Introduction

Early in January of 1992 a thin, hungry and very weary man was found by station workers stumbling through open bush in one of the most isolated parts of the Australian continent. Conditions were unbearable with early afternoon temperatures around 47°C, humidity 85 per cent and monsoonal storms beginning to build. He carried no water and the nearest 'civilisation' was one of northwestern Australia's remotest cattle stations 25 km away. The badly dehydrated man was taken to the station and when sufficiently recovered he told his rescuers he was not alone. He had left companions to make their way in small groups across the baking harshness of the rocky Mitchell Plateau. He was walking across one of the harshest and least explored areas of Australia that stretches for thousands of square kilometres. Without knowing the cattle station was there he would have missed it altogether.

One by one the man's companions were found and when they had partially recovered from their exhaustion they related their story. They had been walking for days over the rugged, scrubby terrain with hardly any water and little food except some flour and a few lizards and snakes that they had caught on the way. They had no knowledge of bush foods, no weapons and no previous experience with the Australian bush or that type of environment. The unfamiliar landscape and conditions were doubly hard for them because they had entered this harsh wilderness at its worst, during the extreme mid-summer monsoon. But who were these people?

Using fairly sophisticated electronic satellite navigation equipment, the group had headed straight for Australia from China. Unfortunately the navigation system could not tell them that they were heading for the remotest piece of Australia's 36 700 km coastline and one of the most inhospitable parts of the continent. Their boat had grounded on mudflats covered with hectares of densely tangled mangrove infested with sandflies, mosquitoes and sharp spines, and patrolled by more than the occasional salt water crocodile. Rather than stay in this extremely uncomfortable environment and with little hope of refloating their worn out fishing vessel, the 60 or more crew and passengers began to trek inland in small groups in the hope of finding a town and rescue. When found, the first man had already trekked over 140 km in

seven days wearing only thin sandals on his feet. Others including women with children had no footwear but had still walked many kilometres.

The 'boat people' phenomenon has swept many parts of the world during the last 25 years and it continues. Obviously, it is a source of escape for those devastated by prolonged and intractable wars, persecution, disease, death, poor living conditions and no future. Termination of hostilities often brings little peace, persecution for some, food shortages, refugee camps and many other hardships for people in their own country. To escape these, many have taken to the high seas or crossed borders into territory that is sometimes almost as hostile as the one they have left behind, but they have little choice and for many nothing will be worse than what they live in. So, they have everything to gain and nothing to lose by going.

Humans live by chances and the boat people calculate that their chances for survival would be better if they try to escape elsewhere, even if there is a chance of dying in the attempt. For many it is not just a chance for them to survive, it might just change their lives for the better, release them from economic circumstances that provide little and bring an early death. Some 'refugees' are trying to circumvent lengthy or impossible immigration procedures and regulations in order to start a new life. But to start out on a voyage is a start at a fresh life even if there are no guarantees of success. Contemporary ocean-going voyages are not without danger. Modern-day pirates, cyclones, overloading and the unseaworthy, leaky and rotting hulks often provided for these escapes have probably seen more voyagers perish than succeed in their journey. So, in January 1992, 60 more people arrived in Australia and this group was only one of hundreds that have set out to reach Australia during the last 30 years.

From an anthropological perspective, there is nothing unusual about these arrivals, however. They represent a single drop from a bucket of human migration that has been dripping all over the planet over the last two million years. During the Upper Pleistocene some would have headed for Australia. Although none of our modern group perished, they were not able to read their surroundings as the Pleistocene migrants were. What they both shared, however, is that they had the will to survive, they used different tools to do it; the situation drew out the will for 'survival' in them. Their determination and stamina came from attempting to save themselves, a desire shared by all humans whether they are separated by distance or time.

Humans are great survivors. When pushed they can achieve remarkable feats with very little, and in essence that is what this book is about. It is concerned with a phenomenon that binds modern people to their distant ancestors through the twin problems of why and how we move from one place to another. Human migration to Australia continues in much the same

way as it has done for tens of thousands of years. Today it may be shorter because people know their destination, but their reasons for making the journey now may not be very different from those of the ancient mariners. Nor is the will and fortitude to carry it out very different, together with the strength to survive in the hope that a safe landfall will be made. Perhaps the pressure of those behind them made migrants of people in the distant past as it often does now.

There was an evening during the last interglacial or before when Sahul (Australia, New Guinea and Tasmania) was completely devoid of humans. Its beaches had never had an imprint of a human foot on them and the fauna had never been hunted. The only fires here were natural and the landscape had not heard the chatter or call of the human voice. By the next evening, however, the first camp fire lit up ancient faces and glittered in time with strange voices drifting across an estuary or along a very lonely and pristine beach. The first human footprints were being washed by the tide or sniffed by strange looking giant marsupials. Whenever this event took place it was the most significant and exciting event that Australia has ever known. It represents a time when humans came of age on open sea and they would now begin to explore the oceans.

1 *Going to Sunda: Lower Pleistocene transcontinental migration*

Introduction

By its very nature archaeological evidence is almost always deficient and rarely tells us what we would *really* like to know. Our inquisitiveness, however, drives us to seek new evidence, ask more questions and keep looking. After more than a century of looking, the fossil evidence continues to point to Africa as the development centre for humanity. While little evidence has been found to show how large early human populations were and how they subsequently grew, it is always taken for granted that they were small, actually, very small. Besides the equivocal definition of what is 'small', the premise that our formative populations were 'small' could be wrong. There may have been several population centres that arose from an earlier single centre, where the human line broke away from a common ape ancestor. As evidence emerges that hominins may have divided from anthropoids as far back as the Upper Miocene, it is increasingly difficult to believe that they lived in *extremely* small populations (Brunet *et al*., 2002). Research during the last decade suggests that early hominins were distributed over a wide area of Africa and were not necessarily confined to eastern parts as previously suspected. Perhaps more importantly, it shows that they could survive in savannah and close to semi-arid environments. They were not necessarily confined to rainforests or dense forest eco-niches (Vignaud *et al*., 2002). There may indeed have been a single geographical area where the separation of the human line from our common ancestor took place or it may have taken place in several areas. A parsimonious view is that the latter is less likely than the former. Whatever the case, it is likely that sooner or later groups budded off from founder populations and the ancestral line leading to humans began to grow as a distinct group separated from the apes. It is always going to be difficult to recognise this process because of the immense odds and sheer chance of finding the fossil remains necessary to piece the story together in any great detail. The budding-off process could have given rise to morphologically similar forms and this would have been underpinned by linkage in the form of intercommunication and territorial overlap which, in turn, facilitated gene flow. Of primary interest here is that population

budding suggests population growth, but the fact that life may have been nasty, brutish and short for early hominins, the net outcome of such growth was minuscule. Nevertheless, it was with these early groups that a process began that would eventually lead to one of humanity's most frightening problems – overpopulation.

Competition or geographical barriers may have kept some early hominin groups apart for considerable periods of time. This is likely to have been one mechanism leading to such a complex branching tree of evolution from which the *Homo* line eventually staggered away. Genes would have been exchanged between most groups, as females were captured or one group overwhelmed another. Geographical separation of related lineages would have produced morphological divergence, even on a lesser rather than greater scale. We know virtually nothing about the reproductive biology or biogeography of proto-hominins or the later ubiquitous Australopithecines of southern, eastern and north central Africa. Naturally, we know even less about the fundamental demographic parameters of life expectancy, natality, rates of fertility and mortality, birth intervals, and the age and sex structure of Australopithecine groups or later populations. Using reproductive and demographic profiles of higher primates and anthropoid apes to reconstruct these parameters for hominins may mislead rather than inform us. To do this is similar to rigidly extrapolating demographic information gathered from modern hunter-gatherer people to hunter/scavengers living 1 My ago and less.

Because of these constraints it is difficult to understand the population dynamics of our earliest direct ancestors, including their demography, their migratory habits and, consequently, how their populations might have grown and spread. This situation is frustrating because the reproductive and demographic dynamics of these populations led directly to the later spread of erectine or erectine-like groups in the early Lower Pleistocene out of Africa. At this stage I am not too concerned with taxonomic propriety. It is immaterial for the arguments in this book whether *Homo ergaster*, *Homo erectus* or even *Homo antecessor* was the migratory species. I am only concerned with a hard-working 'erectine' as the protagonist, and I will refer to these migrants as 'erectines' throughout. The ability to know the size and distribution of these populations and their migration patterns during the Lower and Middle Pleistocene is vital to understanding the development of modern human populations, how they emerged and the eventual occupation of the planet by us.

Our knowledge of world populations in the Lower Pleistocene is as meagre as our knowledge of those that came before them and a resort to guesswork is all that seems possible. There is a desperate need, however, to understand humanity's palaeodemographics in order to develop a fuller understanding of

the important evolutionary processes taking place during this phase of human development. It would also help us understand better how erectines successfully crossed the globe. Even basic questions seem beyond us, such as how large were these populations when they started out and how fast did they grow? Answers could provide a better understanding of the speed and direction of migrations, when they began and how fast the world was populated. It might also help throw more light on when and where we as modern humans evolved.

Therefore, it is my aim to tackle a number of questions relating to world population growth over the last 2 My. Naturally, it takes a largely theoretical approach because it is the only one open to us. In addition, I use as much knowledge of the biology of these early people as we know at this point. The model is, however, conservative and based on the most plausible parameters used widely in palaeodemography. This first chapter begins the task by examining how people may have arrived in and crossed Asia. A general discussion describing evidence for hominin distribution is presented, followed by a description of some possible palaeodemographic parameters based on what is known about the biology of erectines.

Leaving Africa

When the first hominins left the African continent, probably crossing the Sinai Peninsula, it sparked off a process of world migration that began in the Lower Pleistocene and has never really ended. Although hominins must have moved within continental Africa before this, leaving the continent marked the first transcontinental step for humans. Many steps later they had spread from the African savannahs through a wide variety of environments stretching into Europe, crossing the Middle East and into Asia. Almost 2 My later, migrating peoples stared out across the icy waves of the Southern Ocean, the Tasman Sea, the Beagle Channel and the North and South Atlantic Oceans. Our fascination with exploration continued until great Pacific voyages took people to almost all the tiny atolls scattered across that vast ocean. Effectively, our explorative journeys ended with the occupation of New Zealand a little over 1 ky ago. Exploration of the world by Europeans during the next 800 years or so was essentially re-explorations. With the exception of Antarctica, humans had fully explored the world's continents long before any galley, dhow, junk, longship, caravel or galleon had left its respective home moorings. Transworld migration began with *Homo erectus* and ended with *Homo sapiens*, but when viewed in this way it seems that whatever we like to call these people it was always *us*, equipped with our inquisitiveness, cunning, adaptiveness,

toughness, innate ability, athleticism, need to explore and our doggedness of purpose. We continue to explore and probably always will because of our natural curiosity, a special quality that readily flags up who we are.

The large collection of fossil human remains from China and Indonesia is mute testimony to the success of erectine migrations. The antiquity of the first erectines to leave Africa is not in dispute. It had certainly happened by the Lower Pleistocene, but what we lack is both detail of these events and the exact timing. Even though originally disputed, the almost 2 My date for the Perning (Modjokerto) *Homo erectus* seems to be holding the record for the oldest evidence for hominins outside Africa (Swisher *et al*., 1994; Antón, 2003). Two million years is a controversial date for erectines to be living in Java, because to accept their presence in this far corner of the Old World at such an early time would almost predate the species in its African home (KNM-ER3228, 1481 ~ 1.9 My). It is not unlikely that some might even argue that they could have evolved outside that continent (see below). Other early dates for *Homo erectus* outside Africa include those from Dmanisi, in the Republic of Georgia. Recent discoveries there include two crania and a mandible dated to 1.7 My (Tchernov, 1987, Shipman, 1992, Gabunia *et al*., 1999). Reassessment of the dating of the Sangiran fossils from Java has now produced a minimum date for them of 1.5 My (Larick *et al*., 2001). The oldest firm date for fossil hominins in China is that for the Gongwangling (Lantian) calvarium (1.15 My) (An *et al*., 1990). The upper incisors from Yuanmou in southwestern China still present problems for interpretation and it continues to be unclear whether they are morphologically closer to an *Australopithecine* or are erectine. Nevertheless, they are still believed to be Lower Pleistocene in age, and could be as old as 1.7 My (Wu and Poirier, 1995). But the recent discovery of stone artefacts in sediments in the Nihewan Basin, radiometrically dated at between 1.77 My and 1.95 My and those at Renzidong that may be as old as 2.25 My, probably puts the earliest hominin occupation of China beyond that of Java (Zhu *et al*., 2001). Indeed, if these dates are found to be correct, then the whole debate about the origin of *Homo erectus*, or a similar hominin, will be open for a radical re-think, together with their direction and rate of spread across the world. Perhaps an *Australopithecine* origin for the Yuanmou incisors may then not be as fanciful as has been assumed in the past.

For now, however, we will stick to the original story and go back to Africa's front door. Ubeidya (1.4 My) is an artefact site on the banks of the Jordan River 1400 km southwest of Dmanisi (Tchernov, 1987). Although dated later than Dmanisi, it has been suggested that the site may eventually reveal dates predating the Georgian evidence. It is immaterial really because it is logical to assume that if erectines came out of Africa then those areas

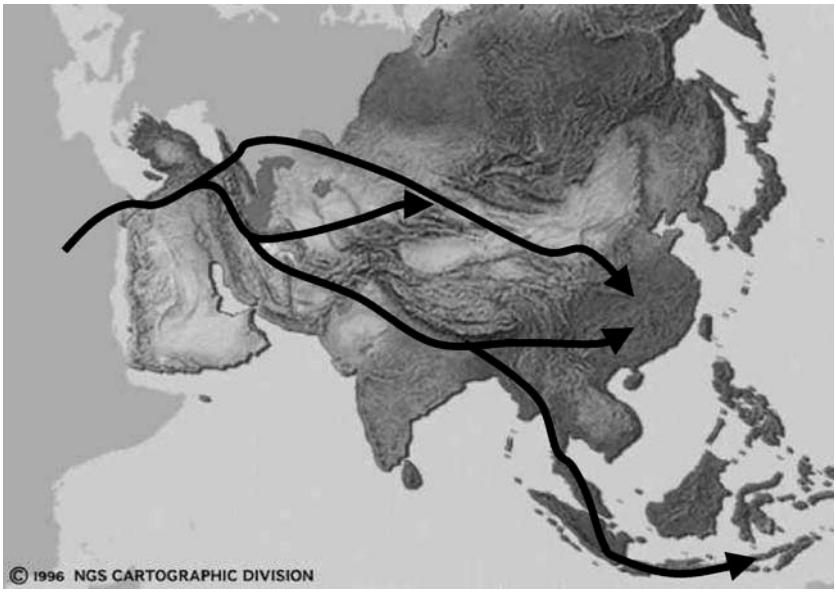
geographically closer to the dark continent should eventually produce the earliest dates for their exodus. It is also logical because Ubeidya is on a route that would have taken them north through the Sinai region. The Dmanisi and Ubeidya evidence is interesting because that is not the direction to go if you want to get to Indonesia or China, assuming you knew they were there. The data point strongly to an erectine radiation out of Africa, not only in a north-easterly direction but probably in all directions. This suggests a vital point for human palaeodemography at this time: if erectine populations were extremely small and they radiated in all directions, these hominins would have been exceptionally thin on the ground. That would not have been safe considering they were prey to wide range of large carnivores at that time. So, were there enough erectines to go round? In other words, how many erectines were there?

The earliest evidence for humans in Europe still has not broken through the 1 My barrier. Sites at Soleilhac, Vallonet Cave and Isernia la Pineta are the closest (Roebroeks *et al*., 1992). Discoveries of erectine crania at the Grand Dolina locality, Atapuerca, in Spain and Ceprano in Italy show erectines were living in southern parts of Europe around 800 ky (Bermudez de Castro *et al*., 1997; Arsuaga *et al*., 1997; Manzi *et al*., 2001; Antón, 2003). This evidence not only brings them into Europe at a much earlier date than previously thought, they are living at the far western end of the continent, close to the Atlantic coast, a position that suggests others were living between them and the Levant. Even if they had crossed at a land bridge between North Africa and Gibraltar, it means that they had spread far across North Africa to reach that crossing point, but the evidence from that region is not particularly old at around 400 ky for Thomas' Quarry and Sidi Abderrahman fossils in Morocco (Antón, 2003). The European dates are much younger than those from the Far East and at least 900 ky years after Dmanisi, but a successful entry and occupation of Europe may have been harder to accomplish in the face of the glacial conditions that existed there around 1 My ago. But why not an entry before those conditions prevailed? The Georgian evidence shows us that erectines were moving in the right directions. Nihewan tools have been found above 40° north, so cold may not have played as big a part in the dispersal patterns of these hominins as previously thought. Also, we must not forget that at the same time as people were living at Grand Dolina, their relatives were island hopping through the Indonesian archipelago using water craft (Morwood *et al*., 1999). It is debatable when humans first began to adapt to very cold conditions, but there is the possibility of them exploring as far north as the Lena River (Diring-Ur'akh) almost at the same time around 700 ky ago. While far to the east they had reached deep into Japan (Kamitakamori), then a peninsula jutting east from China, again around 700 ky ago (Sekiya, 2000). A later date of 500 ky also puts them in southern Mongolia (Tsagaan Agui),

attesting to their ubiquitous spread across the Old World and obviously evidence for erectines trying their hand in not too benign regions as far north as 60° (Derevianko *et al*., 2000). If confirmed, the Lena evidence also puts them within 600 km of the Arctic Circle and 200 km from the southern limit of the present permafrost line.

The first human occupation of northern Europe probably did not take place until the mid or even late Middle Pleistocene because of cyclic glaciations; evidence from Boxgrove in England shows that there were successful hunting bands living there around 450 ky. They probably arrived in Britain via the land bridge from Europe during low sea levels. But in those times, enormous glaciers lay across northern Europe preventing entry into the northern half of the continent and northern Britain for long periods. Glaciers would also destroy any evidence of occupation in those areas, particularly open sites, which was probably very sparse in any case. Moreover, the colder sub-glacial environments as well as steppe-like expanses were probably not popular with erectines and why should they be when the empty world before you is your oyster and you can stay in warmer regions? Thus, the European landscape may have remained an unfriendly venue for occupation until cultural and/or biological adaptation to such environments had evolved. I reiterate, however, that erectines were living in northern parts of China long before 800 ky. As with many other areas, the European evidence is fraught with site interpretation and dating problems associated with the relative age and timing of the appearance and disappearance of stone tool and faunal assemblages. Evidence for erectines in northwest Africa is somewhat later than that in northern Europe, probably reflecting Middle Pleistocene migrations into the region due to population expansion into other areas in the south and east (see Chapter 2).

At present, the sparse evidence for the first patterns of erectine migration and exploration outside Africa shows a radiation confined to the northeast and then the east. The reason for choosing one direction over another will never be known. It may have been purely random, but it is interesting to see that they went in several directions and, with a few exceptions, that they were not daunted by different landscapes. Although present evidence helps define the direction of erectine movement, how long it took them to reach China and Indonesia and what routes they took to reach those destinations are elementary questions but seem impossible to answer. Nevertheless, those questions beg others, including: were Indonesia and China reached concurrently or at different times; were those migrations isolated events, involving single bands, or was there a chain of bands each keeping in touch with the next? Moreover, how many individuals were involved? Even with an obvious lack of empirical data, what are the most likely answers to these questions?



Map 1.1. Erectine migration from Africa to Asia showing two possible routes to East Asia and a third into central Russia.

Mechanisms and barriers to Lower Pleistocene hominin migration

A walk from Africa to China requires passage through most of the environments that our planet has to offer (Map 1.1). Today, these include desert landscapes, sub-alpine meadows, vast savannas, open forests, tundra and dense equatorial rainforests. No doubt ice was always avoided. The late Tertiary trend of planetary drying continued in the Pleistocene with a commensurate build up of ice at the poles. An accompanying drying in many parts of the world particularly affected mid and lower latitudes. As deserts expanded, forests and wet tropics contracted (Williams *et al*., 1993). Many regions began to experience cooler winters and drier summers, although some fluctuations crept into this trend after 2 My ago. At least 20 major glaciations were experienced after that time, with fluctuating sea levels that alternately flooded and exposed vast areas of continental shelf. Some environments altered little, while others underwent enormous changes that redistributed and probably radically altered the composition of both floral and faunal populations. For example, a 20 ky exposure of the Sunda shelf between Indonesia and Thailand was probably enough time to produce a vastly