Electronic Supplementary Materials: Adult Sex Ratios & Partner Scarcity among Hunter-Gatherers: Implications for Dispersal Patterns and the Evolution of Human Sociality

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Data format

The data derive from censuses collected by Greaves, Kramer and others in years 1986, 1988, 1990, 1993, 2005, 2006, 2007 (see main text). Using the following coding procedures we translated the data into an account of the year-by-year status of all individuals. We transcribed the data onto an NxT matrix, where N is the total number of individuals included in the census over all years, and T is the number years in included in the analysis. The elements / entries in the matrix give the status of individual i at time t, or $s_{i,t}$:

$$\begin{array}{c c}
 & \begin{array}{cccc} y_1 & y_2 & \cdots & y_T \end{array} \\
\begin{array}{c} 1 \\ 2 \\ \vdots \\ N \end{array} & \begin{pmatrix} s_{1,1} & s_{1,2} & \cdots & s_{1,T} \\ s_{2,1} & s_{2,2} & \cdots & s_{2,T} \\ \vdots & \vdots & \ddots & \vdots \\ s_{N,1} & s_{N,2} & \cdots & s_{N,T} \end{pmatrix}
\end{array}$$

The status $s_{i,t}$ may indicate the presence or absence of an individual in the population at time t, and also may record death and migration. We use this matrix to estimate how death, aging-in, and migration affect adult sex ratios over time.

Describing demographic forces

We can attribute the changes to a population's adult sex ratio from time t to $t+1$ in a straightforward manner. At the earliest time in our dataset, set at $t = 1$, we can sum up the number of male and females present. Let $p_{i,t} = 0, 1$ indicate the presence of an adult male at time t, then

$$p_{i,t} = \begin{cases} 1 & \text{if } s_{i,t} \equiv h, \ 15 \leq a_{i,t} \leq 50, \text{ and } g_i \equiv 1 \\ 0 & \text{otherwise} \end{cases}$$

where $a_{i,t}$ and $g_i = 1, 2$ are the respective age and sex (1=male, 2=female) of individual i at time t. Similarly, for females,

$$q_{i,t} = \begin{cases} 1 & \text{if } s_{i,t} \equiv h,\ 15 \leq a_{i,t} \leq 40 \text{ and } g_i \equiv 2 \\ 0 & \text{otherwise} \end{cases}$$

We can then calculate the total number of males (m_t) and females (f_t) at time t:

$$m_t = \sum_{i=1}^{N} p_{i,t},\ f_t = \sum_{i=1}^{N} q_{i,t}$$

Table 1 gives the number of males and females in Yaguri and Doro Aná at time t. From this data, the adult sex ratio (ASR) at time t can then be calculated as $ASR_t = m_t/(m_t + f_t)$.

Table 1: Counts of males ages 16-45 and females 14-36 living in Yaguri (YA) and Doro Aná (DA)

Year	males YA	females YA	males DA	females DA	males Combined	females Combined
1983	8	7	8	9	16	16
1984	11	7	8	10	19	17
1985	12	6	8	9	20	15
1986	13	7	7	8	20	15
1987	11	7	10	10	21	17
1988	11	7	10	11	21	18
1989	10	7	11	10	21	17
1990	9	8	11	12	20	20
1991	8	9	12	11	20	20
1992	9	10	11	11	20	21
1993	9	9	11	12	20	21
1994	9	8	12	16	21	24
1995	9	9	14	16	23	25
1996	10	9	16	15	26	24
1997	10	9	16	15	26	24
1998	10	10	16	12	26	22
1999	12	13	15	12	27	25
2000	11	13	14	12	25	25
2001	13	14	15	12	28	26
2002	16	13	15	13	31	26
2003	16	14	14	12	30	26
2004	16	14	13	13	29	27
2005	17	15	15	14	32	29
2006	17	14	15	16	32	30
2007	16	15	16	18	32	33

We are also interested in the change of status for individual i and how that affects ASR_t. Let us define $h_{i,t}$ as the migration status of a male individual i at time t.

$$h_{i,t} = \begin{cases} 0 & \text{if } s_{i,t} \equiv h,\ g_i \equiv 1 \text{ and } 15 \leq a_{i,t} \leq 50, \\ 1 & \text{if } s_{i,t} \equiv m,\ g_i \equiv 1 \text{ and } 15 \leq a_{i,t} \leq 50, \\ -1 & \text{if } s_{i,t} \equiv e,\ g_i \equiv 1 \text{ and } 15 \leq a_{i,t} \leq 50, \end{cases}$$

Thus the net migration change of males at time t becomes,

$$H_t = \sum_{i=1}^{N} h_{i,t}$$

In a similar manner we can calculate the change in ASR_t due to death (D_t) and aging-in (B_t) for both males and females. Using values of H_t, D_t, and B_t, we can calculate and compare the effect of each of these forces, as we see in Figure 1 and in the main text. We see aging-in effects figuring in more prominently, with net migration and death both as next major factors.

ESM Fig. 1: Cumulative absolute effect of net migration, adult death, and aging-in on ASR each year among two populations of Savanna Pumé.