

Knocking Down the Straw Man Once Again: Out-of-Africa in the Middle Paleolithic and Siberia as a Test Case

The history of archaeology and prehistory since the time of Herodotus is the history of incessant arguments between a conservative short chronology and a cutting-edge long chronology. Over the centuries the long chronology usually wins out against its begrudging opponents and our knowledge of prehistory gradually advances.

One of the current contenders is the 'out-of-Africa' short chronology for the origins of so-called 'modern humans'. It is variously called the '(Recent) Out-of-Africa Model', 'Recent Single-Origin Hypothesis', or 'Replacement Hypothesis (or ROM for short). A summary may be found at http://en.wikipedia.org/wiki/Out_of_Africa_theory. Basically, ROM argues that the following components were all interlinked and left Africa as a single package.

- (a) Behaviors: a definable and limited set of 'modern' behavioral traits, evident in the archaeological record, such as range extension to unoccupied regions; long-distance procurement and exchange of raw materials and produced goods; intensification of resource extraction, especially aquatic and vegetable resources requiring specialized technologies.
- (b) Technology: Mode IV (blade cores, blades and blade-based tools, backed blades) Upper Paleolithic/Later Stone Age tool industries, and may include hafting and composite tools; tools in novel materials, e.g. bone, antler; distinctive regional tool styles; first steps in coastal navigation and seafaring;
- (c) Language: 'modern' capacity for language, possibly due to some kind of mutation of the FOXP2 gene or some other brain development or mutation
- (d) Symbolic behavior: self adornment, e.g., beads and ornaments; use of pigment; notched and incised objects (bone, egg shell, ocher, stone); image and representation; symbolic 'notation' systems; new musical instruments (e.g., bird bone flutes); burials with grave goods, ocher, ritual objects; a so-called 'big bang of human culture, the origins of art and religion', to cite Mithen (1996);
- (e) Genetics: e.g. Y-DNA haplogroups C and/or D and mtDNA haplogroup M (possibly 45-60 ka) and N (possibly 70 ka);
- (f) Palaeontology: *Homo sapiens sapiens* or 'anatomically modern' or 'modern' *Homo sapiens*, who evolved from and 'replaced' various prior forms of *Homo sapiens*, such as *Homo helmei* in Africa, the Neanderthals of Eurasia, and 'archaic' or 'transitional' *Homo sapiens* in more easterly Asia.

For short chronologists, the date when *Homo sapiens sapiens* migrated from Africa carrying this package is placed at around 45,000 years ago (Klein 2003) or 45,000 to 50,000 (Mellars 2005; Bar Yosef 2002).

Mounting evidence that ‘behavioral modernity’ appears in the archaeological record well before the African Later Stone Age (LSA) has challenged ROM. It is widespread in the Middle Stone Age (MSA) and has even earlier antecedents at Late Acheulian sites (McBrearty and Brooks 2000, which includes a definitive definition of ‘behavioral modernity’). Behavioral modernity began at least as early as the late MSA, 70-80 ka (OIS4 ~59-74 ka), e.g., Blombos Cave, South Africa (D’Errico 2003) if not earlier (Stringer 2004).

Thus, perhaps realizing that the ROM model appears to have more holes than Swiss cheese, some new ‘not-quite-so-short’ chronologists have entered the fray. Mithen (1996) loosened things up by advocating for 60-30 ka. Mellars (2005) in a response to D’Errico (2003) seems to have slightly modified his ROM ‘explosion’ or ‘revolution’ model. Narrowly focusing his analysis on Europe, he argues that ‘modern humans’ left SW Asia 45-47 ka and headed to Europe and western Asia, arriving in Germany [*of all places*] by 38 ka. Noting that something like UP assemblages occur in Africa ‘possibly back to 50-60 ka’, he refuses to speculate on the geographic origins of ‘anatomically and genetically modern humans’, while subtly noting a “sharp contrast between the relative speed and abruptness with which all of these novel technological and cultural features appear in the archaeological records of Europe” and the “gradual, piecemeal” innovations in Africa. He avoids making a hypothesis about when ‘modern’ humans left Africa. He studiously avoids discussion of what’s been going on in the rest of the world for the last 150,000 years of *Homo sapiens sapiens*.

The preceding proponents of the not-quite-so-short chronology appear to keep their focus on Africa, SW Asia and Europe and, unwittingly or not, fail to take into account the obviously challenging case of Australia, which, based on the archaeology, appears to have been settled by *Homo sapiens sapiens* (in the absence of any other fossil species) carrying [*oh god forbid*] a Middle Paleolithic technology around 55,000, and possibly 60,000, years ago.

Robert Bednarik (2003 and numerous other articles) has strongly documented a long chronology for palaeoart from at least Acheulian times or earlier across Africa and Asia and argued for the refutation of any short-chronology.

James and Petraglia (2005) bring up the archaeological record of South Asia. In a review of the South Asia data they argue that *Homo sapiens sapiens* colonized South Asia as part of an early ‘Southern Route’ dispersal from Africa but developed local cultural traditions “that may be traced to the Middle Paleolithic” and suggest a convergent evolution of prepared core technology that draws on indigenous Acheulian antecedents. South Asian Late Paleolithic microlithic industries appear to not constitute a sudden break but a gradual shift to more intensive blade production. The earliest Early Middle Paleolithic (EMP) industry occurs at the 16R Dune site and dates ~150 ka. The earliest Middle MP (MMP) in the Son Valley dates to ~75-100 ka. The earliest Early Upper Paleolithic (EUP) sites, e.g., Site 55, Pakistan, begin around ~45 ka, which is too late to

arrive in Australia by ~55 ka. This leads James and Petraglia to question the ROM linkage of modern behavioral traits with Upper Paleolithic Mode IV stone knapping industries. They suggest two possibilities to explain the archaeology: (a) those who colonized South Asia “were not behaviorally modern—that they were incapable of fully symbolic thought” or (b) absence of symbolic objects in the South Asian record does not equate with “absence of a modern mind” (S15-S16).

As soon as the date for out-of-Africa across the Southern Route is moved earlier than the innovation of Upper Paleolithic Mode IV technologies, the key linkage of species to toolkit that supports the ROM model falls apart and a new paradigm is required.

So when did the people with the ‘creative revolution’ burst out of Africa? Given the South Asian dates in James and Petraglia (2005), Field, Petraglia and Lahr (2007) tries to update an answer this question. Using GIS-based analyses, climate, archaeological and genetic data, they argue a hypothesis that *Homo sapiens sapiens* migrated from Africa not in OIS3 [*the short chronology*], but in OIS4 (59-74 ka), travelling along a coastal-based route into South Asia and then by several routes onward into SE Asia. They note that OIS4 was a time of increased aridity and expansion of deserts in North Africa, Arabia and Western South Asia and argue that this would have exposed coastal shelves, which expedited migrations.

But even this slipping further back of the not-quite-so-short chronology appears to be contradicted by the earliest known dates of Mid-MP type industries across the ‘Southern Route’ – Patpara, India ~75-85 ka, Liang Bua, Flores ~61-74 ka and Australia by ~55 ka.

Without being too sarcastic, the short chronology ROM model and now the ‘not-quite-so-short’ chronology might be caricatured as something like this: about 50,000 (or maybe 75,000) years ago, after a 10,000 year bottleneck, or maybe they were shy about it, a small group of hopped-up sapiens, probably numbering a couple thousand, carrying the ‘big bang creative explosion’, including language (thanks to a mutant gene), art, symbols, and all kinds of other amazing things that dazzle the mind, got real thirsty. You see there was a bad drought going on. Hey, I need a drink. What’s that you say, I can get a drink in Australia. Awesome. So these Star Trek übermenschen travelling at warp speed left Africa around 50,000 years ago and arrived in Australia 55,000 years ago or maybe they left 70,000 years ago and arrived in India 75,000 years ago. Anyway they were real fast. Speed freaks. Zoom zoom. It was a stunning success. Along the way all Neanderthals and other archaic Homo sapiens, who were simply illiterate savages and slow on the draw, were quickly exterminated, or to be polite, ‘replaced’. Thank goodness. Now we have music, ornaments, power bracelets, and Coca Cola and the whole world is happy.

Oppenheimer (2009) suggests that since modern humans are not designed for hyperarid desert conditions it's more likely they left in OIS-5a,b (~74-96 ka) and were impelled to do so because at that time the Red Sea suffered a period of hypersalinity making fishing less reliable for subsistence, and this accords with an mtDNA genetic clock study suggesting that the L3 (M+N) haplogroup disperse at 83 ± 8 ka.

Carto et al. (2009) slips the 'not-quite-so-short' chronology one step further back from the date proposed by Oppenheimer; they suggest "most scientists conclude that anatomically modern humans had evolved in Africa at around 200 ka and subsequently began migrating to diverse parts of the world in several waves. The first of these began between 100 and 90 ka" (OIS 5c, ~93-105 ka), citing Stringer (2000, although Stringer actually says "before 60,000", carrying a Middle Paleolithic technology), because, as Carto et al. note, dust deposition studies indicate that OIS 5c may have been less arid in the Arabian Peninsula than OIS 5d (~115-105 ka). They pass over the fact, which they themselves cite, that *Homo sapiens sapiens* with MMP technology occurs at Skhul in SW Asia, ~120 ka and China, possibly ~110 ka.

Given that the molecular clock used in archaeogenetic studies has itself questions of what mutation rates to use and when the common ape-homo ancestor on which it is based is actually to be dated, I suggest that one best argues out-of-Africa on archaeology and climate data. Climate is a key in Oppenheimer's and the Carto et al. hypotheses. Along this line Sahara pump theory may be helpful. Dry and wet periods in Sahara and Arabia have oscillated over millions of years and during the wet periods flora and fauna migrate between Africa and SW Asia (http://en.wikipedia.org/wiki/Sahara_pump_theory). Vaks et al. (2007) examines the desert speleothem record in the Negev over the last 150,000 years and conclude that if wet episodes over a Saharan-Arabian corridor were crucial to migrations out of Africa, the wet period was 140-110 ka (OIS 5e and 5d), which saw increased monsoonal precipitation across the Saharan-Arabian Desert, allowing Eurasian biota to travel to Africa and vice versa. Before 140 and after 115 ka the Red Sea coastal route was extremely arid, with a slightly wetter condition at ca. 85-90 ka (at only one of 5 tested caves), but rainfall still ten times less than around 125 ka. From 60 to 30 ka arid conditions prevailed in many parts of Africa. During the Eemian perennial lakes existed in basins now occupied by playas in southern Jordan and African and Saharan-Arabian fauna elements were their highest since 780 ka, including hartebeest, equids, ostrich, indicating an abundance of savannah species. While the wet episode could have removed the climatic barriers to human and animal migration, increasing aridity at ca. 110 ka. would have suppressed the return route for at least 20,000 years. If these dates and interpretations are correct, on the basis of climate alone the primary dispersal across the southern coastal route most likely occurred during OIS5e (~110-130 ka) or earlier and significant dispersal during OIS 4 and OIS 5a-c should be rejected.

Where do we go from here? What could be the new paradigm?

In 2006 I was invited to write a paper for the prehistory of language journal *Mother Tongue* with the task of answering the question of when *Homo sapiens sapiens* left Africa

to travel the ‘Southern Route’ along the coast of Asia eventually arriving in Australia and to do so based on the archaeology. Like the sorcerer’s apprentice—and not being an archaeologist—I read 527 archaeological studies covering 551 archaeological sites in Africa, Southwest Asia, South Asia, Southeast Asia, Australia and East Asia and produced more than 190 pages of tables and references in a set of databases for each region. Rather than just look myopically at *Homo sapiens sapiens* out-of-Africa, I considered 13 distinct archaeological epochs from 3 million years ago to track multiple waves of technological innovation and I also highlighted evidence, if any, for art and symbol at the 551 sites. A prepress version of the paper and all the databases are posted at <http://www.originsnet.org/publications.html>.

With respect to the issue at hand, the adventures of *Homo sapiens sapiens*, I concluded from my review the following points:

- During the course of human evolution there appear to be at least three periods during which earliest dates for a particular tool industry, hominid species and associated symbolic behavior appear to provide evidence for a West to East gradient. One might label these the three great dispersals across the ‘Southern Route’, the first two probably out-of-Africa but the latter either out-of-Africa or SW Asia:
 - ‘Classic’ Oldowan (*sensu lato*, i.e., the time period ~1.4 to 2.0 Ma) with Mode I pebble core and flake industries
 - Middle Acheulian (*sensu lato*, ~500 ka to 1 Ma) with Mode II direct percussion façonnage (formally shaped pieces)
 - Mid-Middle Paleolithic/Mid-MSA (*sensu lato*, ~60 to ~150 ka) with Mode III prepared core industries or in East Asia discoids, small tools (rare points, no blades), bone tools
 - For correlation of these phases to dates of existence of a Nile River Corridor to the Sinai and into the Negev and beyond see Derricourt (2005).
- Across the Southern Route regions, the archaeology indicates that the deep roots of symbolic behavior, including palaeoart and protolanguage, were planted deep in Classic Oldowan, Middle Acheulian and Mid-Middle Paleolithic strata (again, all *sensu lato* for their respective time periods). This serves as a corrective to the notion of ‘behavioral modernity’.
- With the caveat ‘based on this meta-review’, the earliest sites and dates by region across the Southern Route appear to be something like this (this is an updated table of the one in the *Mother Tongue* article):

SITES AND DATES FOR A NEW PARADIGM FOR <i>HOMO SAPIENS SAPIENS</i> OUT-OF-AFRICA			
	Mid-MP technology (<i>sensu lato</i>)	Palaeoart 'symbolic behavior'	<i>Homo sapiens sapiens</i>
AFRICA	Mumba, Tanzania ~130	Mumbwa, Zambia, MSA, ~OIS5e, red colorants, possible figurative piece	Omo Kibish* ~195 ka
	Klasies River Mouth, S. Africa, MSA I-II, ~90-130 ka	Klasies River Mouth, South Africa, MSA I-II, ~90-130 ka extensive red colorants, incised bone, possible secondary burial	
	Blombos, S. Africa, M2, ~100 ka M3, ~75-90 ka	Blombos M2, ~100 ka, decorated bone tools; shell beads, colorants; M3, ~75-90 ka, engraved bone, engraved ochre with X signs, other markings	
SW ASIA	Tabun, C, Israel (ESR) ~120-220 ka	Skhul, B, ~120 ka, burials, grave goods;	Skhul, B ~120 ka
	Hayonim, Israel ~150 ka	Qafzeh, ~90 ka, burials, grave goods, extensive colorants, shell beads, engraved stone plaquette	Qafzeh ~90 ka
SOUTH ASIA	Son-Belan, India ~85-75 ka	?	
	Samnapur, India ~74 ka		
SE ASIA	Liang Bua, Flores ~61-74 ka		Niah, Sarawak ~42 ka
EAST ASIA	Huanglong, China ~100 ka	Xinglongdong, ~120-150 ka: engraved markings on ivory**	Huanglong, China ~100 ka
		Shiyu, Shanxi, (14C) ~30 ka, pendant****	Ryonggok, N. Korea ~46-48 ka***
CENTRAL ASIA / SIBERIA	Kara-Bom L9, Altai, ~62 ka (calibr.)	??	Baigara Irtysh, W. Siberia >48 ka*****
AUSTRALIA	Australia ~55 ka	Malakunanja II, ~52 ka: colorants; Nauwalabila I, ~55 ka: colorants; Devil's Lair, ~45 ka: pendants, beads; Lake Mungo, ~43-45 k: burial with ochre, cremation burial	Lake Mungo ~43-45 ka

* Omo Kibish is earliest attested *Homo sapiens sapiens*; fossils are not associated with diagnostic lithic industry.
** Small sample indicates chopper-chopping tool industry, 1 hominid tooth attributed to *archaic Homo sapiens*.
*** Initially identified as *archaic sapiens* but cranial size at 1450-1650cc comparable to Skhul-Qafzeh sapiens. Most definitive is direct dating on hominin femur, Tianyuan, China, ~34-41 ka.
**** Shiyu tool industry is typed as early Upper Paleolithic.
***** Baigara is typed as early Upper Paleolithic, but hominin as 'most probably *H. s. s.* comparable to Skhul'.
? Palaeoart for India is reported for Acheulian and UP beginning ~40-45 ka, but not yet in evidence for the MP in between, assuredly a sampling problem of South Asian archaeology.
?? Earliest evidence of art is at sites typed EUP.

- Proposed New Paradigm: If these early dates are not a case of multi-regional convergent evolution, *Homo sapiens sapiens* carrying a Mid-Middle Paleolithic toolkit and corresponding ‘behavioral package’ appears to have dispersed out-of-Africa or Southwest-Asia-into-Africa, then into India and beyond, beginning around ~130 ka or earlier.
 - Note. This corresponds to the OIS5e climatic wet optimum for the migration of flora and fauna between Africa and Asia as proposed by Vaks et al. (2007). In SW Asia it corresponds to Tabun C technologies, including *Homo sapiens sapiens* at Skhul and Qafzeh.
- Based on archaeological data alone it cannot be inferred from this gradient whether it reflects physical dispersal (migration), genetic dispersion, diffusion of technology and symbolic behavior, or independent, multi-regional innovations.
- Corollary. With the caveat ‘based on this meta-review’, with respect to the question of dispersal from Africa or SW Asia for either Mid-UP Mode IV blade and burin technologies, including so-called Bohunician or Aurignacian ‘packages’, or Late-MP Mode V microblade technologies, available archaeological data appears to show that these technologies spread across the Southern Route and into northern Eurasia by multi-regional convergent innovations that were based on already dispersed Mid-MP technologies.
 - This supports the position of Otte and Kozłowski (2003) who classify blade technologies at Kara Bom, Altai, Siberia (~43 ka) and Bacho-Kirian sites as ‘pre-Aurignacian’, followed by ‘early or proto-Aurignacian’ perhaps originating in and diffusing from the area of Iran, Uzbekistan and Afghanistan, ca. 38-32 ka, which, in turn, evolves into ‘classic Aurignacian’ across Eurasia, ca. 34-28 ka. Along these lines, Kuzmin (2006) concludes that “the very early UP assemblages of the Altai Mountains challenge the model of Near Eastern origin of UP and its spread first from Levant toward Europe, and afterwards from Europe to Siberia.”
- In sum, the short chronology hypothesis that *Homo sapiens sapiens* left Africa or Southwest Asia bearing an UP ‘package’ around 50 ka does not fit the archaeological data, nor do adjustments of the not-quite-so-short chronology.
- This review has knocked down the ROM ‘straw man’ of the short chronology and its cousin the not-quite-so-short chronology. Along with it all the proposed component linkages that constitute the ROM model, to mix metaphors, can no longer be juggled together.

That was my 2006 *Mother Tongue* review.

In that study I did not consider Europe or Siberia, the ‘Northern Routes’, so to speak. I’d like now to add a review of Central Asia/Siberian archaeology, which may be of special interest with respect to questions of the peopling of the Americas. It will also provide another test case for the ROM model. This might be a case of knocking down the straw man once again, but until we double check the data who knows?

To build a Central Asia/Siberia database I reviewed 34 archaeological studies, reviews and single site reports for the region and placed over 84 sites into a comprehensive database, which I have posted at <http://www.originsnet.org/publications.html>. This and related databases give the references for all sites that I mention.

The archaeology of Siberia appears to show that hominins and technological innovation had no problem reaching that region during the Middle Acheulian (*sensu lato*) time period (~500 ka to 1 Ma), generally associated with *Homo erectus*.

Reconstructed ‘MA’ (~500 ka to 1 Ma) Route ‘Out-of-Africa’: From Africa (Olorgesailie ~990 ka; Bouri, Ethiopia ~ 1 Ma.) through Southwest Asia (Bizat Ruhama, Negev, ~850-990 ka; Gesher Benot Ya’aqov, ~750-780 ka) and through coastal India (Attirampakkam, Tamil Nadu, ~780 ka) reaching China (Bose, ~800 ka; Zhoukoudian-1, ~770 ka). Diagnostic MA assemblages not yet found in SE Asia, but sites in comparable time range (Ola Bula, Soa, Flores 800±80 – 840±70 ka) may be either persisting Developed Oldowan or actually Middle Acheulian core-and-flake small tool sub-facies.

Similarly, sites without diagnostic Acheulian tools, more like Developed Oldowan, appear to occur in Central Asia/Siberia, including

- Zasukhino, Transbaikal, 800-900 ka
- Berezhkovo-1, Yenisei, <900 ka (tentative)
- Mokhovo-1, SW Siberia, 500-600 ka
- Ulalinka, Altai, >780 ka (‘disputed’).

During the Middle Acheulian time period there appears to be time gradient sufficient to suggest an out of Africa migration for Acheulian technology by a coastal route into East Asia. Siberia evidences a persistent Developed Oldowan or chopper-chopping tool technology.

This technology persists into the Later Acheulian time period (~300-500 ka) throughout the region at sites such as:

- Berezhekovo-1, Yenisei, Minusinsk, L8a <500 ka (Holstein interglacial)
- Diring-Yuriakh, Lena, Yakutsk, north central Siberia >260 ka, possibly 270-370 ka

Early Middle Paleolithic sites, with prepared core techniques, occur across southern Siberia

- Ust'-Izhul', Yenisei, Southern Siberia, ~125 ka, with stone, ivory and antler tools
- Denisova Cave, Altai, L22-14, ~80-130 ka, with 2 hominin teeth attributed to *Neanderthal*
- Berezhekovo-1, Yenisei, Minusinsk, L7, last interglacial

As in the case of the Middle Acheulian 'out-of-Africa', Siberia appears to show that Mid-MP technological innovation had no problem reaching that region during the Mid-MP (*sensu lato*) time period (ca. 60 ka to 150 ka), generally associated with *Homo sapiens sapiens*.

Reconstructed MID-Middle Paleolithic (~60-150 ka) Route 'Out-of-Africa': This appears to be a wave (or waves) possibly originating in Africa (Omo Kibish, ~195 or Mumba Shelter ~130) or Southwest Asia (Tabun C, ESR ~120-220 ka, TL, ~150-250 ka; Hayonim Cave, ~150 ka). Mid-MP subsequently occurs in India (Patpara Upper, Middle Son, ~75-85 ka and Challahia-1-2 Belan, ~72-85 ka; Samnapur, Narmada, 74 ka); Southeast Asia (Liang Bua, Flores, U3, ~61-74 ka); China (Huanglong Cave, Yunxi, Hubei, ~100 ka; Xinglongdong, Three Gorges, ~120-150, palaeoart, but *H. s. archaic?*) and Sahul (Malakunanja II, Kakadu, ~55 ka; Lake Mungo, ~43-45 ka).

Central Asia/Siberia:

- Kara-Bom, Ob River source area, near Mongolia-Kazakhstan, L9, ~62 ka (calibrated); Levallois cores, Levallois and subprismatic blades, pointed blades, crested blades, bladelets, as well as scrapers, notches, denticulates

During the Middle Acheulian time period there appears to be time gradient sufficient to suggest an out of Africa migration for Mid-MP technology by a coastal route into East Asia, including a Narmada River crossing of South Asia, and ultimately to Australia. From my review, Kara-Bom L9 seems the one site known for this time period, which, alas, does not yet evidence palaeoart or a hominid fossil.

Neanderthal persists into the Siberian late MP period, as at Okladnikov Cave, ~34 ka. The earliest evidence for fossil *Homo sapiens sapiens* is at Baigara, Irtysh, Western Siberia, with a hominin talus bone dated by AMS 14C at either >40.3 ka or >48.1 ka. and a tool industry classed as Upper Paleolithic.

The earliest identified palaeoart is at the arctic site of Mamontovaya Kurya, Usa River, Urals, Komi Republic, ~35-40 ka, with incised markings on ivory; tools are non-diagnostic, 'resembling both MP and UP'. Other EUP palaeoart sites are Voennyi Gospital, Baikal, ~30 ka, incised ivory, ivory and bone pendants, bracelet; Tolbaga, Transbaikal, ~25-35 ka, bear sculpture on bone; and Yana RHS, Yana River, northeastern Siberia, ~30 ka, small red ochre pieces, and, in this authors view, a so-called 'worked piece of quartz' that might be interpreted as a possible intentional sculpture of a mammoth.

In sum, taking Siberia as a test case for a mid-MP time period dispersal from Africa or Southwest Asia of *Homo sapiens sapiens* carrying a Middle Paleolithic technology across Asia into Australia, it offers at least one site, Kara-Bom at 60,000 years ago, that appears to support the overall paradigm and suggests that this mid-MP diffusion reaches into Siberia as well as across the Southern Route to Australia.

Finally, in accord with the view of Laukhin (2003), given the dispersal of *Homo erectus* by the Middle Acheulian time period to the NE Siberian site of Diring-Yuriakh (~270-370 ka); *archaic Homo sapiens* (comparable to Neanderthals) from Uzbekistan to the Altai; and *Homo sapiens sapiens* possibly southern Siberia at Kara-Bom (~62 ka) and from western Siberia (Baigara, Irtysh, >40.3 ka or >48.1 ka) to northeast Siberia (Yana River, ~30 ka) carrying, respectively, Middle and Early Upper Paleolithic tool-and-art kits, and all clearly managing to survive and flourish in all these time periods, the most likely hypothesis is that there were multiple waves of migration across Beringia well prior to that of the Holocene, as suggested by sites such as Calico.

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