of fraternal vs. non-fraternal polyandry among the non-classical societies.

The descriptive analysis for the variable *prolonged male absence* revealed that for these non-classical polyandrous societies, there were more cases in which males were absent from home for long periods of time than there were cases in which males were present, however, the difference was not significant according to a binomial test ($p = .099$). According to the case studies, the reasons for absence included warfare, hunting, whaling, and trading. This prevalence of prolonged male absences may indicate that polyandry is functioning as a form of mate guarding in these cases, in that the purpose of the secondary husband is to provision for and protect the wife and children, as well as to prevent the wife from taking lovers outside of the union, while the first husband is away. This trend of prolonged male absence also has implications for the Prolonged Male Absence Hypothesis, which will be discussed later.

The univariate data for *stability* showed a bimodal distribution; nearly as many societies had “somewhat stable” unions (38.5%) as had “somewhat unstable” (33.3%), and these categories were significantly different from one another, according to the non-parametric chi-square test ($p = .002$). This challenges the idea that polyandrous unions are inherently unstable, as Levine and Silk (1997) suggest. Instead, among these non-classical cases at least, polyandrous unions are slightly more likely to be stable than they are to be unstable. This variable will also be discussed in relation to the Father Effect Hypothesis.

Imbalanced Sex Ratio Hypothesis

The first Imbalanced Sex Ratio Hypothesis suggests: *Overall, non-classical polyandrous societies should have sex ratios, whether at birth or in adulthood that are skewed in favor of males*. The results of the descriptive univariate analyses for the variables *sex ratio at birth* and *adult sex ratio* support the hypothesis. The majority of the societies in the study have sex ratios at birth and adult sex ratios that are skewed in favor of males. Both the sample size for *sex ratio at birth* (n = 11) and *adult sex ratio* (n = 22) were small, however, when the counts were compared for different populations, for example formal groups vs. informal groups, the trend remained the same.

While this hypothesis has been suggested to pertain to classical societies (Westermarck 1926; Berreman 1962; Cassidy & Lee 1989), the results of this test show that an imbalanced sex ratio appears to play a part in non-classical polyandrous societies as well. While these counts are certainly not sufficient to suggest causation, these findings, along with the findings of Berreman (1962) and other anthropologists of classical polyandrous societies, indicate that an imbalanced sex ratio with more men than women does seem to be an important correlate for all types of polyandry.

The second hypothesis regarding imbalanced sex ratio stated: *Societies with unstable polyandrous unions should be negatively correlated with an adult sex ratio that is skewed in favor of males*. This hypothesis suggested that societies that have more marriageable men than women should also have more stable polyandrous unions and, conversely, in societies that do not have a skewed sex ratio in favor of men, polyandrous unions should be less stable. This hypothesis was not supported with the chi-square test of independence. Nor were any significant results found when comparing the possible

association across different populations. This lack of support is possibly due to the small sample size (n = 17).

Prolonged Male Absence Hypothesis

The Prolonged Male Absence Hypothesis proposed: *Fraternal polyandry should be positively correlated with prolonged male absences*. The chi-square test of independence used to test this hypothesis was significant (p = .041), therefore, supporting the hypothesis for non-classical polyandrous societies. Both Westermarck (1926) and Tambiah (1966) hypothesized that prolonged male absence should be a factor in classical polyandrous societies. Support for this hypothesis among the non-classical cases indicates that prolonged male absence may be an important contributing factor for all types of polyandry. Also, these findings support the importance of kin selection theory in that when one husband is away from home for long periods of time, it will benefit both the primary husband and secondary husband's fitness to a greater extent if the husbands are brothers than if they are unrelated. In this scenario, both husbands are investing in children that are related to them by at least .25, if not by .50, which is always better than being related by 0.

Interestingly, when this association was tested with a chi-square test of independence across the sub-populations of type of polyandry, social stratification, male relationship, partible paternity, and economic emphasis, significant results were found for societies practicing formal polyandry (p = .016), for egalitarian bands and tribes (p = .034), and for societies that do not practice partible paternity (p = .027), but not for those that do. One possible reason for the differential significance among these populations could be sample size. However, it is logical that a formal union should be in place when

prolonged male absence occurs, in order to ensure that the wife and children have a male who is obligated to provision for and protect them, and to ensure that the primary husband has a related male at home who is similarly interested in preventing their wife from having extra-marital affairs. The same should be true for societies that do not practice partible paternity, given that all of these societies are formal polyandrous groups. Among egalitarian bands and tribes, it may be the case that specific characteristics of band- or tribal-level societies, such as small group size, frequency of warfare, geographical proximity to other groups, etc., make mate guarding especially important, therefore, increasing the likelihood of fraternal polyandry when one husband is away for long periods of time. It also may be the case that the sample sizes for stratified tribes, chiefdoms, and states were too few in this study to garner any significant results.

Adult Male Mortality Hypothesis

The first Adult Male Mortality Hypothesis suggested: *Overall, adult males in non-classical societies should have high mortality rates*. Univariate descriptive analyses, which simply involved a count of the results for the variable *adult male mortality*, were significant based on the binomial test ($p = .004$) and supported this hypothesis. The majority of societies practicing non-classical polyandry have high adult male mortality rates. As theorized in the Introduction, in groups where adult male mortality is high, due to warfare, hunting, disease, or any other factors that would differentially affect male mortality, polyandry should be employed as a type of insurance policy. A woman with more than one husband and children with more than one father will have a backup in place to provision for them and protect them, should the primary husband or father die.

The second hypothesis proposed: *Fraternal polyandry should be positively correlated with high adult male mortality* and was not supported. The theory behind this hypothesis is similar to that behind the Prolonged Male Absence Hypothesis: where males are likely to die, kin selection theory suggests that the secondary husband should be a brother or close relative of the primary husband because he may increase his own inclusive fitness by investing in his brother's children. Interestingly, then, while the Prolonged Male Absence Hypothesis was supported, the results of the chi-square test of independence run for this Adult Male Mortality Hypothesis were not significant and therefore, this hypothesis was not supported. It was also not found to be significant when compared across populations.

Death is a permanent form of absence and in both cases, when polyandry is involved, the children of the primary husband are left in the care of the secondary husband. Therefore, male mortality should show a trend similar to that of prolonged male absence, but it does not. It is possible that insufficient data led to non-significant results. It may also be the case that because death has a different long-term outcome for a male than does prolonged absence, a different strategy is employed when forming the polyandrous union. Men who are away from home for long periods of time will, presumably, eventually return and resume investing in their wife's children. In this scenario, based on kin selection theory and inclusive fitness, it would be important to the man for the children he is investing in to be related to him in some way, which may prompt him to take a brother as a co-husband. And, as has already been discussed at length, the fraternal co-husband would be more motivated to invest in the children while his brother is away. On the other hand, in the case of the primary husband's death, he no

longer has to worry about being cuckolded by his wife or investing in a child that may be unrelated to him and therefore, may be less concerned about who his co-husband is. Currently, there is no empirical evidence to support any of these claims, however, they would be an interesting and informative topic for future research.

Male Economic Production Hypothesis

The Male Economic Production Hypothesis suggests: *Overall, non-classical polyandrous societies should have economies in which men contribute more to the subsistence economy than women*. The descriptive analysis for the variable *male contribution* supported this hypothesis, according to the non-parametric chi-square test ($p = .001$). As Cassidy and Lee (1989) proposed, males in the majority of these groups contribute more to the subsistence economy than women. While women are far from economically unimportant and serve extremely important functions in these societies, they rely on men for their food. This has a few important implications. First, in societies in which males provide most of the calories, absence or death of a husband should have a significant impact on the ability of the children to survive (this will be discussed in more detail in relation to the second Father Effect Hypothesis). Second, in harsh environments where resources are hard to come by, environments in which the case studies showed that several non-classical polyandrous groups like the Inuit are living, more than one man may be necessary to provide enough food to feed the whole family. Finally, there are many hunter-gatherer or slash-and-burn groups in which females contribute an important amount to the subsistence economy, and while polyandry occurs in some of those groups, like the !Kung, non-classical polyandry is most prevalent in groups with high male

economic contribution. This suggests that male economic contribution may be an important driving factor in the practice of non-classical polyandry.

Father Effect Hypothesis

The first Father Effect Hypothesis predicted: *On average, non-classical polyandrous societies should show a father effect for the offspring.* The univariate descriptive analysis run on the variable *father effect* showed results that did not support the hypothesis. Based on the available data, there were more non-classical groups that did not show a father effect than groups that did show a father effect. This could be due to either a small sample size (n = 22) or to the difficulty of obtaining good data for this variable. Discussions of the effect of fathers on the ability of children to survive and reproduce were extremely rare in the literature. Although some authors covered the topic in great detail (Beckerman, et al. 2002; Hill and Hurtado 1996), the great majority either mentioned very little or nothing at all. More data on this variable would be more descriptive of the actual presence or absence of father effects in non-polyandrous societies.

The second Father Effect Hypothesis proposed: *The presence of a father effect should be positively correlated with high male economic production*. The chi-square test of independence run on the variables *father effect* and *male contribution* was not significant, indicating that there was no statistically significant relationship between father effect and male contribution for the non-classical polyandrous groups in this study. When this possible relationship was compared across populations, once again there was no significant relationship found. The small sample size (n = 24) could be influencing these results.

The third Father Effect Hypothesis predicted: *The presence of a father effect should be positively correlated with stability of the union.* When tested for the entire population, there was no significant relationship between father effect and the stability of a union, and therefore, this hypothesis was not supported. Levine and Silk (1997) suggest that fraternal unions should be more stable than non-fraternal unions, however, this hypothesis was not supported by the non-classical data. If it were the case that fraternal unions were more stable, a father effect should only enhance the stability, however, this idea is not supported by these data. This is a possible direction for future research.

It is clear from the case studies that there are cases in which the absence of a father has an extremely detrimental effect (see discussions of the Ache, the Barí, and the Maasai) and cases in which the presence of a secondary father has a very positive effect on the children (see discussions of the Ache and the Malekula). These cases suggest that the effect of fathers should have a significant relationship with the practice of polyandry and theoretically, as discussed in the Introduction, it seems reasonable to assume that in societies where men provide the majority of the food, losing a father should have a significant effect on his children's wellbeing. It also makes sense that if the presence of a father greatly affected the child, unions in which father effects exist should be more stable; fathers should be less likely to leave the union if they doing so will have a detrimental effect on their children. However, the case studies in this thesis also point out that societies have other systems in place to prevent the father effect from being quite so dramatic. These systems commonly involve the mother's family and include matrilocality and avuncular provisioning (see discussions of the Nayar, the Cherokee, and

the Innu). In these cases, polyandry may be occurring for different reasons than it does in societies like the Ache, where the presence of a father is necessary for a child's survival. This would be an area in which future research could be done to help understand the distinction between groups that have a father effect and those that do not.

To summarize, this thesis showed that the following statistically significant trends are descriptive of these fifty-two non-classical polyandrous groups. The majority of these groups practice formal polyandry, and are egalitarian bands or tribes, practicing either strictly hunting and gathering, or a mix of slash-and-burn horticulture with hunting and gathering. In most non-classical polyandrous societies, males are away from home for long periods of time and also die at a higher rate than females. In the societies with prolonged male absence, the unions are likely to be fraternal, but the same is not true for societies with high adult male mortality. The unions are split almost equally between being stable and unstable. Overall, there are more males than females in these societies and overall, males contribute more to the subsistence economies than females do. And finally, a father effect was not found for the sample on average. The implications for these results on the study of polyandry as a whole will be discussed in the Conclusions however, it is clear from the significant trends that were discovered in this study that these results provide a much more complete and informative description of non-classical polyandry.

Chapter 5

Conclusions

This study of fifty-two non-classical polyandrous societies lays to rest the outdated notion that only four societies in the world are allowed to practice polyandry. It also dispels assumptions that polyandry only occurs among stratified, agricultural, state-level societies found only in a circumscribed area in Southeast Asia and functions mainly as a strategy for keeping family land and property together and thereby keeping a family's status intact. This study shows that polyandry has been practiced around the world, among egalitarian hunting and gathering people, as well as slash-and-burn horticulturalists and pastoralists. It seems that polyandry is a means by which societies, and individuals in them, can respond to different environmental and social constraints. It is clear that polyandry covers a scope far beyond that which Murdock (1949) suggested it does.

Non-classical polyandry has not gone unnoticed by scholars, but has failed to become a prevalent part of the main body of literature on polyandry. Westermarck (1922) gives an overview of numerous cases of non-classical polyandry while Kjellstrom (1973) covers all of the known Inuit groups that have practiced polyandry. However, the main focus of polyandry to this point has been on the classical cases. The main theories and hypotheses regarding polyandry have centered around the conditions under which classical polyandry occurs. While there is some overlap among the classical and non-classical societies, especially if, as Smith (1998) suggests, the classical theories are examined on a broader level, there are two main problems with viewing polyandry with such a narrow focus. First, the picture of polyandry that includes only the classical cases

is not fully descriptive of the practice of polyandry as a whole. For example, the monomarital principle (Goldstein 1971) seems to be one of the main driving forces behind classical polyandry, but is a non-issue for non-classical societies. Second, looking at polyandry only among highly stratified state-level societies diminishes the possibility of understanding polyandry from an evolutionary standpoint. Instead, understanding polyandry, as it exists in all types of societies helps to better understand the conditions under which polyandry might have evolved and why it has persisted.

Defining polyandry in such an exclusive manner as Murdock (1949) did has many limitations and has left a gap in the polyandry literature where discussion of the non-classical cases should be. So, in order to encompass all forms of long-term polyandrous unions, including classical and non-classical formal and informal, this thesis redefined polyandry as *the simultaneous bond of one woman to more than one man in which all parties involved have sexual rights and economic responsibilities toward each other and toward any children that may result from the union*. According to this definition, an in-depth literature review revealed the fifty-two non-classical polyandrous societies used in this study. As much data as possible was collected for each society which, along with a thorough case study of polyandrous behavior in each group, have some important implications for the discussion of polyandry in an evolutionary context.

Evolutionary Implications

Symons (1992) uses the fact that the conditions under which Crook and Crook (1988) found polyandry to be adaptive, including agriculture, caste systems, and a state-level government, would not have existed in the EEA to support his argument that polyandry cannot be an adaptation. As highlighted in the Discussion, the prevalence of

polyandry among hunter-gatherers and slash-and-burn horticulturalists who also hunt and gather, most of which are living as egalitarian bands and tribes, shows that Symons' claim that polyandry did not exist in the EEA is likely wrong or, at the very least, incomplete. While a fair amount of contention exists around the issue of contemporary hunter-gatherers being truly representative of hunter-gatherers in the EEA (Bailey and Headland 1991; Endicott and Bellwood 1991), the existence of polyandry not only outside of the classical contexts, but also among some of the people living under the simplest forms of social complexity in recent human history, are sufficient to refute Symons' (1992) use of such an argument. The persistence of polyandry across the forty-one hunting-gathering and slash-and-burn groups in this study demonstrates that polyandry can, and does, occur and persist under conditions that may have been present in the EEA.

Symons' (1992) argument against polyandry as an adaptation was not as much wrong as it was off-target. Discussing polyandry as an adaptation misses the point, as would such a discussion of polygyny, monogamy, group marriage, or any other marriage form. Symons' (1992) criteria for polyandry being an adaptation is that there must be "at least one psychological mechanism" that owes its form to the greater reproductive success of individuals from ancestral populations. It is unlikely that there is a psychological mechanism that evolved for each individual marital form. Instead, pair bonding and the human ability to be flexible with regards to mate choice and different forms of pair bonding, as both Crook and Crook (1988) and Smith (1998) argue, should be the behaviors that are considered as adaptations. Polyandry, or any other form of

marriage, is simply a demonstration of human facultative abilities, and to discuss it as a separate adaptation is not productive.

Symons (1992) also argues against the adaptive nature of paternity confusion, suggesting that it would not benefit females to confuse the paternity of their children. Symons argues that men who are unsure of their paternity will invest less in the child than they would if they had a greater level of certainty. Hrdy (2000) counters that polyandrous mating is a reproductive strategy that can be beneficial to female reproductive fitness. While formal polyandry results in paternity uncertainty to some extent, it also appears to function as a form of mate guarding, thereby limiting paternity to typically two men, who are usually brothers. Informal polyandry, on the other hand, should result in a fair amount of paternity uncertainty but still the uncertain males continue to invest. Societies practicing partible paternity beliefs are an excellent example of this in that the social consequences of partible paternity are such that multiple, usually unrelated, men believe that they share biological paternity of a child with other men, and yet, they still provision for the child and sometimes for its mother. Also, consider Lele informal polyandry in which all children born to the village wife are considered to belong to all men in the village. Again, paternity is quite uncertain and multiple men invest anyway. However, while it is clear that paternity confusion may be a beneficial strategy for females in some cases, it also appears that too much confusion can be detrimental to females' reproductive success. Beckerman et al. (2002) and Hill and Hurtado (1996) supply data for the Barí and the Ache, respectively, showing that while two fathers increase the likelihood of a child's survival, three or more fathers decrease the likelihood. Therefore, Symons (1992) was right about detriments of paternity confusion to the extent

that it may be detrimental to females' reproductive fitness, however, there are clear cases in which a limited amount of confusion is actually beneficial. Therefore, it is unproductive to discuss effects of paternity confusion in such a narrowly focused manner.

Levine and Silk (1997) suggest that male sexual jealousy, among other stressors, leads to the instability of polyandrous unions and the general unwillingness of men to share a wife. However, the results of this study dispute this cut-and-dry notion of male sexual jealousy and how it affects polyandrous unions. The data show that among these non-classical cases, polyandrous unions are slightly more likely to be stable than they are to be unstable. In other words, men are slightly more likely to continue sharing a wife than to leave the union. This certainly does not suggest that men typically enjoy sharing a wife, though some probably do, and it doesn't mean that if the opportunity presented itself for a secondary husband to have his own wife, he would not do it. It does mean, however, that when necessary, and it seems for as long as is necessary, men are capable of sharing a wife. Under these conditions they are, in essence, making the best of a bad situation.

In cases where marriageable women are often unavailable, for instance in the seventeen societies in which there are more men than women in the population, or when men cannot provide enough resources to care for a wife and children of their own, polyandry is one possible solution which allows them to make the best of a less than ideal situation and share a wife. In these instances, when a man cannot have his own wife, it would better serve his fitness for him to share a wife than to have no wife at all. Likewise, it would be more beneficial to him and his reproductive fitness to increase his chances of fathering at least one child and investing in it than it would be to risk having

no child at all. Of course, truly making the best of such a situation would mean sharing a wife with a brother. In this case, all of the children that a co-husband is investing in are likely to be related to him by at least .25, so even if he doesn't manage to father any children with the wife, he is still increasing his inclusive fitness.

Based on the fifty-two non-classical polyandrous case studies, it seems that males and females are employing their own strategies, under different conditions, which ultimately results in different types of polyandry. Beckerman et al. (2002) discuss polyandrous behavior as a strategy females employ to ensure male investment in their offspring and also, in the best-case scenario, to increase their likelihood of obtaining both good genes from a father and investment. The case studies support this idea; it looks as though informal polyandry may be more of a female-driven endeavor. Societies practicing partible paternity, which make up over half of the total number of informal groups in this study, illustrate this point in that mothers are responsible for deciding whether or not to recognize a specific man as a secondary father of her child. Therefore, the mother has the power to determine which of the men that she had sexual relations with during her pregnancy are going to take on the responsibilities of provisioning for her children.

Also, in more than half of the informal societies for which data were available the polyandry was non-fraternal. For inclusive fitness purposes, men should be more likely to choose a brother as a co-father, therefore suggesting that women have a hand in determining who the secondary fathers of their children are. This strategy functions as a sort of insurance policy for females. Adult male mortality is high among the informal cases of polyandry, which indicates that it would be beneficial for a mother to have

another man immediately available to step in and take the place of the primary father, provisioning for and protecting the mother and her children.

Formal polyandry, on the other hand is more likely to be a male strategy and function as a form of mate guarding when the primary father is away, indicated by the fact that nearly all of the societies in which prolonged male absences occurred practiced formal polyandry. The significant results of the Prolonged Male Absence Hypothesis fully supports the notion of formal polyandry as a mate guarding technique because it shows that men in formal unions in which males are away from home for long periods of time were more likely to be brothers. As previously discussed, a primary husband's inclusive fitness would benefit more from leaving his wife with his brother, thereby allowing his brother sexual access to his wife, and investing in children that result from that union than if he left his wife unguarded and risked investing later in a child that was unrelated to him. Also, inclusive fitness benefits to the brother of the primary husband would likely motivate the brother, also the secondary husband, to invest in and protect the primary husband's children during instances of prolonged absence.

It is interesting that while males and females employ unique reproductive strategies that result in different forms of polyandry, the result is still polyandry. Therefore, high adult male mortality and prolonged absences of males from home seem to be extremely important factors related to the practice of polyandry. But it would be wrong to assume that these variables alone are driving polyandry, for there are undoubtedly many societies in the world that experience prolonged male absence or high adult male mortality rates and do not practice polyandry; it is likely that these groups are employing alternative strategies to deal with such issues. Male contribution to the

subsistence economy also seems to be an important associate of non-classical polyandry but, again, cannot stand alone as the driving factor for the practice of non-classical polyandry. The same may be true for imbalanced sex ratios, however, it is unclear how common male surplus and female shortage are in non-polyandrous societies and currently the empirical data has not been gathered together to compare this variable across societies with different marital forms. What may be more likely is that different combinations of variables, like adult male mortality, prolonged male absence, male contribution, sex ratio, type of economy, social stratification, and father effect, occurring under differing conditions may lead certain people in a society to form polyandrous unions. Therefore, polyandry seems to be one strategy employed by different groups of people, under different conditions to solve problems like a shortage of females, or husbands being away for long periods.

There were a number of limitations of this study. While the literature search was as extensive as possible, it is highly likely that there are cases of polyandry in other groups that have either gone unrecorded, or were not reported in such a way that the case would turn up in a search of the literature. This belief is based on the fact that some of the cases in this study were found by luck or by word of mouth. A central problem in this study is also very little empirical data regarding any of the variables that were included in this study. Only the more recent literature included quantitative data, therefore, leaving very little information that could be analyzed more extensively than the simple univariate and bivariate analyses that were conducted for this study. Also, where empirical data was collected, the sample sizes were typically very small, which also makes analysis difficult. Perhaps the greatest limitation, though, was not the lack of information available and

accessible, but the fact that the data that exists on most of these groups is all that will ever exist. Many of the groups in this study are no longer living under the conditions they were at the time their authors wrote about them. For example, many of the American Indian groups that were hunting and gathering at the time that they were practicing polyandry are now living in a Westernized world, often on reservations. Some of the groups in this study have even gone extinct. Therefore, it makes further research on most of these groups impossible.

Further research is entirely possible, however. Some societies are still living in conditions that would likely allow them to practice polyandry, such as the Yanomamö or the Ache. While these are the cases for which some quantitative data already exists, more data could be collected from interviews and possibly observations that focused solely on polyandrous practices. Another interesting direction for future research would be to examine informal polyandry from the female's perspective. Since this thesis has established that informal polyandry seems more likely to be a strategy employed by women, and that polyandrous practices related to partible paternity are almost always driven by women, Lowland South American groups that still believe in partible paternity would be a good place to start. The current non-classical polyandrous literature says almost nothing about women, their perspective, or their role in orchestrating the polyandrous unions.

Appendix

Table 1. Data on all variables for all fifty-two non-classical polyandrous societies.

Culture	Type of Polyandry	Social Stratification	Partible Paternity	Type of Economy	Relationship of Men	Sex Ratio at Birth	Adult Sex Ratio	Adult Male Mortality	Male Absence	Male Contribution	Father Effect	Stability
!Kung		1	1	2	1		3	1	2	2	3	
Ache		1	1	1	2	2		1	1	2	5	1	2
Aleut		1	3	2	1	1		3	1	1	5		
Alutiiq		1	1	2	1		1	1	1	1	5		3
Aymara		1	3	2	3	1	1	1		1	3	2	
Bahuma		1	1	2	4				2		5	1	2
Bang Chan		1	4	2	5				2	1	4		1
Bari		2	1	1	2			1	1	2	3	1	5
Blackfoot		1	3	2	1			3	1	1	5	2	2
Canarians		1	3	2	2	2			1	1	4		
Canela (pp)		2	1	1	1				1		5	2	4
Cashinahua (pp)		2	1	1	2	1					4	1	4
Cherokee		2	1	2	2	2		1	1		3	2	2
Chuuk		1	1	2	2	3				2	4		3
Copper Eskimo		2	1	2	1	2	1	1	1	1	5		
Cubeo		1	1	1	2	1	1	1	1	2	3		4
Dieri		2	1	2	1	1					3		2
Gilyaks		1	1	2	1	1		1	1	1	4	1	4
Hawaiians		1	1	2	3	1	1	1	2	1	5		3
Hephthalites		1	4	2	4				1	1	5		
Innu		1	1	2	1	1				1	5	2	3
Irigwe		2	2	2	3	2					5		4
Israelis		2	4	2	5			1	2	2	5	2	2
Kulina (pp)		2	1	1	2	1					4	1	4
Lamotrek Atoll		1	3	2	3	1	3	3		1	4		
Lele		2	1	2	2	2				2	4	2	2
Maasai		2	2	2	4	3		1	1	1	5	1	4
Mackenzie River Eskimo		1	1	2	1				1	1	5		
Malekula		1	3	2	2	2			1		4	1	4
Mehinaku		1	1	1	2	2		1	2	1	4	1	4
Mongolians		1	2	2	4	1					5		
Nayar		2	4	2	5	3			1	1	2	2	4
Netsilik		1	1	2	1	2	1	1	1	2	5		2
NW Alaskan Eskimo		1	1	2	1			1	1	1	4		2
Orang Tanjong		1	1	2	1				2	2	3		
Paliyans		2	1	2	1	2					3		5
Panoan Matis (pp)		2	1	1	1	1					3	2	2
Paviotso		1	1	2	1	1		1			3		5
Pawnee		1	1	2	2	1			1	1	3		2
Point Hope Eskimo		1	1	2	1				1	1	5		
Polar Eskimo		1	1	2	1				1	1	5	2	1
Pomo		1	2	2	1				1		4	2	
Punans		1	1	2	1	2			2	2	3	2	5
Semang		1	1	2	2						3		4
Shoshoni		1	1	2	1	1	2	2		1	3		4
Subanu		1	1	2	2	3			2	2	3		4
Tikerarmiut		1	1	2	1	3	3	3	1	1	5		4
Tlingit		1	1	2	1	1			1	1	4	2	
Utes		1	1	2	1	1			1	1	3	2	2
Yanomamö		1	1	1	2	3	1	1	1	2	5		2
Yokuts		2	3	2	1				1		3	2	3
Zo'e		1	1	1	2	2				2	5		4

List of Variable Codes

Type of polyandry:
1 = formal
2 = informal
0 = no information

Societal Stratification:
1 = egalitarian band or tribe
2 = stratified tribe
3 = chiefdom
4 = state level system
0 = no info

Partible Paternity:
1 = yes
2 = no
0 = no information

Type of Economy:
1 = purely hunter-gatherer
2 = simple slash-and-burn horticulture
3 = primarily horticulture
4 = pastoralism
5 = agriculture
0 = no information

Relationship of Men:
1 = fraternal
2 = non-fraternal
3 = both fraternal and non-fraternal
0 = no information

Sex Ratio at Birth:
1 = more males than females
2 = not skewed (equal number males to females)
3 = more females than males
0 = no information

Adult Sex Ratio:
1 = more males than females
2 = not skewed (equal number males to females)
3 = more females than males
0 = no information

Adult Male Mortality:
1 = high
2 = low
0 = no information

Prolonged Male Absence:
1 = yes (it occurs)
2 = no (it does not occur)
0 = no information

Male Contribution to Subsistence:
1 = males contribute nothing
2 = males contribute less than females
3 = males and females contribute approximately equal amounts
4 = males contribute more than females
5 = males contribute everything or nearly everything
0 = no information

Father Effect:
1 = yes (a father effect was reported)
2 = no (a lack of father effect was reported OR circumstances were such that there should be no father effect - see methods for more description)
0 = no information

Stability of the Union:
1 = very unstable (nearly all marriages dissolve)
2 = somewhat unstable (marriages are more likely to dissolve than to stay together)
3 = both stable and unstable (it is as common for marriages to dissolve as it is for them to stay together)
4 = somewhat stable (marriages stay together more than they dissolve - cases in which marriages are unstable at young ages, but become quite stable after the birth of a child are included here)
5 = very stable (marriages hardly ever dissolve

Table 2
Summary of Type of Polyandry, Social Stratification, Partible Paternity, Type of Economy, Male Relationship, Prolonged Male Absence, and Stability of Unions

Variable	Univariate Statistics	
Type of Polyandry	Formal	36 (69.2%)
(N = 52)	Informal	16 (30.8%)
Social Stratification	Egalitarian Band or Tribe	37 (71.2%)
(N = 52)	Stratified Tribe	4 (7.7%)
	Chiefdom	7 (13.5%)
	State Level	4 (7.7%)
Partible Paternity	Yes	10 (19.2%)
(N = 52)	No	42 (80.8%)
Type of Economy	Hunter-Gatherer	25 (48.1%)
(N = 52)	Horticultural/Hunter-Gatherer	16 (30.8%)
	Farming	4 (7.7%)
	Pastoralism	4 (7.7%)
	Agriculture	3 (5.8%)
Male Relationship	Fraternal	17 (48.6%)
(N = 35)	Non-fraternal	12 (34.3%)
	Both	6 (17.1%)
Sex Ratio at Birth	More Males Than Females	7 (63.6%)
(N = 11)	Not Skewed	1 (9.1%)
	More Females Than Males	3 (27.3%)
Adult Sex Ratio	More Males Than Females	17 (77.3%)
(N = 22)	Not Skewed	1 (4.5%)
	More Females Than Males	4 (18.2%)
Adult Male Mortality	High	27 (75%)
(N = 36)	Low	9 (25%)
Male Economic Contribution	Less Than Females	1 (1.9%)
(N = 52)	Equal	17 (32.7%)
	More Than Females	13 (25%)
	Nearly All	21 (40.4%)
Father Effect	Yes	9 (37.5%)
(N = 24)	No	15 (62.5%)
Prolonged Male Absence	Yes	24 (64.9%)
(N = 37)	No	13 (35.1%)
Stability	Very Unstable	2 (5.1%)
(N = 39)	Somewhat Unstable	13 (33.3%)
	Both Stable and Unstable	5 (12.8%)
	Somewhat Stable	15 (38.5%)
	Very Stable	4 (10.3%)

Table 3.

Relationship between Stability of Unions and Adult Sex Ratio*

		Stability of Unions				Total
		somewhat unstable	both stable and unstable	somewhat stable	very stable	
Adult Sex Ratio	more males than females	6	2	4	2	14
	not skewed	0	0	1	0	1
	more females than males	1	0	1	0	2
Total		7	2	6	2	17

*X^2 = 2.804, p = .833

Table 4.

Relationship between Prolonged Male Absence and Male Relationship*

		Male Relationship			Total
		fraternal	non-fraternal	both fraternal and non-fraternal	
Prolonged Male Absence	yes	10	3	3	16
	no	1	5	3	9
Total		11	8	6	25

* X^2 = 6.406, p = .041

Table 5.

Relationship between Prolonged Male Absence and Male Relationship among Formal Polyandrous groups*

		Male Relationship			Total
		fraternal	non-fraternal	both fraternal and non-fraternal	
Prolonged Male Absence	yes	10	2	1	13
	no	1	4	3	8
Total		11	6	4	21

a. type of polyandry = formal

* X^2 = 8.311, p = .016

Table 6.

Relationship between Prolonged Male Absence and Male Relationship for Egalitarian Bands or Tribes*

		Male Relationship			
		fraternal	non-fraternal	both fraternal and non-fraternal	Total
Prolonged Male Absence	yes	7	2	1	10
	no	1	5	3	9
Total		8	7	4	19

a. social stratification = egalitarian band or tribe
* $X^2 = 6.752$, $p = .034$

Table 7.

Relationship between Prolonged Male Absence and Male Relationship among Groups That Do Not Practice Partible Paternity*

		Male Relationship			
		fraternal	non-fraternal	both fraternal and non-fraternal	Total
Prolonged Male Absence	yes	10	2	3	15
	no	0	3	2	5
Total		10	5	5	20

a. partible paternity = no
* $X^2 = 7.20$, $p = .027$

Table 8.

Relationship between Adult Male Mortality and Male Relationship*

		Male Relationship			
		fraternal	non-fraternal	both fraternal and non-fraternal	Total
Adult Male Mortality	high	6	6	4	16
	low	1	2	1	4
Total		7	8	5	20

* $X^2 = .268$, $p = .875$

Table 9.

Relationship between Father Effect and Male Economic Contribution*

		Male Economic Contribution				Total
		males contribute less than females	males and females contribute equally	males contribute more than females	males contribute nearly everything	
Father Effect	yes	0	1	5	3	9
	no	1	6	3	5	15
Total		1	7	8	8	24

* $X^2 = 4.343$, $p = .227$

Table 10.

Relationship between Father Effect and Stability of Unions*

		Stability of Unions					Total
		very unstable	somewhat unstable	both stable and unstable	somewhat stable	very stable	
Father Effect	yes	0	2	0	6	1	9
	no	1	6	2	2	1	12
Total		1	8	2	8	2	21

* $X^2 = 6.708$, $p = .152$

Table 11.

Relationship between Stability of Unions and Male Relationship*

		Stability of Unions				Total
		somewhat unstable	both stable and unstable	somewhat stable	very stable	
Male Relationship	fraternal	4	2	5	1	12
	non-fraternal	4	0	4	2	10
	both fraternal and non-fraternal	1	1	4	0	6
Total		9	3	13	3	28

*$X^2 = 4.499$, $p = .609$

References

Aginsky, B. W.
1939 Control in the Shanel (Pomo) Tribe. American Sociological Review 4(2):209-216.

Ales, Catherine
2002 A Story of Unspontaneous Generation: Yanomami Male Co-Procreation and the Theory of Substances. *In* Cultures of Multiple Fathers: The Theory and Practice of Partible Paternity in Lowland South America. Stephen Beckerman and Paul Valentine, eds. Pp. 62. Gainesville, FL: University Press of Florida.

Alexander, Richard D.
1974 The Evolution of Social Behavior. Annual Review of Ecology and Systematics 5:325-383.

Alkire, William H.
1965 Lamotrek Atoll and Inter-Island Socioeconomic Ties. Vol. 5. Urbana: University of Illinois Press.

Altmann, J.
1980 Baboon Mothers and Infants. Cambridge: Harvard University Press.

Anne Wilson Goldizen
1987 Facultative Polyandry and the Role of Infant-Carrying in Wild Saddle-Back Tamarins (Saguinus Fuscicollis). Behavioral Ecology and Sociobiology 20(2):99-109.

Arnqvist, Goran, and Tina Nilsson
2000 The Evolution of Polyandry: Multiple Mating and Female Fitness in Insects. Animal Behaviour 60:145-164.

Baker, A. J., K. L. Bales, and J. M. Dietz
2002 Mating System and Group Dynamics in Lion Tamarins. *In* Lion Tamarins: Biology and Conservation. Devra G. Kleiman and Anthony B. Rylands, eds. Pp. 188-212. Washington D.C.: Smithsonian Institution Press.

Bales, Karen L., Jeffrey A. French, Jennifer McWilliams, Reagan A. Lake, and James M. Dietz
2006 Effects of Social Status, Age, and Season on Androgen and Cortisol Levels in Wild Male Golden Lion Tamarins (Leontopithecus Rosalia). Hormones and Behavior 49(1):88-95.

Balikci, Asen
1970 The Netsilik Eskimo. Long Grove, IL: Waveland Press, Inc.

Balikci, Asen
1967 Female Infanticide on the Arctic Coast. Man 2(4):615-625.

Batchelor, John
1927 Ainu Life and Lore; Echoes of a Departing Race. Tokyo: Kyobunkwan.

Bateman, A. J.
1948 Intra-Sexual Selection in Drosphila. Heredity 2:349-368.

Beckerman, Stephen and Valentine, Paul
2002 Introduction: The Concept of Partible Paternity among Native South Americans. *In* Cultures of Multiple Fathers: The Theory and Practice of Partible Paternity in Lowland South America. Beckerman, Stephen and Valentine, Paul, ed. Pp. 1. Gainesville, FL: University Press of Florida.

Beckerman, Stephen, and Roberto Lizarralde
1995 State-Tribal Warfare and Male-Biased Casualties among the Bari. Current Anthropology 36(3):497-500.

Beckerman, Stephen, Roberto Lizarralde, Manuel Lizarralde, Jie Bai, Carol Ballew, Sissel Schroeder, Dina Dajani, Lisa Walkup, Mayhsin Hsiung, Nikole Rawlins, and Michelle Palermo
2002 The Bari Partible Paternity Project, Phase One. *In* Cultures of Multiple Fathers: The Theory and Practice of Partible Paternity in Lowland South America. Stephen Beckerman and Paul Valentine, eds. Pp. 27. Gainesville, FL: University Press of Florida.

Berndt, Ronald Murray, and Catherine Helen Berndt
1951 Sexual Behavior in Western Arnhem Land. Vol. 16. New York: The Viking Fund.

Berreman, Gerald D.
1962 Pahari Polyandry: A Comparison. American Anthropologist 64(1):60-75.

Bicchieri, M. G.
1972 Hunters and Gatherers Today: A Socioeconomic Study of Eleven such Cultures in the Twentieth Century. New York: Holt, Rinehart and Winston.

Birkhead, T. R., L. Atkin, and A. P. Moller
1987 Copulation Behavior of Birds. Behaviour 101:101-138.

Bogoras, Waldemar
1904; 1909 Chukchee. Leiden: E. J. Brill ltd.

Bollig, Laurentius
1967 The Inhabitants of the Truk Islands: Religion, Life, and a Short Grammar of a

Micronesian People. New Haven, CT: Human Relations Area Files (Original work published 1927).

Bontier, Pierre, Jean Le Verrier, and Richard Henry Major
1872 The Canarian: Or, Book of the Conquest and Conversion of the Canarians in the Year 1402. Vol. 1st ser. v.46. London: Printed for the Hakluyt society.

Borgerhoff Mulder, Monique
2009 Serial Monogamy as Polygyny Or Polyandry? Human Nature 20(2):130-150.

Brown, Gillian R., Kevin N. Laland, and Monique Borgerhoff Mulder
2009 Bateman's Principles and Human Sex Roles. Trends in Ecology and Evolution 24(6):297-304.

Brown, Donald E.
1991 Human Universals. Philadelphia, Pa.: Temple University.

Burch, Ernest S.
1975 Eskimo Kinsmen: Changing Family Relationships in Northwest Alaska. St. Paul: West Pub. Co.

Buss, David M.
1989 Sex Differences in Human Mate Preferences: Evolutionary Hypotheses Tested in 37 Cultures. Behavioral and Brain Sciences 12:1-49.

Buss, David M., and Martie Haselton
2005 The Evolution of Jealousy. Trends in Cognitive Sciences 9(11):506-507.

Buss, David M., Randy J. Larsen, Drew Westen, and Jennifer Semmelroth
1992 Sex Differences in Jealousy: Evolution, Physiology, and Psychology. Psychological Science 3:251-255.

Cassidy, Margaret L., and Gary R. Lee
1989 The Study of Polyandry: A Critique and Synthesis. Journal of Comparative Family Studies 20:1-11.

Chagnon, Napoleon A.
1983 Yanomamö :The Fierce People. 3rd ed. New York: Holt, Rinehart and Winston.

Chandra, Ramesh
1987 Polyandry in the North-Western Himalayas: Some Changing Trends. *In* Polyandry in India. Manis Kumar Raha and Palash Chandra Coomar, eds. Pp. 130-154. Delhi: Gian.

Chao, L.
1997 Evolution of Polyandry in a Communal Breeding System. Behavioral Ecology 8:668-674.

Chernela, Janet M.
2002 Fathering in the Northwest Amazon of Brazil: Competition, Monopoly, and Partition. *In* Cultures of Multiple Fathers: The Theory and Practice of Partible Paternity in Lowland South America. Stephen Beckerman and Paul Valentine, eds. Pp. 160. Gainesville, FL: University Press of Florida.

Christian, David
1998 A History of Russia, Central Asia and Mongolia. Oxford; Malden, Mass.: Blackwell Publishers.

Crocker, William H.
2002 Canela "Other Fathers": Partible Paternity and its Changing Practices. *In* Cultures of Multiple Fathers: The Theory and Practice of Partible Paternity in Lowland South America. Stephen Beckerman and Paul Valentine, eds. Pp. 86. Gainesville, FL: University Press of Florida.

Crook, John H., and Stamati J. Crook
1988 Tibetan Polyandry: Problems of Adaptation and Fitness. *In* Human Reproductive Behavior. L. Betzig, M. Borgerhoff Mulder and P. Turke, eds. Pp. 97-114. Cambridge: Cambridge University Press.

Czaplicka, Marie Antoinette
1914 Aboriginal Siberia: A Study in Social Anthropology. Oxford: Clarendon Press.

Daly, Martin, Margo I. Wilson, and S. J. Weghorst
1982 Male Sexual Jealousy. Ethology and Sociobiology 3:11-27.

Damas, David
1975 Demographic Aspects of Central Eskimo Marriage Practices. American Ethnologist 2(3):409-418.

Damas, David
1972 The Copper Eskimo. *In* Hunters and Gatherers Today. M. G. Bicchieri, ed. Pp. 3-50. New York: Holt, Rinehart and Winston, Inc.

Darwin, Charles
1871 The Descent of Man and Selection in Relation to Sex.

Davenport, William
1964 Social Structure of Santa Cruz Island. *In* Explorations in Cultural Anthropology: Essays in Honor of George Peter Murdock. Ward Hunt Goodenough and George Peter Murdock, eds. Pp. 57-94. New York: McGraw-Hill Book Co.

De Laguna, Frederica
1972 Under Mount Saint Elias: The History and Culture of the Yakutat Tlingit. Vol. 7. Washington: Smithsonian Institution Press; for sale by the Supt. of Docs., U.S. Govt. Print. Off.

Deacon, Bernard, and Camilla H. Wedgwood
1934 Malekula, a Vanishing People in the New Hebrides. London: G. Routledge & Sons, ltd.

Dempsey, Hugh A.
1986 The Blackfoot Indians. Toronto, Ontario: McClelland and Stewart.

Dufour, Darna L.
1994 Diet and Nutritional Status of Amazonian Peoples. *In* Amazonian Indians from Prehistory to the Present: Anthropological Perspectives. Anna Roosevelt, ed. Pp. 151-176. Tucson: University of Arizona Press.

Dutilleux, Jean Pierre
2007 The Zo'e.

Emlen, S. T.
1978 The Evolution of Cooperative Breeding in Birds. *In* Behavioral Ecology: An Evolutionary Approach. J. Krebs and N. Davies, eds. Oxford: Blackwell.

Encyclopedia Britannica, inc
2007 The New Encyclopedia Britannica. 15th ed. Chicago: Encyclopedia Britannica.

Endicott, Kirk, and Peter Bellwood
1991 The Possibility of Independent Foraging in the Rain Forest of Peninsular Malaysia. Human Ecology: And Interdisciplinary Journal 19(2):151-185.

Erikson, Philippe
2002 Several Fathers in One's Cap: Polyandrous Conception among the Panoan Matis (Amazonas, Brazil). *In* Cultures of Multiple Fathers: The Theory and Practice of Partible Paternity in Lowland South America. Stephen Beckerman and Paul Valentine, eds. Pp. 123. Gainesville, FL: University Press of Florida.

Finley, John Park, and William Churchill
1913 The Subanu: Studies of a Sub-Visayan Mountain Folk of Mindanao. Washington, D. C.: Carnegie institution of Washington.

Fisher, Diana O., Michael C. Double, Simon P. Blomberg, Michael D. Jennions, and Andrew Cockburn
2006 Post-Mating Sexual Selection Increases Lifetime Fitness of Polyandrous Females in the Wild. Nature 444:89-92.

Fox, Mary Jo, and John Tippeconnic Beierle
2009 Culture Summary: Cherokee. New Haven, CT: Human Relations Area Files.

Gardner, Peter M.
1972 The Paliyans. *In* Hunters and Gatherers Today. M. G. Bicchieri, ed. Pp. 404-450. New York: Holt, Rinehart and Winston, Inc.

Gayton, Anna H.
1948 Yokuts and Western Mono Ethnography: Tulare Lake, Southern Valley, and Central Foothill Yokuts. Vol. 1. Berkeley: University of California Press.

Geary, David C.
2000 Evolution and Proximate Expression of Human Paternal Investment. Psychological Bulletin 126(1).

Gifford, E. W.
1928 Notes on Central Pomo and Northern Yana Society. American Anthropologist 30(4):675-684.

Goldman, Irving
1963 The Cubeo Indians of the Northwest Amazon. Vol. 2. Urbana: University of Illinois Press.

Goldstein, Melvyn C.
1978 Pahari and Tibetan Polyandry Revisited. Ethnology 17(3):325-337.

Goldstein, Melvyn C.
1971 Stratification, Polyandry, and Family Structure in Central Tibet. Southwestern Journal of Anthropology 27(1):64-74.

Goodenough, Ward Hunt
1951 Property, Kin, and Community on Truk. New Haven: Published for the Dept. of Anthropology, Yale University, by the Yale University Press.

Gough, E. Kathleen
1959 The Nayars and the Definition of Marriage. The Journal of the Royal Anthropological Institute of Great Britain and Ireland 89(1):23-34.

Gough, E. Kathleen
1952 Changing Kinship Usages in the Setting of Political and Economic Change among the Nayars of Malabar. The Journal of the Royal Anthropological Institute 82:71-87.

Gowaty, P. A.
1985 Multiple Parentage and Apparent Monogamy in Birds. *In* Avian Monogamy. P. A. Gowaty and D. W. Mock, eds. Pp. 11-21.

Graul, Walter D., Scott R. Derrickson, and Douglas W. Mock
1977 The Evolution of Avian Polyandry. The American Naturalist 111(980):812-816.

Gregor, Thomas
1985 Anxious Pleasures: The Sexual Lives of an Amazonian People. Chicago: University of Chicago Press.

Gregor, Thomas
1977 Mehinaku: The Drama of Daily Life in a Brazilian Indian Village. Chicago: University of Chicago Press.

Griffith, Simon C., Ian P. F. Owens, and Katherine A. Thuman
2002 Extra Pair Paternity in Birds: A Review of Interspecific Variation and Adaptive Function. Molecular Ecology 11:2195-2212.

Grinnell, George Bird
1891 Marriage among the Pawnees. American Anthropologist 4(3):275-282.

Gurven, Michael, and Kim Hill
2010 Moving Beyond Stereotypes of Men's Foraging Goals. Current Anthropology 51(2):265-267.

Hames, Raymond B.
2010 Personal communication.

Hart, Charles W., Arnold R. Pilling, and Jane C. Goodale
1988 The Tiwi of North Australia. Cengage Learning.

Hawkes, Kristen
1993 Why Hunter-Gatherers Work: An Ancient Version of the Problem of Public Goods. Current Anthropology 34:341-361.

Hawkes, Kristen
1991 Showing Off: Tests of a Hypothesis about Men's Foraging Goals. Ethology and Sociobiology 12:29-54.

Hawkes, Kristen
1990 Why do Men Hunt? Some Benefits for Risky Strategies. *In* Risk and Uncertainty in Tribal and Peasant Economies. Elizabeth Cashdan, ed. Pp. 145-166. Boulder: Westview Press.

Hawkes, Kristen
1987 How Much Food to Foragers Need? *In* Food and Evolution: Toward a Theory of Human Food Habits. M. Harris and E. Ross, eds. Pp. 341-355. Philadelphia: Temple University Press.

Hawkes, Kristen, and Rebecca Bliege Bird
2002 Showing Off, Handicap Signaling, and the Evolution of Men's Work. Evolutionary Anthropology 11:58-67.

Hawkes, Kristen, Kim Hill, and James F. O'Connell
1982 Why Hunters Gather: Optimal Foraging Theory and the Ache of Eastern Paraguay. American Ethnologist 9(2):379-398.

Hawkes, Kristen, and James F. O'Connell
1981 Affluent Hunters? Some Comments in Light of the Alyawara Case. American Anthropologist 83(3):622-626.

Hawkes, Kristen, James F. O'Connell, and Nicholas G. Blurton Jones
2001 Hunting and Nuclear Families: Some Lessons from the Hadza about Men's Work. Current Anthropology 42:681-709.

Hawkes, Kristen, James F. O'Connell, and Nicholas G. Blurton Jones
1997 Hadza Women's Time Allocation, Offspring Provisioning and the Evolution of Long Postmenopausal Life Spans. Current Anthropology 38:551-578.

Hawkes, Kristen, James F. O'Connell, and Nicholas G. Blurton Jones
1991 Hunting Income Patterns among the Hadza: Big Game, Common Goods, Foraging Goals, and the Evolution of the Human Diet. Philosophical Transactions of the Royal Society B: Biological Sciences 1270:243-251.

Hawkes, Kristen, James F. O'Connell, and James E. Coxworth
2010 Family Provisioning is Not the Only Reason Men Hunt. Current Anthropology 51(2):259-264.

Headland, Thomas N., and Robert C. Bailey
1991 Have Hunter-Gatherers Ever Lived in Tropical Rain Forest Independently of Agriculture? Human Ecology: And Interdisciplinary Journal 19:115-122.

Hewlett, Barry S.
1992 Husband-Wife Reciprocity and the Father-Infant Relationship among Aka Pygmies. *In* Father-Child Relations: Cultural and Biosocial Contexts. Barry S. Hewlett, ed. Pp. 153-176. Hawthorne, New York: Aldine de Gruyter.

Hill, Kim
2010 Personal communication.

Hill, Kim
2008 Personal communication.

Hill, Kim, and A. Magdalena Hurtado
1996 Aché Life History :The Ecology and Demography of a Foraging People. New York: Aldine de Gruyter.

Hollis, Alfred Claud
1905 The Masai: Their Language and Folklore. Oxford: The Clarendon Press.

Hose, Charles, William McDougall, and Alfred C. Haddon
1912 The Pagan Tribes of Borneo: A Description of their Physical, Moral and Intellectual Condition, with some Discussion of their Ethnic Relations. London: Macmillan and co., limited.

Howitt, A. W.
1904 The Native Tribes of South-East Australia. London: Macmillan and Co., limited.

Hrdlicka, Ales
1975 The Anthropology of Kodiak Island. New York: AMS Press.

Hrdy, Sarah B.
2000 The Optimal Number of Fathers: Evolution, Demography, and History in the Shaping of Female Mate Preferences. Annals of the New York Academy of Sciences 907:75-96.

Hrdy, Sarah B.
1997 Raising Darwin's Consciousness. Human Nature 8(1):1-49.

Hrdy, Sarah B.
1981 The Woman that Never Evolved. Cambridge, Massachusetts: Harvard University Press.

Hurtado, Magdalena, and Kim Hill
1992 Paternal Effect on Offspring Survivorship among Ache and Hiwi Hunter-Gatherers: Implications for Modeling Pair-Bond Stability. *In* Father-Child Relations: Cultural and Biosocial Contexts. Barry S. Hewlett, ed. Pp. 31-56. Hawthorne, New York: Aldine de Gruyter.

Jankowiak, William, Monika Sudakov, and Benjamin C. Wilreker
2005 Co-Wife Conflict and Co-Operation. Ethnology 44(1):81-98.

Jenni, Donald A.
1974 Evolution of Polyandry in Birds. Zoologist 14(1):129-144.

Jochelson, Waldemar
1908 The Koryak. Vol. 10 pts. 1-2. Leiden: E. J. Brill ltd.

Jones, Livingston French
1914 A Study of the Thlingets of Alaska. New York: Fleming H. Revell Co.

Jones, Dorothy Miriam
1976 Aleuts in Transition: A Comparison of Two Villages. Seattle: Published for the Institute of Social, Economic, and Government Research, University of Alaska, by the University of Washington Press.

Josephson, Steven C.
2002 Does Polygyny Reduce Fertility? American Journal of Human Biology 14(2):222-232.

Josephson, Steven C.
1993 Status, Reproductive Success, and Marrying Polygynously. Ethology and Sociobiology 14:391-396.

Junod, Henri Alexandre
1927 The Life of a South African Tribe. 2nd , rev a enl ed. London: Macmillan.

Kensinger, Kenneth M.
2002 The Dilemmas of Co-Paternity in Cashinahua Society. *In* Cultures of Multiple Fathers: The Theory and Practice of Partible Paternity in Lowland South America. Beckerman, Stephen and Valentine, Paul, ed. Pp. 14. Gainesville, FL: University Press of Florida.

Kjellström, Rolf
1973 Eskimo Marriage: An Account of Traditional Eskimo Courtship and Marriage. Stockholm: Nordiska museet, Solna: Saelig.

Krause, Aurel
1956 The Tlingit Indians: Results of a Trip to the Northwest Coast of America and the Bering Straits. Vol. 26. Seattle: Published for the American Ethnological Society by the University of Washington Press.

La Barre, Weston
1948 The Aymara Indians of the Lake Titicaca Plateau. Menasha, Wisconsin: American Anthropological Association.

Lancaster, J. B., and C. S. Lancaster
1983 Parental Investment: The Hominid Adaptation. *In* How Humans Adapt: A Biocultural Odyssey. D. Ortner, ed. Pp. 33-66. Washington: Smithsonian Institution Press.

Lantis, Margaret
1984 Aleut. *In* Arctic. David Damas, ed. Pp. 161-184. Washington D.C.: Smithsonian Institution Press.

Lantis, Margaret
1970 The Aleut Social System: 1750 to 1810. *In* Ethnohistory in Southwestern Alaska and the Southern Youkon. Robert E. Ackerman, ed. Pp. 139-301. Lexington: University Press of Kentucky.

Leach, Edmund R.
1955 Polyandry, Inheritance and the Definition of Marriage. Man 55:182-186.

Lee, Richard B.
1972 !Kung Spatial Organization: An Ecological and Historical Perspective. Human Ecology 1(2):125-147.

Lee, Richard B.
1968 What Hunters do for a Living, Or, how to make Out on Scarce Resources. *In* Man the Hunter. Richard B. Lee and Irven DeVore, eds. Pp. 30-48. Hawthorne, New York: Aldine de Gruyter.

Lesser, Alexander
1930 Levirate and Fraternal Polyandry among the Pawnees. Man 30:98-101.

Levine, Nancy E., and Walter H. Sangree
1980 Conclusion: Asian and African Systems of Polyandry. Journal of Comparative Family Studies 11(3):385-410.

Levine, Nancy E., and Joan B. Silk
1997 Why Polyandry Fails: Sources of Instability in Polyandrous Marriages. Current Anthropology 38:375-398.

Linnekin, Jocelyn
1990 Sacred Queens and Women of Consequence: Rank, Gender, and Colonialism in the Hawaiian Islands. Ann Arbor: University of Michigan Press.

Lips, Julius E.
1947 Naskapi Law: Law and Order in a Hunting Society. Transactions of the American Philosophical Society 37(4):379-492.

Majumdar, Dhirendra Nath
1962 Himalayan Polyandry. London: Asia Publishing House.

Marlowe, Frank
2001 Male Contribution to Diet and Female Reproductive Success among Foragers. Current Anthropology 42(5):755-765.

Marlowe, Frank
1999 Showoffs or Providers? The Parenting Effort of Hadza Men. Evolution and Human Behavior 20(6):391-404.

Marlowe, Frank W.
2003 A Critical Period for Provisioning by Hadza Men: Implications for Pair Bonding. Evolution and Human Behavior 24:217-229.

Marsh, Charles S.
1982 People of the Shining Mountains: The Utes of Colorado. 1st ed. Boulder, Colo.: Pruett Pub. Co.

Morgan, Lewis H. L.
1901 League of the Ho-De'-no-Sau-Nee, Or Iroquois. Vol. 2. New York: Mead and Company.

Muller, Jean-Claude
1980 On the Relevance of having Two Husbands: Contribution to the Study of Polygynous/Polyandrous Marital Forms of the Jos Plateau. Journal of Comparative Family Studies 11(3):359-369.

Murdock, George Peter
1967 Ethnographic Atlas. Pittsburgh: University of Pittsburgh Press.

Murdock, George Peter
1949 Social Structure. New York: Macmillan Co.

Opler, Marvin K.
1943 Woman's Social Status and the Forms of Marriage. The American Journal of Sociology 49(2):125-148.

Palombit, Ryne A.
1994 Extra-Pair Copulations in a Monogamous Ape. Animal Behaviour 47:721-723.

Park, Willard Z.
1937 Paviotso Polyandry. American Anthropologist 39(2):366-368.

Parmar, Yashwant Singh
1975 Polyandry in the Himalayas. Delhi: Vikas.

Peters, John F., and Chester L. Hunt
1975 Polyandry among the Yanomama Shirishana. Journal of Comparative Family Studies 6(2):197-207.

Petros
1963 A Study of Polyandry. The Hague: Mouton.

Phillips, Herbert P.
1965 Thai Peasant Personality: The Patterning of Interpersonal Behavior in the Village of Bang Chan. Berkeley: University of California Press.

Pollock, Donald
2002 Partible Paternity and Multiple Maternity among the Kulina. *In* Cultures of Multiple Fathers: The Theory and Practice of Partible Paternity in Lowland South America. Stephen Beckerman and Paul Valentine, eds. Pp. 42. Gainesville, FL: University Press of Florida.

Pospisil, Leopold
1964 Law and Societal Structure among the Nunamiut Eskimo. *In* Explorations in Cultural Anthropology: Essays in Honor of George Peter Murdock. Ward Hunt Goodenough and George Peter Murdock, eds. Pp. 432. New York: McGraw-Hill Book Co.

Rainey, Froelich G.
1947 The Whale Hunters of Tigara. Vol. 41, pt. 2. New York.

Reichel-Dolmatoff, Gerardo, and Sydney Muirden
1949 The Kogi: A Tribe of the Sierra Nevada De Santa Marta, Columbia. Vol. 1. Bogota: El Instituto.

Reid, John Phillip
1970 A Law of Blood; the Primitive Law of the Cherokee Nation. New York: New York Univ. Press.

Riazanovskii, Valentin A.
1965 Fundamental Principles of Mongol Law. London: K. Paul, Trench, Trnbner & Co., Ltd.

Roscoe, Rev Canon John
1932 Immigrants and their Influence in the Lake Region of Central Africa. *In* The Frazer Lectures, 1922-1932. Warren R. Dawson, ed. Pp. 25-46. London: Macmillan and Co., Limited.

Saksena, R. N.
1962 Social Economy of a Polyandrous People. London: Asia Publishing House.

Salesius, Father
1906 The Carolines Island Yap. Berlin: Wilhelm Susserot.

Sangree, Walter H.
1980 The Persistence of Polyandry in Irigwe, Nigeria. Journal of Comparative Family Studies 11(3):335-343.

Scelza, Brooke A.
2010 Fathers' Presence Speeds the Social and Reproductive Careers of Sons. Current Anthropology 51(2):295-303.

Schaffner, C. M., and J. A. French
2004 Behavioral and Endocrine Responses in Male Marmosets to the Establishment of Multimale Breeding Groups: Evidence for Non-Monopolizing Facultative Polyandry. International Journal of Primatology 25(3):709-732.

Schebesta, Paul
1954 The Negritos of Asia. Vol. 2. Wien-Modling: St. Gabriel-Verlag.

Sear, Rebecca, and Ruth Mace
2008 Who Keeps Children Alive? A Review of the Effects of Kin on Child Survival. Evolution and Human Behavior 29:1-18.

Service, Elman Rogers
1962 Primitive Social Organization: An Evolutionary Perspective. New York: Random House.

Sibree, James
1880 The Great African Island: Chapters on Madagascar: A Popular Account of Recent Researches in the Physical Geography, Geology, and Exploration of the Country, and its Natural History and Botany. London: Trübner & co.

Siskind, Janet
1973 To Hunt in the Morning. New York: Oxford University Press.

Skeat, Walter William, and Charles Otto Blagden
1966; 1906 Pagan Races of the Malay Peninsula. New York: Barnes & Noble.

Smith, Anne M.
1974 Ethnography of the Northern Utes. Santa Fe: Museum of New Mexico Press.

Smith, Eric Alden
1998 Is Tibetan Polyandry Adaptive? Methodological and Metatheoretical Analyses. Human Nature 9(3):225-261.

Smith, M. G.
1953 Secondary Marriage in Northern Nigeria. Africa 23:298-323.

Smith, Eric Alden, S. Abigail Smith, Judith Anderson, Monique Borgerhoff Mulder, Ernest S. Burch Jr., David Damas, Nelson H. H. Graburn, Cornelius H. W. Remie, Eric Abella Roth, and George W. Wenzel
1994 Inuit Sex-Ratio Variation: Population Control, Ethnographic Error, Or Parental Manipulation? [and Comments and Reply]. Current Anthropology 35(5):595-624.

Spencer, Paul
1988 The Maasai of Matapato: A Study of Rituals of Rebellion. Bloomington:

Indiana University Press in association with the International African Institute, London.

Spiro, Melford E.
1975; 1970 Kibbutz: Venture in Utopia. Augment ed. Cambridge: Harvard University Press.

Stefansson, Vilhjalmur
1921 The Friendly Arctic: The Story of Five Years in Polar Regions. New York: The Macmillan co.

Steward, Julian H.
1936 Shoshoni Polyandry. American Anthropologist 38(4):561-564.

Strassman, Beverly I.
1997 Polygyny as a Risk Factor for Child Mortality among the Dogon. Current Anthropology 38(4):673-677.

Symons, Donald
1992 On the use and Misuse of Darwinism in the Study of Human Behavior. *In* The Adapted Mind: Evolutionary Psychology and the Generation of Culture. Jerome H. Barkow, Leda Cosmides and John Tooby, eds. Pp. 137-159. Oxford: Oxford University Press.

Symons, Donald
1982 Review: Another Woman that Never Existed. The Quarterly Review of Biology 57(3):297-300.

Tambiah, Stanley J.
1966 Polyandry in Ceylon - with Special Reference to the Lagala Region. *In* Caste and Kin in Nepal, India, and Ceylon. Christoph von Furer-Haimendorf, ed. Pp. 264-358. London: Asia Publishing House.

Tew, Mary
1951 A Form of Polyandry among the Lele of the Kasai. Journal of the International African Institute 21(1):1-12.

Theal, George McCall
1969; 1887 History of the Boers in South Africa: Or, the Wanderings and Wars of the Emigrant Farmers from their Leaving the Cape Colony to the Acknowledgment of their Independence by Great Britain. New York: Negro Universities Press.

Tooby, John, and Leda Cosmides
1992 The Psychological Foundations of Culture. *In* The Adapted Mind: Evolutionary Psychology and the Generation of Culture. Jerome H. Barkow, Leda Cosmides and John Tooby, eds. Pp. 19-136. Oxford: Oxford University Press.

Trivers, R. L.
1972 Parental Investment and Sexual Selection. *In* Sexual Selection and the Descent of Man, 1871-1971. B. Campbell, ed. Pp. 136-179. Aldine.

Valentine, Paul
2002 Fathers that Never Exist: Exclusion of the Role of Shared Father among the Curripaco of the Northwest Amazon. *In* Cultures of Multiple Fathers: The Theory and Practice of Partible Paternity in Lowland South America. Stephen Beckerman and Paul Valentine, eds. Pp. 178-191. Gainesville, FL: University Press of Florida.

VanStone, James W.
1962 Point Hope: An Eskimo Village in Transition. Seattle: University of Washington Press.

Wallace, Ben J.
1969 Pagan Gaddang Spouse Exchange. Ethnology 8(2):183-188.

Wallace, Ernest, and E. Adamson Hoebel
1952 The Comanches: Lords of the South Plains. 1st ed. Vol. [34]. Norman: University of Oklahoma Press.

Weltfish, Gene
1977 The Lost Universe: Pawnee Life and Culture. Lincoln: University of Nebraska Press.

Westermarck, Edward
1926 A Short History of Marriage. New York: The Macmillan Company.

Westermarck, Edward
1922 The History of Human Marriage.

Westneat, David F., Paul W. Sherman, and Martin L. Morton
1990 The Ecology and Evolution of Extra-Pair Copulations in Birds. *In* Current Ornithology. Denis M. Power, ed. Pp. 331-369. New York: Plenum Press.

Weyer, Edward Moffat
1959 Primitive Peoples Today. Garden City, N.Y.: Doubleday.

Wiederman, Michael W., and Elizabeth Rice Allgeier
1993 Gender Differences in Sexual Jealousy: Adaptionist Or Social Learning Explanation? Ethology and Sociobiology 14(2):115-140.

Wolff, Jerry O., and David W. Macdonald
2004 Promiscuous Females Protect their Offspring. Trends in Ecology and Evolution 19(3):127-134.

Wood, Brian M.
2006 Prestige Or Provisioning? A Test of Foraging Goals among the Hadza. Current Anthropology 47(2):383-387.

Wood, Brian, and Kim Hill
2000 A Test of the "Showing-Off" Hypothesis with Ache Hunters. Current Anthropology 41(1):124-125.

Zeh, Jeanne A., and David W. Zeh
2001 Reproductive Mode and the Genetic Benefits of Polyandry. Animal Behaviour 61(6):1051-1063.