

TOWARDS A SOCIAL PALAEODEMOGRAPHY
OF EARLY PREHISTORY

The Palaeolithic – the earliest and longest period of human (pre)history – was a time of substantial demographic upheaval. Throughout the Palaeolithic, both our evolutionary ancestors (hominins) and members of our own species (*Homo sapiens*) variously lived and died, interbred, migrated, speciated, and became extinct in a context of frequent and substantial Pleistocene climatic changes. Palaeolithic populations were dynamic, but this dynamism is rarely acknowledged. The Palaeolithic is a mere footnote in most global overviews of humanity’s demographic history; overviews that contrast Pleistocene hunter-gatherers with their more demographically interesting agricultural successors, and that seldom move beyond brief descriptions of their small population size, low density, and slow long-term growth rates (e.g. Biraben 2003; Livi-Bacci 2017). It was, however, during the Palaeolithic that both the biological and social foundations of the human propensity for rapid population growth and range expansion – the former of which continues apace into the twenty-first century – were laid (Kramer 2019).

Encompassing ~3 million years globally, knowledge of Palaeolithic demographic variation is vital to understanding both humanity’s long-term population history and the substantial social and cultural developments that occurred during this period, including the origins of art and symbolism and the colonisation of an increasing array of new environments. The importance of demography to human societies should not be underestimated. Changes in population size and density play key roles in the development and variability of material culture, settlement patterns, social institutions, and languages (e.g. Acerbi *et al.* 2017; Bromham *et al.* 2015; Kempe & Mesoudi 2014). The balance of kin and non-kin in a person’s social network – a network partially determined by the age and sex composition of the population – influences the degree of cooperation and information exchange among individuals and families, and decisions about who to marry and have children with (David-Barrett 2019; Kramer & Greaves 2011; Migliano *et al.* 2017). Demographic processes are also central

to human evolution. Evolution is driven by the propagation of genes through a combination of natural selection and genetic drift; variables that are determined by the survival (mortality), fertility, and dispersal (migration) of individuals (Gage *et al.* 2012; Metcalf & Pavard 2006). Demographic variation shaped all of human history: the Palaeolithic is no exception.

This book weaves together archaeological, palaeoanthropological, and genetic data, interpreting these with reference to ethnographic data on recent hunter-gatherers and demographic models of extant subsistence-level societies, to develop a demographic prehistory of European Palaeolithic populations between 1.8 million and 15,000 years ago. Three questions lie behind this demographic prehistory: (1) What were the key population limiting factors, and controls and constraints on fertility and mortality experienced by Palaeolithic populations, and how did they vary chronologically, geographically, and between hominin species? (2) What is the relationship(s) between demography, sociocultural change, and climatic/environmental change in the Palaeolithic? (3) What are the implications of these demographic patterns for our understanding of Palaeolithic societies and evolutionary transitions?

The demographic prehistory of Palaeolithic Europe comprises four stages: visitation, residency, expansion, and intensification (Table 1.1). It is a prehistory that is the product of multiple species of humans, all of whom, with the exception of *Homo sapiens*, are extinct by the end of this nearly two-million-year period (Figure 1.1). It is a prehistory that is both biological and social; one in which, within the physiological constraints on fertility and mortality, social relationships provided the key for enduring demographic success. Most importantly, it is a prehistory concerned with the big picture of human evolution but which is firmly grounded in the day-to-day realities of Palaeolithic people – their families, their children, the way they lived and died.

DEMOGRAPHY AND PALAEODEMOGRAPHY

It is important at the outset to be clear as to what exactly demography is. Throughout this book, I use the term ‘demography’ in two ways; (1) to refer to the composition of a particular population (‘the demography of . . .’), and (2) to refer to the discipline of demography (‘the scientific study of human populations and their change’; Billari 2015: 511). Definitions of key demographic terms that recur throughout this book are listed in the Glossary.

The main aims of demography are to document, forecast, and explain changes within, and variations between, the size and structure (composition) of human populations. The three key demographic variables are fertility, mortality, and migration. To allow comparison between populations these

Table 1.1 Summary of the basic structure of the European Palaeolithic archaeological and palaeoanthropological records, their correspondence with geological and climatic schema and the four demographic stages of the European Palaeolithic.

Demographic stage	Archaeological subdivisions	Date range (years ago, approximate)	Pleistocene sub-division	Marine Isotope Stages (MIS) (after Lisiecki & Raymo 2005)		Hominin(s) present	Lithic Mode (after Clark 1969)	Main archaeological technocomplex(es)
				63–9	8–3			
Visitation	Lower Palaeolithic	1.8 million–300,000	Early–Middle	63–9		<i>Homo erectus</i> ; <i>Homo georgicus</i> (?); <i>Homo antecessor</i> ; <i>Homo heidelbergensis</i> ; <i>Homo neanderthalensis</i>	1, 2	Oldowan; Acheulean
Residency	Middle Palaeolithic	300,000–40,000	Middle–Late	8–3		<i>Homo neanderthalensis</i> ; Denisovans	3	Mousterian; Micoquian/Keilmessergruppen
Expansion	Middle-to–Upper Palaeolithic transition	50,000–35,000	Late	3		<i>Homo neanderthalensis</i> ; Denisovans (?); <i>Homo sapiens</i>	4	Bohunician; Châtelperronian; Uluzzian; Szeletian; Lincombian–Ranisian–Jerzmanowician; Aurignacian
Intensification	Mid-to–Late Upper Palaeolithic	35,000–15,000	Late	3–2		<i>Homo sapiens</i>	4, 5	Gravettian; Solutrean; Badegoulian; Epigravettian; Magdalenian; Mezinian

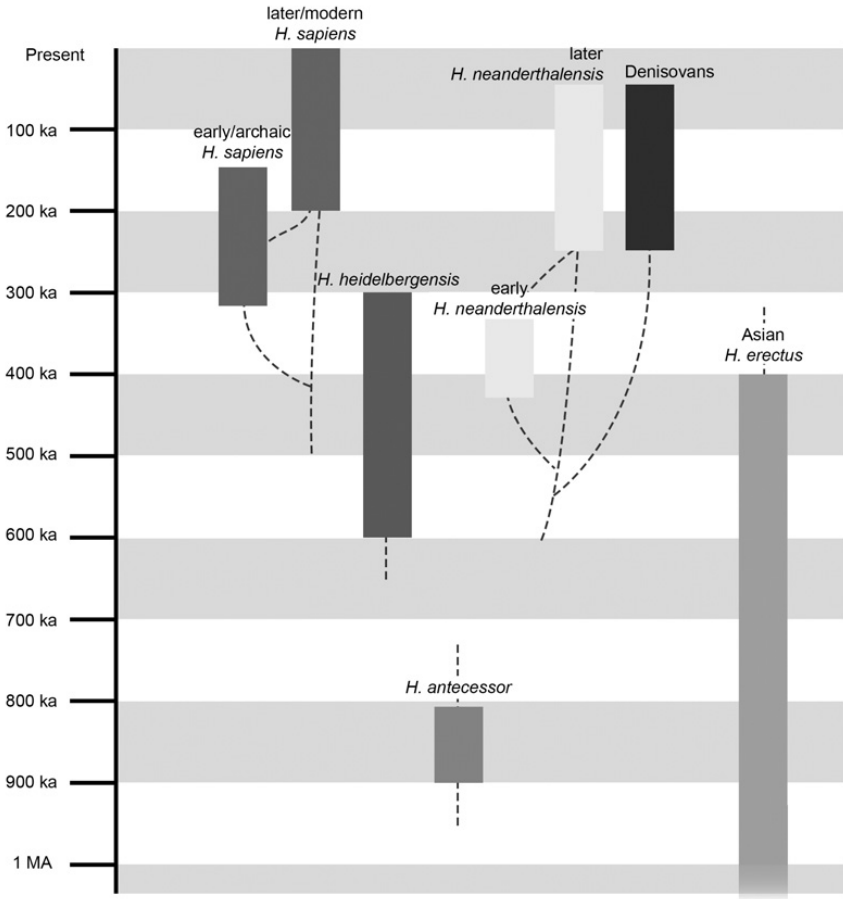


Figure 1.1 Schematic diagram of the inferred age ranges of hominin lineages mentioned in this book during the last million years, and their phylogenetic associations (dotted lines) (redrawn and adapted after Galway-Witham et al. 2019: Figure 2)

variables are measured as rates; the number of events in a given time period, divided by the number of people at risk of experiencing that event. Population change is a result of variation in one or more of the variables of fertility, mortality, and migration which cause further differences in population size, density, and/or growth rate(s). Thus, in order to understand population changes, demographers need to know about these variables and what causes them to alter. The relationship between fertility, mortality, and migration forms the ‘basic demographic equation’ where populations alter through time due to a combination of natural increase (the imbalance between the number of births and deaths) and net migration (the imbalance between the number of people moving into a population (immigration) and the number of people moving out (emigration)). The relative importance of the variables of fertility,

mortality, and migration to population change is not constant. For example, prior to the Industrial Revolution, mortality was the driving force behind population change. In contrast, fertility is the main driver of population change in most twenty-first-century nation states (Livi-Bacci 2015).

'Palaeodemography' refers to the demographic study of prehistoric populations (i.e. those societies for which no written records exist; Bocquet-Appel 2008). While palaeodemography and demography have similar aims, differences in data availability and quality mean that the two research areas contrast in several key ways.

Detailed information about the demographic variables of fertility, mortality, and migration is available for most present-day populations through censuses and vital registration forms, such as birth, death, and marriage certificates. From these, demographic parameters, including population structure, age-specific fertility and mortality rates, and population growth rates are calculated. By definition, no equivalent direct demographic data exist for non-literate prehistoric populations. Instead, palaeodemographers derive their data from other sources; sources that only indirectly inform on past demographic processes and parameters. Palaeodemographic data will never be as reliable or as complete as demographic data proper and we should adjust our expectations accordingly. In particular, given this lack of direct data, palaeodemography typically focuses on the study of long-term (millennial) relative changes in population size and density in contrast to the shorter-term (decadal) analysis of the full range of underlying demographic variables that characterises the present-day discipline.

The palaeodemographic database comprises fragmentary information from multiple disciplines, including archaeology, biological anthropology, genetics and palaeogenetics, and ethnography. Most palaeodemographers embrace this diverse range of data and advocate a multidisciplinary and multi-proxy approach to prehistoric demography. One reason for this is that no one disciplinary body of data, or methodological approach, informs on all aspects of past demography, with different datasets varying in the temporal and spatial scales at which they provide demographic information. A fuller understanding of demographic processes and behaviours in prehistory thus depends on the integration of data from multiple sources.

The other key reason for a multi-proxy, multidisciplinary approach is the indirect nature of palaeodemographic data itself. As these data contain no inherent demographic information, numerous assumptions and theoretical leaps about the relationship between the data and the targeted demographic variables are required. Issues of equifinality also abound, with some proxies more susceptible than others to alternative, but often equally valid, interpretations, both demographic and otherwise. The consideration of multiple types of data provides a form of cross-check, aiding to overcome the limitations of each proxy and strengthening palaeodemographic interpretations by differentiating

between competing explanations for the patterns seen in the data. This multi-proxy, multidisciplinary approach to palaeodemography is taken in this book, and how palaeodemographic measures are inferred from archaeological, biological anthropological (osteological), and genetic data are explained in Chapter 2. The challenges of reconciling different proxies, combined with the fragmentary and indirect nature of palaeodemographic data, should not, however, be underestimated. Criticism of the methods and results of palaeodemographic research is long-standing, both from its practitioners and from those outside the field (e.g. Bocquet-Appel & Masset 1982; Petersen 1975).

PALAEOLITHIC PALAEODEMOGRAPHY: KEY ISSUES AND A FRAMEWORK FOR STUDY

Palaeolithic palaeodemography has been subject to some especially strong criticism (e.g. Dogandžić & McPherron 2013; Kuhn 2012: 82). Data quality features heavily in these critiques. Problems with chronological precision and accuracy that plague all palaeodemographic studies are particularly pronounced in the Palaeolithic. Furthermore, most established palaeodemographic methods were developed for the more sedentary societies of later prehistory and are either unsuitable or require some modification to be applied to Pleistocene contexts and their typically sparser archaeological records (French 2016).

As with many other areas of Palaeolithic research, a common response to this sparse record is to look to the richer corpus of demographic data on extant hunter-gatherers to inform on Pleistocene demography. Demographic data from ethnographically documented hunter-gatherer populations are important tools in Palaeolithic demographic research. Ethnographic data play a key role in both the development of models of Palaeolithic demography (e.g. Binford 2001) and the generation of absolute estimates of Palaeolithic demographic variables, including population size, density, and fertility and mortality rates (e.g. Bocquet-Appel *et al.* 2005; Cucart-Mora *et al.* 2018; Maier & Zimmermann 2017). Most archaeologists are well-versed in the problems and pitfalls, both methodological and theoretical, of using data from living populations to inform on past populations (e.g. Wobst 1978). Elsewhere, I have detailed the challenges specific to their use in palaeodemography (Page & French 2020). Two of these challenges are particularly important for the demographic prehistory presented in this book, both with regard to the use of ethnographic data to inform on Palaeolithic populations, and the reconstruction of Palaeolithic palaeodemography more broadly.

Demographic Uniformitarianism

Demographic uniformitarianism refers to the assumption that demographic processes, and the mechanisms underlying these, are unchanged between the

past and the present (for a review of this concept, see French & Chamberlain 2021). Demographic uniformitarianism was defined most clearly by Howell, who describes it as the premise that:

the human animal has not basically changed in its direct biological response to the environment in processes of ovulation, spermatogenesis, length of pregnancy, degree of helplessness of the young, and rates of maturation and senility over time ... the demographically relevant biological processes of our species are constant in our genetic composition, subject only to variation in response to environmental forces, and that the species has not undergone any significant intra-species evolution since its first appearance as *Homo sapiens*. (Howell 1976: 26)

Importantly, demographic uniformitarianism does not assume that demographic behaviours have remained the same throughout history, nor that specific parameter values derived from recently observed populations are directly applicable to the past. Rather, demographic uniformitarianism assumes that the basic biological processes relating to fertility and mortality are similar between past and present, that they respond to environmental stimuli in the same way, and that these similarities act as constraints of, and impose limits on, demographic behaviours. The relevant biological processes listed by Howell are more specifically known as *life history* parameters. Life history parameters structure the timing of key developmental events in an organism's lifetime and are shaped by natural selection. Given their evolutionary constraints, human life history parameters – and subsequently, patterns of age-specific fertility and mortality – vary in predictable and limited ways. As such, the assumption of demographic uniformitarianism is well accepted.

However, the uniformitarian assumption is only strictly applicable to members of our own species, *Homo sapiens*, who have a distinctive life history pattern comprising a long gestation period, long childhood, late age at first reproduction, and relatively few children – a life history pattern that likely evolved in response to lowered mortality risks (Smith & Tompkins 1995: 262–3). The other – non-*sapiens* or archaic – Pleistocene hominins who inhabited Europe during the demographic stages of visitation and residency, exhibited biological and developmental differences from *Homo sapiens*. The extent of these differences is subject to ongoing debate and is difficult to quantify, but we can safely assume that the life history pattern that characterises *Homo sapiens* emerged within the *Homo* clade (Robson & Wood 2008). A key turning point in hominin life history occurred with *Homo erectus*, with a shift towards the slow life history of *Homo sapiens* (Antón *et al.* 2014). Later archaic hominins (e.g. *Homo heidelbergensis*, *Homo neanderthalensis*) likely had a pace of development within the *Homo sapiens* range but nonetheless subtly different (e.g. Rosas *et al.* 2017; Thompson & Nelson 2011). In addition to their effects on patterns of

age-specific fertility and mortality, life history differences, combined with other related biological and cognitive differences (such as body size, energy expenditure, and brain size), would also have had important implications for population structure and living group size and composition, with attendant repercussions for the evolution of social behaviours such as alloparenting and intergenerational cooperation (Kramer 2019).

Demographic uniformitarianism underpins all research into prehistoric demography. The assumption of uniformity in demographic processes between past and present provides the methodological basis for ageing and sexing human fossils and clear theoretical checks on reconstructions and interpretations of past demographic trends and processes. Where palaeodemographic data do not match up with expectations derived from the uniformitarian assumption (as is usually the case), the assumption helps us to identify the reason(s) for this. The non-applicability of a strict principle of demographic uniformitarianism to the archaic hominins of the Early and Middle Pleistocene has resulted in some fierce and long-standing debates as to the demographic profiles and regimes of these populations. As demographic uniformitarianism provides the justification for the use of estimates of population characteristics and model parameters derived from recent populations to supplement the sparse prehistoric demographic database, it is particularly important to use these data critically in research on the early inhabitants of Europe. We return to the challenges of palaeodemographic research in the absence of the uniformitarian assumption in Chapters 4 and 5.

The 'Forager Population Paradox'

As many scholars have noted, there is a stark contrast between the observed population growth rates of recent hunter-gatherers and those estimated for Pleistocene hunter-gatherers based on back-projections of known global population sizes (Hill & Hurtado 1996; Pennington 2001). Pleistocene hunter-gatherers could not have grown at the same rate(s) as those recorded among extant foragers. Were this the case, the global population would have reached certain sizes at earlier dates than we know it did. Recent hunter-gatherers have population growth rates averaging 1 per cent per annum (Hamilton *et al.* 2007); if sustained, this growth rate would result in a population-doubling time of just seventy years, or a ~20,000-fold increase in size over one millennium. To correspond with known estimates of global population size, Palaeolithic hunter-gatherers must have had a long-term growth rate of near zero (stationary populations). Blurton Jones (2016) has termed the contrast between the growth rates of recent hunter-gatherers and Palaeolithic foragers the 'forager population paradox'.

A hypothesis of stationary, or near-stationary, Palaeolithic populations necessitates an explanation as to the fertility and mortality schedules that made this possible. In the 1960s and 1970s, prevailing models assumed that

this near-zero per cent growth was deliberate, with populations exerting conscious group-level controls on demographic behaviour, regulating growth to ensure that population size never exceeded the carrying capacity of the local environment (Birdsell 1968; Hassan 1975; Hayden 1972). Infanticide (the deliberate killing of babies) was considered to be the primary mechanism used to curtail prehistoric population growth (Divale 1972). Other proposed solutions to the forager population paradox include very low fertility caused by a high prevalence in the Pleistocene of fertility-reducing sexually transmitted infections (Pennington 2001) and very high mortality rates due to increased incidences of violence and warfare (Hill *et al.* 2007).

However, no single factor can adequately account for near-zero long-term population growth. Furthermore, modelling studies extrapolating from demographic data on recent hunter-gatherers indicate that long-term population stationarity requires a combined fertility and mortality schedule outside, or at the extreme limit of, the known range of human variation, violating the principle of demographic uniformitarianism (Blurton Jones 2016; Hill & Hurtado 1996; Pennington 2001). It is possible that Palaeolithic hunter-gatherers – especially archaic or *non-sapiens* populations – were demographically different from any recorded human population, but the most parsimonious solution to the forager population paradox, at least as far as past *Homo sapiens* populations are concerned, is much more banal: it is a product of the contrast between the scales (both spatial and temporal) at which archaeological and ethnographic data are calculated and analysed and of assuming that the uniformitarian assumption applies to demographic parameter values, rather than mechanisms.

Simulations indicate that multiple phases of sustained population growth, followed by sudden population crashes or local extinctions best account for long-term near-zero population growth rates (Boone 2002; Keckler 1997). The regularity and severity of these crashes need not be uniform, but reductions in population size at intervals of 50–100 years could result in long-term zero population growth among populations with demographic profiles within the range of extant foragers (Blurton Jones 2016: 215). A similar saw-tooth pattern of rapid population growth and decline likely also characterised Palaeolithic hunter-gatherers. This pattern provides a more plausible explanation for the long-term trend of near-zero population growth than steady-state equilibrium achieved by the multigenerational balance of fertility and mortality. Genetic data support this scenario, indicating several notably sharp reductions in population size and subsequent population bottlenecks throughout the Pleistocene (e.g. Posth *et al.* 2016). Peaks and troughs of this frequency are, however, impossible to document at the chronological resolution available for the Palaeolithic archaeological record. Prehistoric growth rates calculated from palaeodemographic data are mean values viewed over millennia, recording only the longer term and slower time-averaged rate across crash and recovery cycles. Growth rates of ethnographic foragers represent instantaneous per

annum measures of population change along this continuum of growth and decline. It is therefore not surprising that calculated Palaeolithic growth rates are not the same as those of recent foragers; they are not directly comparable nor can growth rates from recent foragers be taken as realistic long-term estimates for either the population from which they derive or prehistoric hunter-gatherers.

The contrast embodied within the forager population paradox between the long-term stability and slow growth vs. the shorter-term dynamic population fluctuations that occurred during the Pleistocene has important implications for the search for factors that controlled and constrained Palaeolithic populations (known as population limiting factors). The traditional focus on long-term growth viewed Palaeolithic populations within the Malthusian paradigm (see Chapter 2) in which populations were kept in balance with the environment, likely through a combination of moderate mortality and moderate fertility, aided by deliberate regulation. If we switch the focus to the shorter-term, the possibility of intense population growth and crashes indicate periods of much higher fertility and/or lower mortality, followed by lower fertility and/or higher mortality. The search for factors controlling and constraining Palaeolithic populations must take these shorter-term fluctuations into account. Palaeolithic population reductions were likely caused by a combination of stochastic (random) processes (to which small populations are particularly susceptible) and catastrophic events (Gurven & Davison 2019; Hamilton & Walker 2018) that greatly increased mortality and/or greatly decreased fertility. Within this framework, some little-considered causes of mortality, such as diseases and accidents, gain significance, and with them the notion of the relative demographic importance of people of different ages and sexes to the long-term persistence of a population. The role of fertility in population growth is also given greater weight. Earlier assumptions of deliberately maintained stationary populations paid more attention to mortality than to fertility as a means of curbing population growth, as the former is easier to manipulate than the latter in the absence of effective contraception. However, the physiology of female reproduction is an important limiting factor on population growth across mammalian species and similarly played a key role in the overall pattern of long-term low rates of Palaeolithic population growth. This physiology is nonetheless highly responsive to socio-environmental conditions, and factors including diet, workload, and mobility can all have rapid and marked effects on fertility, and subsequently, on short-term population growth (Ellison 2003).

Human Behavioural Ecology as a Framework for Palaeolithic Palaeodemography

The reconstruction of Palaeolithic populations and the assessment of the factors that controlled and constrained fertility and mortality requires the use of multiple lines of evidence from various sources. Ethnographic data provide a valuable tool but the direct application of demographic estimates and models from ethnographic populations to Palaeolithic populations is inadvisable, not least due to the forager

population paradox, and the effects of differing rates of development and maturation (life history) in archaic hominins on fertility and mortality.

The solution adopted in this book is to work within the framework of *Human Behavioural Ecology* (HBE). HBE assumes an underlying principle of optimality and provides a clear goal for human behaviour: people will behave in ways that maximise their reproductive success (their own contribution to the gene pool of future generations) or their inclusive fitness (their own contribution to the gene pool of future generations, plus the contributions made by closely related family members) (Borgerhoff Mulder & Schacht 2012; Codding & Bird 2015). HBE is thus grounded in evolutionary theory and provides a framework for generating and testing hypotheses about human behaviour. Most demographic studies of ethnographic hunter-gatherers are conducted within this framework. From an archaeological perspective, this approach has an additional important merit: it prevents us assuming that past hunter-gatherers should be exactly like recent hunter-gatherers (and vice-versa) as what is considered 'optimal' is context specific (Kelly 2013a: 39). An HBE framework allows for ethnographic data on population variables of recent hunter-gatherers, and the factors controlling and constraining these, to inform the analysis of Palaeolithic demography, while simultaneously accounting for differences in environments, scale, and (when applicable) hominin species. From there, we can develop hypotheses and expectations about the demography of Palaeolithic hunter-gatherers, and how they would have both responded to, and been influenced by, changing social and environmental conditions. For example, following the positive correlation between environmental productivity and population density among recent foragers (Layton & O'Hara 2010), we can hypothesise that a similar relationship characterised variation in Palaeolithic hunter-gatherer population density, seeking data on regional environmental conditions and settlement demography to test this. Most importantly, where the data for such hypotheses are unavailable, the HBE framework provides a scaffolding of theoretically informed suppositions of what 'should happen' if certain assumptions are met, allowing for the consideration of both archaeologically visible and invisible population-limiting factors in early prehistory. We return to both the framework of HBE and the available demographic data from extant hunter-gatherers in Chapter 3.

DEMOGRAPHY AND SOCIETY

Human Behavioural Ecology emphasises the biological basis of demography. However, demography and demographic behaviour are also cultural (Roth 2004). Social norms and practices affect decisions related to all demographic variables, such as residence patterns; when, and with whom, to have children (and how many children to have); and the degree of care afforded to the young

and old, including who provides this care. The demographic prehistory of Palaeolithic Europe presented here is also a social prehistory – not because it adheres to the framework of any specific social theory, but because it is fundamentally concerned with the most intimate and meaningful events of human social and family life and the ties that bind people together: childbirth, parenthood, kinship, sickness, death.

The Palaeolithic record is largely silent about the social factors and individual decisions underlying demographic trends. It is primarily a palimpsest of behaviours best suited to analysis with reference to other long-term aggregate records, such as those documenting temporal and spatial variation in climatic and environmental variables. Occasional glimpses into the demographic lives of specific people shine through this palimpsest: a child who ~400,000 years ago lived to the age of five, despite being born with severe facial and brain deformities (Chapter 4); a girl whose parents belonged to different populations (or, depending on the definition used, species) within the genus *Homo* (Chapter 5); a man who was killed in a violent attack ~30,000 years ago (Chapter 6). It would be unwise, however, to extrapolate too much from these specific cases. Conversely, this does not mean that we should disregard the social element of Palaeolithic demography, viewing individuals and populations purely as biological entities responding and adapting only to their environments. Rather, the recognition that demography is also influenced by sociocultural variables should always remain in view, even if the corresponding image is hard to bring into focus. To help with this, I employ some deliberate lexical choices throughout this book. Without intending to underplay the substantial biological and likely cognitive variation seen within the genus *Homo*, I use ‘humans’ in this book to describe all hominins, not just *Homo sapiens*, with the species designation used when there is a need to differentiate between different types of human; the vague and value-laden ‘modern human’ (meaning *Homo sapiens*) is rejected, although I retain ‘archaic hominin/human’ to refer to all non-*Homo sapiens*. The terms ‘men’ and ‘women’ are preferred to ‘male’ and ‘female’, as are ‘infants/babies’ and ‘children’ to ‘juveniles’, ‘sub-adults’, or ‘offspring’. The terms ‘bred’, ‘interbred’, or ‘mated’ are avoided as far as possible and replaced with a variant of ‘had sexual relations with’ or ‘had children with’. These preferred terms have less precise meanings in a biological or evolutionary sense than those they replace but serve as a continuous reminder of the humanity and social lives of these deep-time populations, and that it is individual *people* – making a series of choices (conscious or otherwise) – that lie behind long-term, archaeologically visible patterns. To further aid this perspective, I convert key time intervals into number of generations, conveying a greater sense of the passing of time in human terms, and how this related to the lives and experiences of Palaeolithic people. Generational time is particularly relevant here, as the generation (around twenty to thirty years for humans today; calculated throughout this book for Palaeolithic populations as approximately twenty years) is the

fundamental timeframe of population dynamics, a fact worth remembering even as such temporal scales remain beyond the resolution of Pleistocene datasets.

Demography, Women and Children, and 'Small-Scale' Societies

The social prehistory presented in this book focuses on two features of Palaeolithic societies. The first is the role(s) and contribution(s) of women and children to both Palaeolithic life and the resultant archaeological record. Women and children comprise the 'demographic core' of any population, and are the most important members in terms of ensuring population survival. This is because population size and growth are most responsive to the mortality of infants and children, followed by the fertility and mortality of women. Men's fertility and mortality play a much smaller role in determining long-term population trends (Low 1994). The living conditions and behaviour of women are key determinants of both their fertility and infant and child mortality (Chapter 3). Women are the drivers of demographic trends.

Following this, as I have argued elsewhere (French 2019a), the study of demography places women and children at the centre of discussion, even if this is rarely made explicit. Any explanations of population change, past or present, must ultimately be framed in terms of factors that affect the fertility and mortality – and subsequently the lives and behaviours – of these two groups (Box 1.1). While the focus on women and children in this book stems from their demographic importance, it also helps to redress a wider imbalance in the study of Palaeolithic societies. Traditionally, the Palaeolithic has been susceptible to androcentric interpretations (Conkey & Spector 1984: 6). Despite the warnings issued by practitioners of the subfields of gender archaeology and the archaeology of childhood, the long-standing default position persists that the archaeological record is the product of men and is formed primarily as a result of their behaviours, along with the notion that direct 'proof' of the presence of women and/or children is required to include them in interpretations still dominated by a 'Man the Hunter' paradigm (Zihlman 2013). This is unacceptable. These two groups combined constituted ~75 per cent of any prehistoric population and could not have been anything other than active contributors to Palaeolithic societies and the resultant archaeological record.

The second key feature of Palaeolithic societies is their characterisation as 'small-scale'. In many ways, this is incontestable. While the data presented in this book show a general trend of increasing metapopulation size and density throughout the Palaeolithic, the accompanying absolute estimates indicate that Palaeolithic populations were small at most times and in most places. Palaeolithic people lived in smaller populations and at lower densities than both later prehistoric and historical hunter-gatherers and members of later agricultural and urban societies. Palaeolithic residential groups were also small; in many cases smaller than twenty-five to thirty people – the oft cited

Box 1.1 Women, demography, and gender archaeology

Using demographic principles as a framework for incorporating women into archaeological interpretations requires caveats, particularly with regard to how this approach aligns with gender theory both in archaeology and allied disciplines. These caveats are detailed in French (2019a) and summarised here.

Firstly, the implicit focus is on women's reproductive role; an approach that is at odds with most gender archaeology research. The focus on biological differences between men and women, and the prominence accorded to women's role in childbirth and childrearing, are hallmarks of earlier androcentric studies in which these differences – particularly different reproductive roles – were used to justify interpretations of the past that saw men as active social agents and women as passive biological agents. However, regardless of its misuse in earlier androcentric studies, reproduction is an important and unavoidable part of the lives of women in natural fertility populations, and, on this basis alone, should not be neglected (Whitehouse 2007: 34–6).

Secondly, the use of demographic data is particularly susceptible to the 'binary binds' of interpretation from which gender archaeology has largely moved away (Ghisleni *et al.* 2016). There are two binaries: the male/female binary and the nature/culture binary between 'sex' and 'gender', with sex a biological certainty and gender a cultural construction. This binary two-sex, two-gender model does not necessarily reflect the full remit of sexes or gender relations in all past societies. The focus on reproduction within demographic research further presents a limited view of 'women' as those who are fertile and of childbearing age. Nonetheless, the demographic approach employed here does not argue that gender is limited to these two categories, or that biological sex is always an accurate proxy for gender; just that male and female reproductive roles are generally recognised within gender systems in some way.

Finally, it is important to remember that the study of women is not the same as the study of gender. The demographic approach is concerned primarily with the archaeological visibility of women and the importance of women to demographic processes, but this does not mean that any demographic study, archaeological or otherwise, automatically informs on gender on a societal level. However, gender can be examined from demographic studies, and many features of women's lives are affected by wider societal ideas about gender, including their rights, employment, and well-being; factors which have clear import to demographic variables, including fertility and mortality (Riley 2005).

average for recent and historical hunter-gatherer groups (Hill *et al.* 2011; Marlowe 2005). The small size and low density of Palaeolithic hunter-gatherer communities feature heavily in explanations for multiple phenomena in the archaeological record, including the perceived stasis of Lower

Palaeolithic Acheulean technologies (Hopkinson *et al.* 2013) and the emergence of so-called ‘behavioural modernity’ with population increase in the Late Pleistocene (e.g. Shennan 2001). These explanations are based on cultural evolutionary models that link demography to sociocultural change through the assumption that population size and density influence cultural evolution through their impact on social learning and rate of cultural ‘drift’ (e.g. Henrich 2004). I use this framework of cultural evolution – called *dual inheritance theory* – throughout this book to assess the role of demography in Palaeolithic socio-cultural change.

Outside of this framework, the size of Palaeolithic populations commands less attention. When thinking about the social implications of living in small, widely dispersed communities, archaeologists living in urbanised nation states struggle with the change in perspective required to ‘think small’ (Hull 2011: 35). As Bird-David (2018) persuasively argues, an understanding of hunter-gatherers’ social lives and cultures – past and present – cannot be divorced from the ‘miniscule size’ (p. 305) of their communities, which is fundamental in shaping their world view and interpersonal relations. There are no easy answers as to how archaeologists can incorporate this perspective in their work on Palaeolithic societies. The research presented in this book – which provides a greater sense of the size of Palaeolithic populations and communities, and of the factors that prevented sustained population growth and large population numbers – is my contribution to this endeavour.

Size and scale are not the same, however. While ‘small-scale society’ is a common anthropological term, specific definitions vary (Reyes-Garcia *et al.* 2017). These definitions usually emphasise the quantitative, basing their categorisation on the small *size* of populations and communities, the interrelated variables of economic base, settlement patterns, and political organisation, and their subsequent contrast with larger, urbanised populations. Despite being inherent in the term, scale – here taken to mean the social reach or networks of individuals as a function of social organisation – rarely features in definitions. The result is a conflation of size and scale whereby hunter-gatherers are assumed to spend their lives in the company of a handful of closely related people who comprise their small residential communities. There is mounting evidence, however, that this assumption is incorrect; evidence that recent hunter-gatherers live in residential groups largely comprised of non-kin; that membership of these groups is fluid rather than fixed; that each person interacts directly with hundreds, if not thousands, of other people during their lifetime through large-scale networks of interaction (Dyble *et al.* 2015; Hill *et al.* 2011; Migliano *et al.* 2017; Page *et al.* 2017); in short, that ‘foragers do not live in small-scale societies’ (Bird *et al.* 2019).

The key question is whether this was also true of Palaeolithic foragers. Direct data on Palaeolithic group composition is rare, and evidence of social networks of prehistoric foragers is notoriously difficult to interpret. Understanding the

exact form of Palaeolithic social networks (i.e. a kinship network, a political alliance) is beyond the capabilities of our data but we can examine the broad spatial and temporal scales at which they operated (Coward 2016: 86). In this book, I argue that while all European Palaeolithic populations were small, they were not all small-scale. The archaic hominin populations of the Lower and Middle Palaeolithic were ‘small scale’ in the truest sense – living in groups composed primarily of close kin and generally lacking extensive social networks (Chapters 4, 5). In contrast, regional *Homo sapiens* populations were more interconnected at a wider spatial scale (Chapters 6, 7).

Hunter-gatherer social networks facilitate the spread and exchange of information, ideas, and resources between and within groups and individuals. They are ‘safety nets’ in situations of local resource scarcity, providing knowledge about, and access to, a wider resource pool, and ensuring a friendly reception during face-to-face interactions with others, as well as functioning as a form of intergroup and intergenerational information storage (Whallon 2006). Social networks are ultimately a cultural mechanism to cope with environmental uncertainty, and the temporal and spatial distribution of resources therefore influence strongly both the scale and frequency of interactions. Spatially extensive, well-connected, and robust social networks are particularly important to hunter-gatherer groups living in low productivity and highly seasonal environments such as those that characterised the European high latitudes throughout the Pleistocene (Fitzhugh *et al.* 2011). The creation and, more crucially, the maintenance of these networks, is, however, harder at these high latitudes. Low environmental productivity reduces the number of people who can be supported by the available resources, resulting in foragers living at lower population densities across larger territories (see Chapter 3). At above 40°N random mobility is insufficient to ensure annual encounters between local groups at the scale of the minimum marriage/mating pool of ~500 people (Pearce 2014). To function as reliable safety nets, some deliberate mechanisms need to be implemented.

At least in broad strokes, these mechanisms are identifiable in the Palaeolithic archaeological record. Some increase face-to-face contact, such as the greater use of logistical (moving resources to people) rather than residential (moving people to resources) mobility (e.g. Grove 2010, cf. Premo 2012) and the periodic aggregations of groups (e.g. Conkey 1980). Others seek to maintain and enhance relations *in absentia* by transmitting information via ‘quality signals’ that symbolise affiliations and relationships, in the form of durable, standardisable, and portable material culture such as decorative items and body ornaments (e.g. Kuhn & Stiner 2007; Osborn & Hitchcock 2019), allowing for what Gamble (1998) terms a ‘release from proximity’ in social relations.

These latter mechanisms are particularly important as groups get larger and/or social networks become more extensive. This is because there are clear trade-offs to be made in terms of balancing the time and energy spent

cultivating and maintaining good relationships with their possible future benefits – especially with those with whom contact is relatively infrequent and who are on the periphery (both literally and metaphorically) of an individual or groups' social network (Pearce *et al.* 2014). At a broader level, the 'scaling up' of social network size and complexity seen throughout the Palaeolithic, suggests that their development involved wider trade-offs within the genus *Homo*. The social brain hypothesis emphasises the high cognitive costs of establishing and keeping track of an increasing number of relationships at different levels of intimacy, hypothesising that the cognitive demands of sociality – particularly keeping track of increasingly fragmented contacts – was a driver of the brain enlargement that occurs throughout the hominin lineage, which had to be balanced against other energetic costs (Dunbar 2003). The types of material culture described previously may have functioned as 'cultural scaffolding' to offload some of the cognitive effort of monitoring these relationships (Coward & Gamble 2008). Cognitive differences between hominins likely drove the differences in the scale of their social relationships across the Palaeolithic, but neural architecture and socio-cognitive abilities are remarkably plastic, inducing a feedback loop between a hominin's social environment and the scale of their social networks; if your social network is not extensive enough to require 'cultural scaffolding' via material culture, this lack of 'cultural scaffolding' might then in turn limit your socio-cognitive abilities and capacity to extend your social network subsequently (Pearce 2018; Pearce *et al.* 2014: 371). When discussing the expected scale of social networks and the frequency of intergroup interactions of archaic hominins we need, therefore, to consider the effects of variable brain size, structure, and underlying socio-cognitive capacities in addition to the influence of the distribution of resources.

The varying scale and strength of social networks during the Palaeolithic had wide effects. In combination with group size and composition, these social networks influenced the evolution of notable social behaviours within the genus *Homo* including intergroup tolerance and cooperation and division of labour (e.g. Apicella *et al.* 2012). The degree of population interconnectivity affects sociocultural change (e.g. Grove 2016; Migliano *et al.* 2020; Powell *et al.* 2009) and this element of Palaeolithic social organisation is thus fundamental to explaining the resultant patterning of material culture in the archaeological record. The demographic effects of hominin social networks are the most important for present purposes. Studies of both humans and other primates indicate a positive correlation between the number and quality of social ties and individual reproductive success (maternal fertility and/or infant survival) and life expectancy through the safety net these relationships offer when resources are scarce or their availability is uncertain (e.g. Holt-Lunstad *et al.* 2010; Page *et al.* 2017; Silk *et al.* 2003). Crucially, the development and maintenance of strong extended social networks mitigates many of the negative

demographic effects intrinsic to small groups that reduce both individual fitness and threaten the groups' continued survival and long-term viability. These effects include their increased susceptibility to stochastic (random) variation in births and deaths, including in the ratio of women to men; their increased vulnerability to extrinsic causes of mortality, such as famine and violence; the proportionally larger influence that the death of a person has on the other group members, including the availability of people to provide food and the loss of any specialist knowledge; and the smaller available pool of potential marriage partners which may promote inbreeding – lowering genetic diversity, reducing disease immunity and resistance, and increasing the risk of some inherited diseases (Fareed & Afzal 2017; Kramer *et al.* 2017; Lande 1993; Lyons *et al.* 2009).

The widening of the scale of social networks by early *Homo sapiens*, and the better maintenance of these relationships, facilitated a key turning point in the demographic prehistory of Palaeolithic Europe. This turning point corresponds with the transition between the second and third stages of this demographic prehistory – from residency to expansion. It is at this juncture that the Palaeolithic people of Europe broke out of the highly seasonal cycle of life and death that previously constrained their population growth and started maintaining viable long-term populations in an increasing array of environments and conditions. This was possible because of the benefits that the relationships derived from robust, broad social networks brought individual groups in times of uncertainty, need, and/or local partner unavailability.

Demography bridges the biological and the social to offer a new perspective on the prehistory of Palaeolithic Europe. We begin this prehistory by examining how Palaeolithic demographic data are generated and interpreted.