Here, we have highlighted just some of the genomic techniques that could enhance responses to the particular conservation issues identified by Pimm *et al*. The established gap between conservation genetics and conservation practice will likely be exacerbated by the often-challenging analysis and interpretation of large amounts of genomic data [11]. There are clear links to be forged between genomic techniques and conservation practice, as well as common obstacles, such as data management and bioinformatics. Sharing techniques and discussing solutions to related issues across disciplines can only enhance conservation efforts.

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Forum

Reproductive Market Values Explain Post-reproductive Lifespans in Men

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Post-reproductive lifespans (PRLSs) of men vary across traditional societies. We argue that if sexual selection operates on male age-dependent resource availability (or 'reproductive market values') the result is variation in male late-life reproduction across subsistence systems. This perspective highlights the uniqueness of PRLS in both women and men.

Male PRLS: A Neglected Puzzle in Human Evolution

Women receive almost all of the attention in human life history studies due to their long PRLS and menopause. By contrast, the prevailing view is that men reproduce until old age and have short PRLSs in traditional societies. Often described under the stereotype of polygynous or serially monogamous patriarchs [1] and lacking an 'andropause' (mid-life infertility), men have been unsurprisingly neglected in most studies of human reproductive senescence.

However, evidence points against universal male late-life reproduction. Recently a skill-based model predicted early reproductive termination in both men and women among Tsimane forager–horticulturalists [2]. Data from other traditional populations reveal significant variation in male PRLS (for original sources of male fertility curves, food production, and polygyny levels discussed below, see references in [3]). While men typically reproduce until old age in Gambian farmers and Turkana pastoralists, reproductive cessation differs by only a few years between women and men in the Dobe !Kung (Ju/'hoansi), Hadza, and Agta hunter–gatherers. Ache hunter–gatherers as well as Tsimane and Yanomamo forager–horticulturalists show intermediate levels of male late-life reproduction. It is therefore surprising that a near consensus over male late-life reproduction has been established. In addition, the proposal of an invariable male life history seems at odds with the widely documented cross-cultural variation in other aspects of male reproductive strategies such as marriage systems and levels of parental investment.

We argue for an increased effort to investigate the adaptive reasons for variation in male late-life reproduction. In addition, much more data collection and publication is needed, since male reproductive curves are available for only a few traditional populations (!Kung, Hadza, Agta, and Ache hunter–gatherers, Tsimane and Yanomamo forager–horticulturalists, Turkana pastoralists, and Gambian farmers). No curves are known for polygynous Australian hunter–gatherers or polyandrous South American foragers. Historical populations such as Christian Finns have featured in analyses of male reproduction [4], but they often outlaw polygamy and divorce thus imposing constraints on male late-life reproduction not found in traditional populations.

Reproductive Market Values and the Plasticity of Male PRLS

Here we propose that 'reproductive market values', a concept reflecting the age dependence of individual desirability as a reproductive partner, can explain variation in male PRLS across traditional

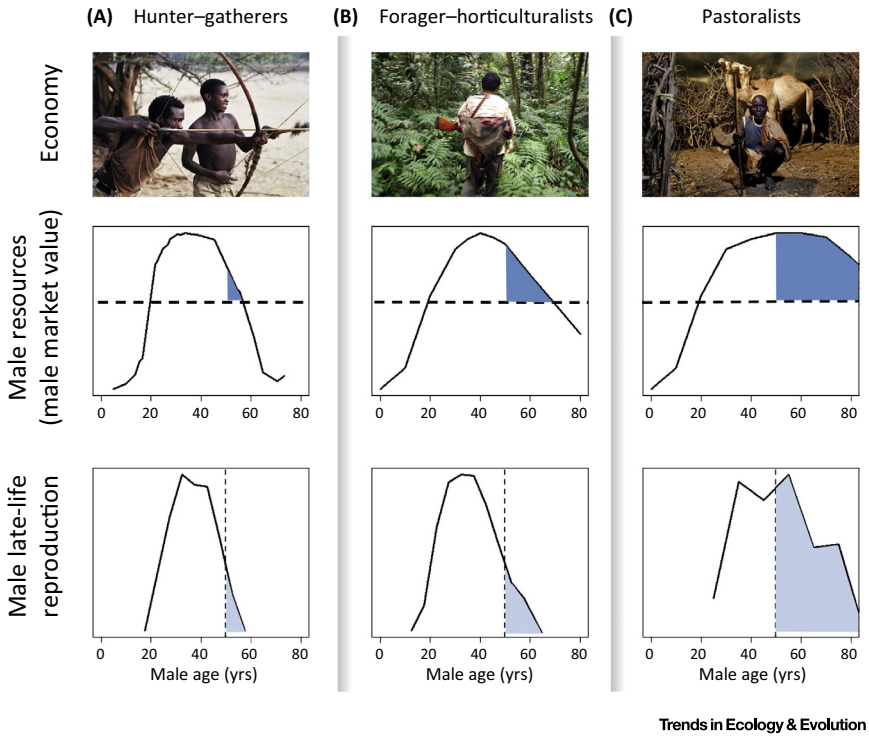

Figure 1. Economy, Male Reproductive Market Values, and Male Late-Life Reproduction. Male late-life reproduction depends on resource availability at old age. (A) In hunter–gatherers such as the Hadza, food production remains above a 'marriage threshold' (a theoretical level of male resources that fertile women require from a potential husband; horizontal hashed line) for most of adult life (middle panel). However, male production often falls below the marriage threshold at old age (here defined as the age of menopause; vertical hashed line). Male fertility is only slightly extended relative to women's (light blue area, bottom panel). Photograph credit: Ibodi. (B) In forager–horticulturalists such as the Tsimane, older men can maintain higher levels of food production due to horticulture and extended late-life reproduction compared with Hadza. Photograph credit: Adrian Jaeggi. (C) In pastoralists such as the Turkana, male accumulated wealth (herd size) often remains high or even increases at old age and men are able extend reproduction into their 70s. All fertility and production curves were taken from sources listed in [1]. No wealth-by-age curve is known for pastoralists; hence, we present a hypothetical curve based on studies demonstrating an increase in male wealth with age [5]. Photograph credit: Alejandro Chaskielberg.

populations. Reproductive market values should respond differently to age in men and women: whereas in women they should drop to zero at the age of menopause, the reproductive market values of older men reflect their available resources in late life. We therefore postulate that male late-life reproduction must vary with subsistence system (Figure 1). In simple hunter–gatherers, male food production is limited by physical condition and declines in late life, explaining early reproductive cessation among !Kung, Hadza, and Agta men who, although still fertile in their 50s or 60s, are unable to attract young wives. By contrast, male wealth often increases with age among pastoralists and farmers [5], accounting for late-life reproduction in male Turkana and rural Gambians. Finally, variable levels of horticulture among forager–horticulturalists create some opportunities for land and resource control by older men, explaining intermediate levels of male late-life reproduction in the Tsimane and Yanomamo. Reproductive market values are an extension of the theory of 'biological markets' [6] and result from sexual selection on an age-dependent male trait; namely, available resources that women desire to convert into investment in offspring. Thus, reproductive market values draw attention to a unique male life history trait: the plasticity of male PRLS duration, or their dependence on population-specific opportunities of resource control at old age.

The Evolution of Marriage Systems and the Absence of Andropause

Our proposal concurs with previous accounts of marriage systems as responses to ecology and subsistence mode [7,8]. Due to underlying effects of socioecology, we argue that correlations between male late-life reproduction and marriage system are also expected. For example, male food production in extant hunter–gatherers decreases with age and as result older men are unlikely to attract additional fertile wives, explaining both reduced male late-life reproduction and low polygyny rates (under 10%) in the !Kung, Hadza, and Agta. In farming and pastoralist societies where wealth can increase with age, older men are able to remain above polygyny thresholds, explaining both extended male reproduction and high polygyny in rural Gambians (40%) and Turkana (80%). The argument can be extended to exceptional marriage systems, including the high polygyny of past Tiwi hunter–gatherers from Australia,