# FEMALE PHILOPATRY IN THE COMCA'AC COMMUNITY OF PUNTA CHUECA, SONORA, MEXICO

By

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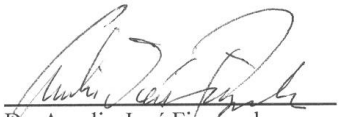

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**Abstract**

This paper concerns the study of sex-biased dispersal patterns as related to genealogical and geographical distribution in the Native American, Comca'ac Community of Punta Chueca, Sonora, Mexico. The Comca'ac Community is an isolate community that exemplifies the conditions of being both spatially and temporally structured around a prescribed relational system, which are desirable conditions for research on kin-structured communities. Agricultural communities are typically patrilocal and follow the trend of female-biased dispersal while hunter-gatherer societies follow the trend of matrilocality about equally often and favor male-biased dispersal. Industrialized communities have yet to be accurately classified as demonstrating a definite male-biased dispersal pattern, female-biased dispersal pattern, or neither as it is a continuously evolving society of relative instability. As the Comca'ac have refused to incorporate agriculture into their economy and proven to be a traditional, nonindustrialized community, it was predicted that they would be patterned after a matrilocal community that exhibits male-biased dispersal. By collecting genealogical (degrees of genetic relatedness) and geographical (location of households) data of the Comca'ac, local kin densities were calculated of the mother and father of the offspring of the community to support the hypothesis of the Comca'ac Community as a matrilocal community with a strong pattern of female philopatry.

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## 1. Introduction

This paper concerns the study of sex-biased dispersal patterns as related to genealogical and geographical distribution in the Native American, Comca'ac Community of Punta Chueca, Sonora, Mexico. The Comca'ac Community is an isolate community that exemplifies the conditions of being both spatially and temporally structured around a prescribed relational system, which are desirable conditions for research on kin-structured communities. Agricultural communities are typically patrilocal and follow the trend of female-biased dispersal while hunter-gatherer societies follow the trend of matrilocality about equally often and favor male-biased dispersal. Industrialized communities have yet to be accurately classified as demonstrating a definite male-biased dispersal pattern, female-biased dispersal pattern, or neither as it is a continuously evolving society of relative instability. As the Comca'ac have refused to incorporate agriculture into their economy and proven to be a traditional, nonindustrialized community, it is predicted that they will be a matrilocal community that exhibits a pattern of male-biased dispersal.

Lidicker (1975) defined the event of dispersal as a migration of an animal away from its birth place in order to establish a new household, or at least attempt to do so. It is often the case that dispersal is associated with sex bias in both mammals and birds (Gaines and McClenaghan, 1980; Greenwood, 1980; 1983; Waser and Jones, 1983). In most mammals, it is common that males disperse farther, while birds tend to favor the opposite pattern of female-biased dispersal (Greenwood, 1980; Dobson, 1982).

However, as concluded by Ravenstein's seventh law of migration, females are more migratory than males in human societies (Ravenstein, 1885). Ravenstein uses the

term virilocal to describe what is more commonly called patrilocal residence, in which the female is more likely to migrate upon attaining sexual maturity. This event is estimated to occur in 68.8% of human populations. He uses the term uxorilocal residence to describe what is more commonly called matrilocal residence, which describes the phenomenon of male-biased dispersal which is estimated to occur in only 13.0% of human societies (van den Berghe, 1979; see also Divale, 1984). The remaining 18.2% of human societies may demonstrate a combination of the two dispersal patterns, but without a strong preference for either one or the other. Interestingly, it is usually an internal migration that results in the event of female dispersal. While males will occasionally migrate outside of their country of origin, it is more common that females will migrate within a homogenous community, rarely leaving familiar territory, also known as internal female-biased dispersal (Katz and Hill, 1962; Brettell, 1986).

Internal female-biased dispersal has been a topic of great attention since Ravenstein first proposed his laws of migration. Since then, evidence in favor of this pattern has been most common in agricultural human societies (Cavalli-Sforza and Bodmer, 1971, p. 433). This seems to be explained by the high degree of patrilocality which is common to agricultural communities and unites male kin leaving the female disunited (van den Berghe, 1979). In a patrilocal community, it would be expected that kin maintain closer relations to the family of the biological father rather than the biological mother and inheritance of land would be passed down through the male lineage. This theory has been used as a possible explanation for androcentric sexist bias in which males of a population are genetically related providing greater unity due to their local, consanguineal relationships. Females, on the other hand, remain socially divided and at a disadvantage to the solidarity of the local males (cf., Hrdy, 1981; Smuts, 1995). In the event of

reproduction, female kin would consequentially be forced to disperse due to the androcentric social bias favoring male offspring. This phenomenon transforms what starts as only patrilocality into full-blown patriarchy, where males exert more social power and influence than females.

Most contemporary humans tend to follow the pattern of being strongly patrilocal. However, opposition to this androcentric sexist bias is strengthened by the existence of a strong extended family network mitigating dependency on male counterparts. Such a network would encourage closer consanguineal relations between females rather than the conjugal relations characteristic of a patrilocal residence. This evolutionary idea would thus affect the proximity of genetic relatives. Industrialized societies, as they exist in Brazil, Scotland, and the United States, embody this idea with evidence of either no sex bias in dispersal or male-biased dispersal (Hollingsworth, 1970; Freire-Maia and Freire-Maia, 1962; Spuhler and Clark, 1961; Shryock, 1964). While these societies may seem to have evolved in one direction, Koenig (1988) argues that the United States has recently evolved in the opposite direction into a pattern resembling agricultural communities in their high degree of female-biased dispersal, particularly internal female-biased dispersal.

Although there exists instability in the sex-biased dispersal patterns of the still-evolving industrialized society, sex-biased dispersal patterns have been attributed to agricultural and loosely attributed to hunter-gatherer societies. Female-biased dispersal is a strong pattern within agricultural communities with a patrilocal system while male-biased dispersal is equally prevalent in hunter-gatherer societies with a matrilocal system. The Native American Comca'ac ("Seri Indian") Community of Punta Chueca represent an endangered, human community of foragers that has eschewed agricultural practice in favor of a fishing subsistence economy. The community also reveals no significant ownership to the land. As fishers with little attachment to

the land and with claims dating back over one hundred years of an existent matriarchal system (McGee, 1898), one might expect the Comca'ac to follow the typical pattern of male-biased dispersal as is frequent in matrilocal, hunter-gatherer societies. The Comca'ac Community has maintained their traditional lifestyle as a result of a geographic and cultural isolation which can be attributed to their early habitation of Tiburon Island. This obviates the possibility of the unstable sex dispersal patterns of an industrialized society.

However, the Comca'ac live relatively sedentary lives as compared to their past hunter-gatherer and semi-nomadic lifestyle. Additionally, decline of the fishing industry between 1930 and 1950 forced the Comca'ac to look to alternative methods of income such as their infamous woodcarvings, woven baskets, and shell necklaces further supporting a sedentary lifestyle (Ryerson, 1976). With this in mind, one might expect the Comca'ac to follow dispersal patterns typical of an agricultural society. The claim and strong evidence in favor of a matriarchal system lead to the prediction that the Comca'ac are indeed representative of matrilocal residence in which there is a pattern of male-biased dispersal, also known as female philopatry, which are more common of hunter-gatherer societies.

By collecting genealogical (degrees of genetic relatedness) and geographical (location of households) data of the Comca'ac, local kin densities can be calculated of the mother and father of the offspring of the community. The location of an offspring serves as a marker of a female's dispersal location which can be used to determine if she migrated toward her own kin, her mate's kin, or neither in the event of attaining sexual maturity. By measuring the local kin densities of the genetic parents of the offspring of a community, it would be possible to identify whether the society followed a pattern of female or male-biased dispersal and consequentially label the

society as either matriarchal or patriarchal. This information is valuable not only to the scientific community, but also to the preservation of Comca'ac culture, tradition, and self-knowledge.

## 2. Methods

### 2.1 *Subjects*

The Comca'ac Community of Punta Chueca, Sonora, Mexico was targeted as the ideal model system due to their relative isolation and strong preservation of tradition and culture. Within the two surviving Comca'ac Communities of northwestern Mexico, it is estimated that only 1,500 members remain, making it an ideal model system to map out the genealogical, family relations in relation to the geographical distances between households. The community has a high degree of genetic relatedness mostly attributed to the highly isolated reproductive pool.

Twenty-five households were included in the study in which 362 people and their relationships to each other were recorded and entered into the Family Tree Maker program. The subjects gave oral consent to participate in the study and demonstrated interest in connecting and discovering their familial relations. Focus was primarily upon households with children between the ages of two and eleven so that these children could later be part of an observational study analyzing the degree of alloparenting and parental involvement. Furthermore, the kin densities of the selected offspring and those of their mothers and fathers were used to see who lived closer to their genealogical kin.

### *2.2 Procedures*

The technique of snowball sampling was used in which at least one adult representative of the household disclosed genealogical and geographical data regarding individuals living within the household and their relation to the representative. The genealogical survey only asked for

degrees of relatedness of $r_g = 0.5$ which signifies relations such as parents, siblings, and offspring, or people that share 50% of the same genes as the representative as determined by Wright's Coefficient of Relatedness. By connecting the data in the Family Tree Maker software, it was possible to correlate the data to estimate degrees of relatedness of more distant relatives. Due to the unique linguistic heritage of the Comca'ac, it was necessary that the representative of the household speak Spanish, as none of the team members were educated in the Comca'ac language. Focus was primarily upon households with children between the ages of two and eleven so that these children could later be part of an observational study analyzing the degree of alloparenting and parental involvement.

The team approached the household to introduce the team and explain the purpose of the study. Snowball sampling was used because it generally aided in the cooperativeness and willingness of subjects to participate knowing that other members of their family had referred them and had previously participated. Consent was orally obtained to conduct the genealogical surveys (Appendix A) and mark and record the location of the households with a GPS tracker. Attached in Appendix B is a written version of the consent protocol which served as an informal script to explain the procedure and intentions of the study.

After conducting the genealogical survey and collecting the geographical coordinates of the household, representatives and families were thanked and asked for suggestions for participants for the next interview. The participant was asked specifically if there were other members of his or her family in different households that would be interested in participating in the study.

To organize and analyze the data, we calculated the indirect family relationships that had not been directly reported using the combined genealogical information collected from the full set of informants that participated in the study. Wright's Coefficients of Relatedness ($r_g$) were then

imputed for each pair of individuals using the Family Tree Maker (FTM) software. The ArcView (ESRI) software and "Distance Matrix of Point Feature" extension was used to calculate the distance between each waypoint, representing the household in which each participating individual had been identified as living by the informants contacted.

A data transformation algorithm in Statistical Analysis Software (SAS) was used to calculate the kin densities of the mothers and fathers of children between the ages of two and eleven. It was with this data that analyses were able to be drawn relating the sex-biased dispersal pattern as pertains to the Comca'ac Community. Kin densities of the mothers and fathers were used to see who lived closer to their genetic relatives. The methods recognized the offspring solely as a means to mark the area to which the mother migrated, or did not migrate, to have her offspring in relation to her kin and the kin of her mate.

## 3. Results

### *3.3 Descriptive statistics*

In order to calculate the kin densities of both the mother and father of the offspring, the following kin density formula (based on the one developed in a study relating spousal abuse to female-biased dispersal in non-Comca'ac residents of Hermosillo, Sonora, Mexico by Figueredo et. al, 2001), was used:

$$D = \Sigma\, r_g(i,j)/d^2(i,j)$$

This formula describes kin density as the sum of all the Wright's coefficients of relatedness ($r_g$) between the focal subject (i) and each member of the community (j) divided by the square of the distance between the households of the focal subject and member of the

community. Wright's coefficient of relatedness was calculated from the genealogical data while the distances between respective households were calculated using the GPS data.

Kin densities were calculated for mothers and fathers of all of the offspring between the ages of two and eleven (See Table 1) to see who lived closer to their genealogical kin. Furthermore, kin were filtered by sex in order to test the matrilineal hypothesis.

The kin densities are not appreciably different when comparing the number of female and number of male genetic relatives of either the father or mother. Contrastingly, there were notably higher kin densities of the mother for both male and female kin with a mean kin density of 132.2 for female kin and mean kin density of 115.7 for male kin. Fathers of the offspring demonstrated substantially lower kin densities with male kin averaging approximately 18.9 and female kin 22.9.

Table 1
Comparing kin densities between mothers and fathers of the Comca'ac Community

| | Sex of Kin | | |
|---|---|---|---|
| | Females | Males | Sample size (n) |
| Mother | 132.2 | 115.7 | 11 |
| | (176.3) | (303.2) | |
| Father | 22.9 | 18.9 | 10 |
| | (41.7) | (31.7) | |

Note. Standard deviations appear in parentheses below means; the sample size is the number of mothers or fathers.

Estimates were also calculated for the offspring's patrilineal and matrilineal kin, aggregated across the two sexes. The offspring's total kin density would simply be the sum of the patrilineal and matrilineal kin densities of their genetic parents. This is done because within the selected age

range of offspring, it is expected that their only true relation to other kin of the community is through the connection to their parents since they have not yet had the chance to reproduce. It should be noted that when calculating the kin densities, the members of the same households, including themselves, were not counted.

Table 2
Comparing patrilineal and matrilineal kin densities of offspring

| | Mean | Standard Deviation | Sample size (n) |
|---|---|---|---|
| Matrilineal Kin | 173.6 | 373.5 | 30 |
| Patrilineal Kin | 29.2 | 65.2 | 30 |

The sample size is the number of children.

The comparison between the number of patrilineal and matrilineal kin (Table 2) reveals a substantial difference in the means with patrilineal kin estimating 29.2 and matrilineal kin approximately 173.6. There is also a negative correlation of -0.2 between the patrilineal and matrilineal kin densities estimated for each child, representing that the offspring will either mimic a matrilineal or patrilineal pattern.

## 4. Conclusions

The higher kin densities of the mother for both female and male kin indicate a strong pattern of female philopatry, also known as male-biased dispersal. Male-biased dispersal is more prevalent in hunter-gatherer communities as compared to the pattern of female-biased dispersal of agricultural communities. As was predicted, this makes sense and is supported by the Comca'ac's disregard for land ownership, which is typically inherited by males in a patrilineal system. When land is not an issue, there tends to be a strong pattern of females, particularly

mothers, migrating towards their own kin. These areas of high kin density serve as opportunities for high alloparental assistance, particularly from genetically related females. The kin densities of each offspring, as represented by sum of the kin densities of the genetic parents, provide additional evidence in support of the hypothesis of a matrilineal system and evidence in favor of Greenwood and Dobson's predictions.

The female philopatry and matrilineal system of the Comca'ac reveal that a mother, as well as her genetic relatives, remains nearer to her offspring than the father and the father's kin. The Comca'ac are a highly kin-structured community with a rare exception for divorce and high paternity certainty. In such a community, it would be expected that biological fathers would provide care for their offspring either directly or indirectly. Direct care could be in the form of tasks such as feeding or carrying offspring while indirect care would be exemplified by search and delivery of food and resources and providing shelter. Lower levels of alloparenting, or care provided to an immature individual by individuals other than the genetic parents, would thus be expected in a community in which the father is known and able to care for the offspring (Alexander, 1974; Flinn, 1981; Gaulin & Schegel, 1980).

However, since there is a high degree of male dispersal in the Comca'ac, it would therefore be reasonable to predict a higher degree of alloparental care. The classification of the society as matrilineal provides an excellent starting point for future, observational study relating the system to the degree of alloparental care allocated to the offspring and questioning whether alloparental care is a result of kin-selected altruism, or the partiality in distributing care specifically to genetic relatives in return for social benefits.

This study successfully supported the hypothesis of the Comca'ac Community as a matrilocal community with a strong pattern of female philopatry by collecting data regarding the genealogical and geographical relations of 362 members of the tribe. Due to the small sample size and large standard deviations of the kin densities, further studies would be beneficial to expand on this topic to either support or negate the hypothesis. Also noteworthy upon a later visit was the discovery that the Comca'ac occasionally relocate within the community. Although internal migration is expected, it must be noted that only geographical data from the first two expeditions were used to calculate the distance between the location of the original households.

# Appendix

## Appendix A: Worksheet for Genealogical Interview

***Original Spanish-Language Version of Genealogical Worksheet:***

| **Relación** | | **Nombre** | **Apellido Papá** | **Apellido Mamá** | **Edad** | **¿Dónde Viven?** |
|---|---|---|---|---|---|---|
| **Jefe de Familia** | | | | | | |
| **Papá de El** | | | | | | |
| **Mamá de El** | | | | | | |
| **Hermano 1** | **F H 0** | | | | | |
| **Hermano 2** | **F H 0** | | | | | |
| **Hermano 3** | **F H 0** | | | | | |
| **Hermano 4** | **F H 0** | | | | | |
| **Hermano 5** | **F H 0** | | | | | |
| **Hermana 1** | **F H 0** | | | | | |
| **Hermana 2** | **F H 0** | | | | | |
| **Hermana 3** | **F H 0** | | | | | |
| **Hermana 4** | **F H 0** | | | | | |
| **Hermana 5** | **F H 0** | | | | | |
| **Hijos de El** | **Mamá** | **Nombre** | **Apellido Papá** | **Apellido Mamá** | **Edad** | **¿Dónde Viven?** |
| **Hijo 1** | | | | | | |
| **Hijo 2** | | | | | | |
| **Hijo 3** | | | | | | |
| **Hijo 4** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Hijo 5** | | | | | | |
| **Hija 1** | | | | | | |
| **Hija 2** | | | | | | |
| **Hija 3** | | | | | | |
| **Hija 4** | | | | | | |
| **Hija 5** | | | | | | |
| **Relación** | | **Nombre** | **Apellido Papá** | **Apellido Mamá** | **Edad** | **¿Dónde Viven?** |
| **Ama de Casa** | | | | | | |
| **Papá de Ella** | | | | | | |
| **Mamá de Ella** | | | | | | |
| **Hermano 1** | **F H 0** | | | | | |
| **Hermano 2** | **F H 0** | | | | | |
| **Hermano 3** | **F H 0** | | | | | |
| **Hermano 4** | **F H 0** | | | | | |
| **Hermano 5** | **F H 0** | | | | | |
| **Hermana 1** | **F H 0** | | | | | |
| **Hermana 2** | **F H 0** | | | | | |
| **Hermana 3** | **F H 0** | | | | | |
| **Hermana 4** | **F H 0** | | | | | |
| **Hermana 5** | **F H 0** | | | | | |
| **Hijos de Ella** | **Papá** | **Nombre** | **Apellido Papá** | **Apellido Mamá** | **Edad** | **¿Dónde Viven?** |
| **Hijo 1** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Hijo 2** | | | | | | |
| **Hijo 3** | | | | | | |
| **Hijo 4** | | | | | | |
| **Hijo 5** | | | | | | |
| **Hija 1** | | | | | | |
| **Hija 2** | | | | | | |
| **Hija 3** | | | | | | |
| **Hija 4** | | | | | | |
| **Hija 5** | | | | | | |

## Appendix A (Continued): Worksheet for Genealogical Interview

***English-Language Translation of Genealogical Worksheet:***

| **Relationship** | | **First Name** | **Father's Surname** | **Mother's Surname** | **Age** | **Where do they live?** |
|---|---|---|---|---|---|---|
| **Head of Household** | | | | | | |
| **His Father** | | | | | | |
| **His Mother** | | | | | | |
| **Brother 1** | **F H 0** | | | | | |
| **Brother 2** | **F H 0** | | | | | |
| **Brother 3** | **F H 0** | | | | | |
| **Brother 4** | **F H 0** | | | | | |
| **Brother 5** | **F H 0** | | | | | |
| **Sister 1** | **F H 0** | | | | | |
| **Sister 2** | **F H 0** | | | | | |
| **Sister 3** | **F H 0** | | | | | |
| **Sister 4** | **F H 0** | | | | | |
| **Sister 5** | **F H 0** | | | | | |
| **His Children** | **Mother** | **First Name** | **Father's Surname** | **Mother's Surname** | **Age** | **Where do they live?** |
| **Son 1** | | | | | | |
| **Son 2** | | | | | | |
| **Son 3** | | | | | | |
| **Son 4** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Son 5** | | | | | | |
| **Daughter 1** | | | | | | |
| **Daughter 2** | | | | | | |
| **Daughter 3** | | | | | | |
| **Daughter 4** | | | | | | |
| **Daughter 5** | | | | | | |
| **Relationship** | | **First Name** | **Father's Surname** | **Mother's Surname** | **Age** | **Where do they live?** |
| **Head of Household** | | | | | | |
| **Her Father** | | | | | | |
| **Her Mother** | | | | | | |
| **Brother 1** | **F H 0** | | | | | |
| **Brother 2** | **F H 0** | | | | | |
| **Brother 3** | **F H 0** | | | | | |
| **Brother 4** | **F H 0** | | | | | |
| **Brother 5** | **F H 0** | | | | | |
| **Sister 1** | **F H 0** | | | | | |
| **Sister 2** | **F H 0** | | | | | |
| **Sister 3** | **F H 0** | | | | | |
| **Sister 4** | **F H 0** | | | | | |
| **Sister 5** | **F H 0** | | | | | |
| **Her Children** | **Father** | **First Name** | **Father's Surname** | **Mother's Surname** | **Age** | **Where do they live?** |
| **Son 1** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Son 2** | | | | | | |
| **Son 3** | | | | | | |
| **Son 4** | | | | | | |
| **Son 5** | | | | | | |
| **Daughter 1** | | | | | | |
| **Daughter 2** | | | | | | |
| **Daughter 3** | | | | | | |
| **Daughter 4** | | | | | | |
| **Daughter 5** | | | | | | |

**Appendix B: Verbal Informed Consent Protocol**

***Spanish Transcript of Verbal Informed Consent Protocol:***

¡Buenos días! Estamos haciendo una encuesta acerca de la familia y crianza de los niños dentro de la comunidad de Punta Chueca y Desemboque. Primero, estamos entrevistando un miembro de cada hogar para conocer "quien vive in la casa" y como están relacionados unos a otros. Queremos darles a todas las familias de la comunidad que participen copias de sus propios árboles familiares. ¿Podríamos preguntarle a uno de ustedes acerca de su familia? Si no conoce la respuesta a una u otra pregunta, está bien. También, si hay alguna pregunta a la cual no quiere responder, no tiene que hacerlo y uno puede dejar de participar en la entrevista en cualquier momento, ¿está bien?

**If they have children between the ages of 2 and 11:** Además de la entrevista, estamos haciendo observaciones de la crianza de niños entre las edades de dos y once años. ¿Podríamos regresar algún día para observarles cuidar a los niños?

***English-Language Translation of Verbal Informed Consent Protocol:***

Good afternoon! We are doing a survey regarding family and parenting within the community of Punta Chueca and Desemboque. First we are interviewing a member of each home to know who lives in each home and they are related to each other. We would like to give all the families in the community that participate copies of their own family trees. Could we ask one of you about your family? If you don't know an answer to one question or another, that is ok. Also, if there is a question you would prefer not to answer, you don't have to, and one can stop participating in the interview at any time, ok?

**If they have children between the ages of 2 and 11:** In addition to the interview, we are doing observations of the care of children between the ages of 2 and 11 years. Could we return some day to observe you taking care of the children?

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