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The oldest human groups in the Levant

Avraham Ronen

Department of Archaeology, University of Haifa, Haifa 31905, Israel

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For Vadim A. Ranov, on his 80th birthday

Abstract

Between 2.5 and 0.8 Myr, at least four episodes of hominine dispersal from Africa to the Levant are known, each culturally distinct. All have settled on lakes or river banks. The oldest occurrence is Yiron, in the northern portion of the Israeli Rift, with flint artefacts in a fluvial deposit below a basalt layer dated 2.4 Myr. Yiron was followed by the Ubeidiya group in the central Rift ca. 1.4 Myr, with a Lower Acheulean industry. Somewhat later, the Bizat Ruhama group has settled (1.0 Myr) in the eastern coastal plain, with a small, microlith-size industry. Around 0.8 Myr, newcomers have settled at Geshar Benot Yaaqov (GBY) in the northern Rift, introducing the cleaver tradition. None of the sites yielded human remains. The cultures of Bizat Ruhama and GBY have subsequently disappeared. During the Lower Palaeolithic the Levant remained largely an Acheulean province, probably evolved from Ubeidiya. The Late/Final Acheulean, with developed Levallois technology is the possible ancestor of the Middle Palaeolithic 'Levallois–Mousterian'. **To cite this article: A. Ronen, C. R. Palevol 5 (2006).**

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Résumé

Les premiers peuplements du Proche et du Moyen-Orient. Entre 2,5 et 0,8 Ma, au moins quatre épisodes de dispersion humaine de l'Afrique vers le Levant sont connus. La plus ancienne est celle de Yiron, avec des éléments en silex dans un dépôt fluvial sous-jacent à une couche de basalte datée de 2,4 Ma, dans le Nord du Rift israélien. Le groupe Acheuléen ancien d'Ubeidiya, 1,4 Ma, lui succède dans le Rift central ; ce groupe est lui-même suivi par le groupe de Bizat Ruhama (1.0 Ma), à industrie microlithique, dans l'Est de la plaine côtière. Vers 0,8 Ma, un nouveau groupe s'installe dans le Geshar Benot Yaaqov (GBY), dans le Nord du Rift. L'industrie y est conforme à la tradition biface, mais présente une forte proportion de hacheraux. Les industries de Bizat Ruhama et de GBY ont par la suite disparu. Le Levant resterait une province largement acheuléenne, ayant probablement évolué à partir d'Ubeidiya, jusqu'à la phase finale à technique Levallois, qui pourrait être l'ancêtre du « Levallois–Moustérien » au Paléolithique moyen du Levant. **Pour citer cet article : A. Ronen, C. R. Palevol 5 (2006).**

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E-mail address: aronen@research.haifa.ac.il (A. Ronen).

Hominine dispersal from Africa to Asia and Europe may have taken a few ways – through Gibraltar, the Red Sea or through the Levant. The Levant pass is presently the best documented. Ancient sites in the Levant (Fig. 1) shed light on a few dispersal episodes, briefly discussed in this paper.

1. Yiron

Yiron is located in northern Israel not far west of the Jordan Valley. Yiron is well known for its rich Upper Acheulean remains [23,28].

1.1. Stratigraphy, from top (Fig. 2)

- Brown clay with Upper Acheulean assemblages.
- A basalt layer ca. 4-m thick.
- Gravel in a matrix of red soil, 8-m maximum thickness.
- Eocene bedrock.

A small series of flint artefacts was found in 1980 in a restricted area among the gravel below the basalt (Fig. 2) [27,29]. The basalt layer ends in a cliff ca. 80 m west of this locality, but abundant basalt fragments everywhere on the surface indicate that the layer had extended eastward before it was eroded. The gravel artefacts include flake with butts at angles between 80–100°, cores (Fig. 3, 3) and two retouched tools: a

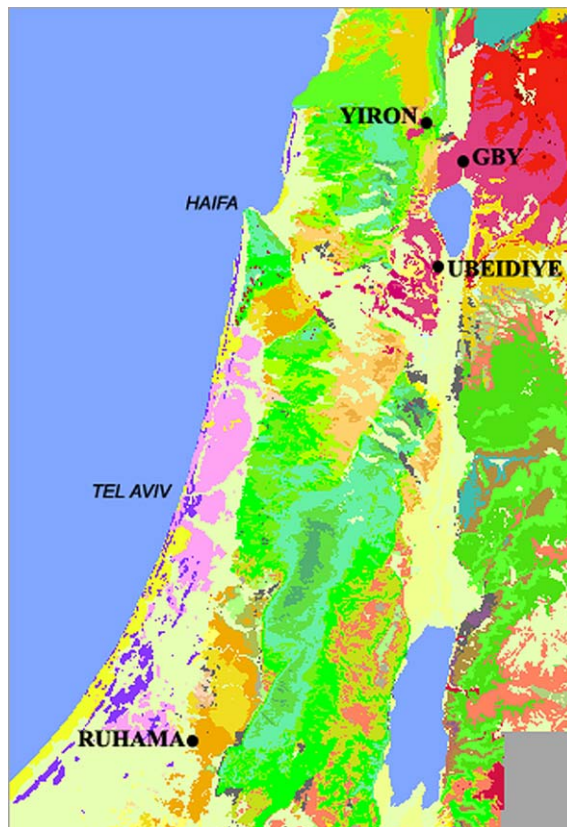


Fig. 1. Geological map and location of sites discussed (basalt areas in red, dates in Ma).

Fig. 1. Carte géologique et localisation des sites étudiés (zones basaltiques en rouge, dates en Ma).

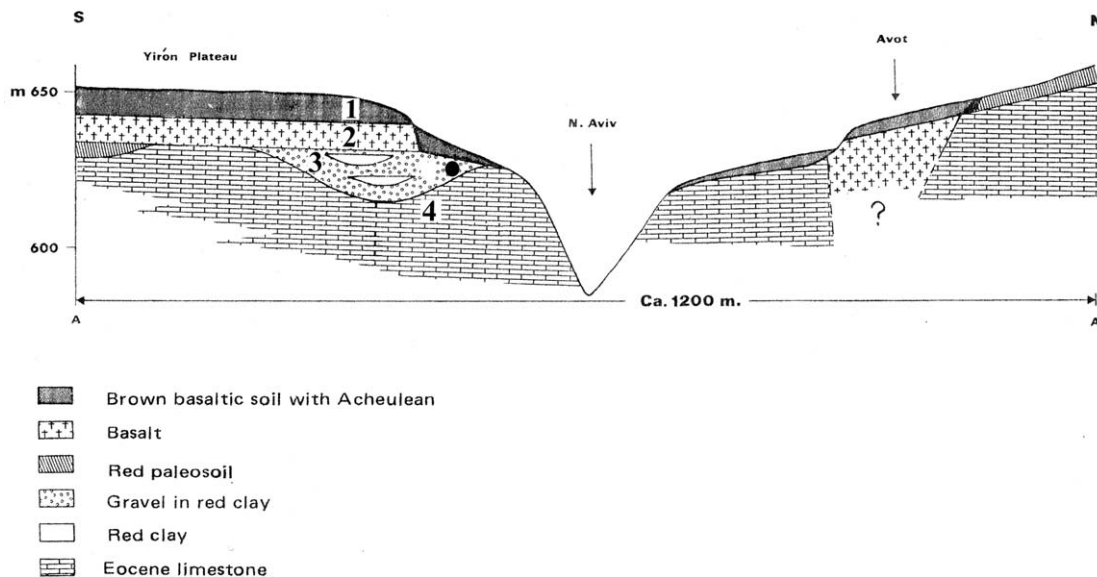


Fig. 2. Yiron, stratigraphic section. The star indicates the find spot (after [29]).

Fig. 2. Coupe stratigraphique d'Yiron. L'étoile indique le site de la découverte (d'après Ronen et al. [29]).

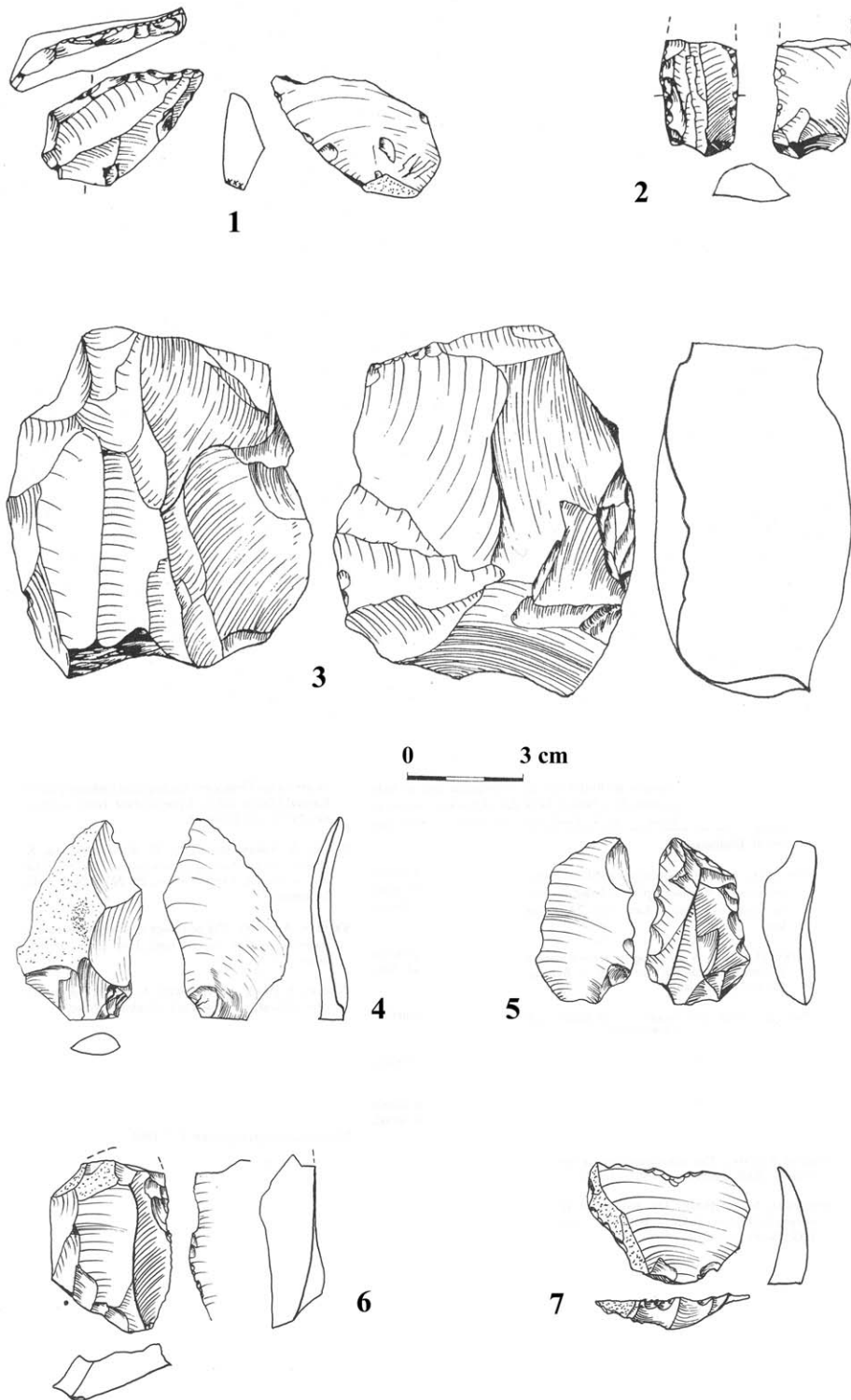


Fig. 3. Yiron artefacts: 1, racloir; 2, retouched blade; 3, core; 4–7, flakes. 1–3, from the gravel bed; 4–7, from trench.

Fig. 3. Objets trouvés à Yiron : 1, racloir ; 2, lame retouchée ; 3, nucléus ; 4–7, éclats ; 1–3, provenant du lit graveleux ; 4–7, provenant de la tranchée.

Table 1
K/Ar dates of the Yiron basalt (from [22])
Datations K/Ar obtenues sur le basalte d'Yiron (d'après [22]).

Locality	Elevation (masl)	Number of measurements	Age (Myr)	S.D.	Mean age
Alma	600	4	1.66	0.11	1.68
Dalton	870	2	1.69	0.2	
Rihaniya	690	2	1.7	0.25	
Har Yohanan	880	2	2.4	0.25	2.39
Amuka	700	2	2.29	0.08	
Avivim	660	2	2.22	0.25	
Yiron	680	2	2.47	0.07	
Gush Halav	810	2	2.6	0.4	

transversal scraper and a retouched blade fragment. The scraper (Fig. 3, 1) is shaped on a side-struck flake with cortical butt and a prominent bulb. The blade (proximal fragment) (Fig. 3, 2) has a regular, semi-steep retouch, a dihedral butt and a developed bulb. Repeated search in the gravel bed failed to reveal artefacts outside that restricted area.

In addition to the finds in the gravel bed, a few artefacts were recovered deep below the basalt in trenches dug by a back-hoe. One trench, dug in 1981 adjacent to the northern edge of the Yiron basalt flow yielded four artefacts in a red clay devoid of gravel [4]. The artefacts are in mint condition: a primary flake (Fig. 3, 4) and three flakes with utilization retouch, one with a faceted butt (Fig. 3, 7). In another trench, dug in 1999 adjacent to the eastern basalt escarpment, a large core was found some 3 m below the basalt base, in a brown–yellowish clay clear of stones. The core is on a large pebble and has a distinct platform opposite an extraction surface with a few removals. Utilization is confined to one extremity of the pebble, with no other removals anywhere on the pebble's circumference. The localized and patterned removals, coupled by the core being the single stone found in a thick clay deposit, point to an anthropogenic origin.

K/Ar measurements have established the age of the Yiron basalt at 2.4 [22]. The pre-basalt date of the Yiron finds described above seems clear, which makes Yiron the most ancient hominine site presently recorded outside Africa (Table 1).

2. Ubeidiya

Ubeidiya is situated south of the Lake of Galilee (Fig. 1), on the western shore of the Early Pleistocene Ubeidiya Lake. Subsequently folded and faulted, the 150-m-thick Ubeidiya Formation (Fig. 4) yielded 64 archaeological horizons with abundant lithics [2]. Over 100 faunal species were identified including mammals,

birds, reptiles and molluscs of European, Asiatic and, to a lesser extent, of African origin [34].

The date of Ubeidiya is estimated by the stratigraphical position, bio-geographical and lithic comparisons. Ubeidiya overlies the Pliocene Erq el-Ahmar Formation [14], the top of which is dated ca. 1.9–1.8 Myr [2]. The lithic assemblages of Ubeidiya [7] closely resemble those of Olduvai Bed II [19], dated around 1.5 Myr. The faunal assemblage of Ubeidiya with *Lagurodon arankae* and *Dicerorhinus etruscus* best matches Guérin's bio-zones 19–20 [12] of the terminal Villafranchian [20]: hence the accepted date of 1.4–1.0 Myr for Ubeidiya.

The lithic assemblages of Ubeidiya comprise chopping tools, spheroids, crude ('Abbevillian') handaxes and flake tools, especially racloirs, notches and denticulates. The lowest layers are devoid of handaxes and, in the upper layers, spheroids are absent or very rare. The entire lithic sequence of Ubeidiya is assigned, however, to the Early Acheulean phase [7].

The Ubeidiya knappers made use of the three types of rock existing around the site – limestone, basalt and flint. They were seemingly used in a planned manner, with a close correlation between tool form and raw material (Table 2). Thus, handaxes were mostly made of basalt, spheroids are of limestone while chopping tools and most of the flakes are of flint. The variety of handaxe types at Ubeidiya is noteworthy: in addition to 'classical Abbevillian' bifaces, original and unique specimens were occasionally manufactured (Fig. 5), which appear to have been experiments.

3. Geshar Benot Yaaqov

The Acheulean site Geshar Benot Yaaqov (= GBY), situated in the northern Jordan Valley (Fig. 1) on the shore of palaeolake Hula, is dated on palaeomagnetic evidence to the Brunhes/Matuyama boundary, some 0.8 Myr ago [10].

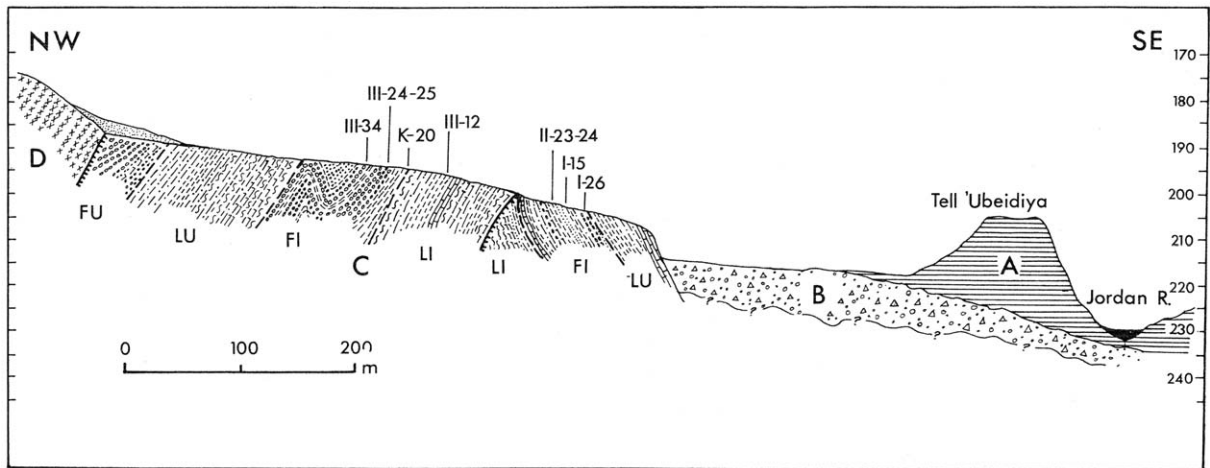


Fig. 4. Ubeidiya stratigraphic section. A, Lisan; B, post-Ubeidiya gravel (= Naharayim); C, Ubeidiya Formation; D, basalt (not in-situ) (from [2]).
 Fig. 4. Coupe stratigraphique d'Ubeidiya. A, Lisan; B, niveau graveleux post-Ubeidiya (=Naharayim); C, formation d'Ubeidiya; D, basalte (non in situ) (d'après [2]).

Table 2

Distribution of raw material at Ubeidiya and GBY (%)
 Distribution de matière première à Ubeidiya et GBY (%)

	Flint	limestone	basalt	Total number
Ubeidiya				
Handaxes	25	15	60	206
Chopping tools	85	8	7	780
Gby				
Handaxes	1.9		98.1	105
Cleavers	0		100	41



Fig. 5. Ubeidiya handaxes.
 Fig. 5. Bifaces d'Ubeidiya.

GBY is the only water-logged Acheulean site in the Levant with outstanding preservation of organic matter, wood, bark, fruit and seeds [11]. Like at Ubeidiya, at GBY too basalt was knapped beside flint. In some layers at GBY, furthermore, basalt was the almost exclusive raw material used, a unique phenomenon in the Levant (Table 2). Giant basalt cores further characterize the GBY industry [21].

Ubeidiya and GBY are the only Palaeolithic sites in the Levant to manufacture artefacts of basalt; in all the other sites, flint was exclusively used. Basalt was not introduced again into hominine technology in the Levant until the final Upper Palaeolithic, ca. 20 ka ago [31].

GBY is outstanding above all by the very high ratio of cleavers among its bifacial component, ca. 50% as against the usual ratio of 1–3% in Levantine Lower Palaeolithic sites [26]. The cleaver is a sophisticated tool, which required planning and a special core preparation (Fig. 6) [9].

The numerous cleavers have set GBY apart as a unique occurrence in the Levant, believed to have had African origins [6,9]. Recently, however, large Acheulean sites were discovered in eastern Jordan, comprising as much as 90%–95% of cleavers within their biface component [24]. The sites are located on Middle Pleistocene lake shores in the present-day steppic environment.

Rather than an isolated occurrence at GBY, then, the cleaver tradition now appears to have spread over a large area.

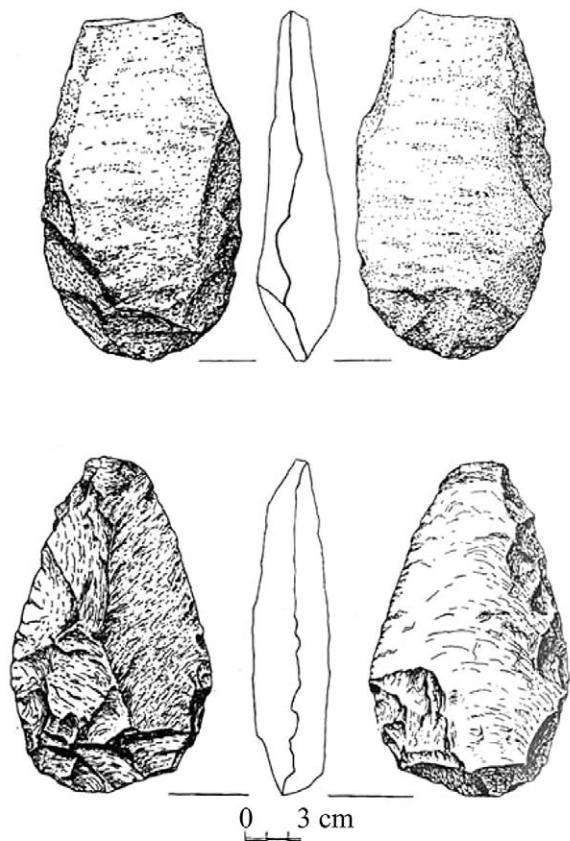


Fig. 6. GBY, a handaxe and a cleaver (from [9]).
Fig. 6. Biface et hachereau de GBY (d'après [9]).

4. Ruhama

Bizat Ruhama (= Ruhama swamp) is located on the eastern margins of the coastal plain close to the junction of Quaternary and Tertiary deposits (Fig. 1). The stratigraphy at the site is, from top (Fig. 7):

- loess, 2 m;
- alluvial clayey sand, ca. 10 m;
- a sandy clay sometimes laminated containing the archaeological horizon, 0.2 m;
- a red loam (Hamra soil) 2-m thick;
- eolianite (sandstone).

Three or four red loams in the Ruhama area postdate the Bizat Ruhama horizon. These loams contain Late Acheulean assemblages [17]. The loam of layer 4 is the oldest in our area and possibly in the entire coastal plain [25,26]. The underlying sandstone is the eastern-



Fig. 7. Bizat Ruhama, stratigraphy at the site.
Fig. 7. Stratigraphie du site de Bizat Ruhama.

most, and probably the oldest penetration of Nile quartz onto the coastal plain.

Layers 4, 3 and 2 are palaeomagnetically reversed. The archaeological horizon of Bizat Ruhama is dated to the Matuyama epoch later than the Jaramillo episode, i. e. between 0.99–0.85 Myr [18].

The Bizat Ruhama horizon contains a rich lithic industry and well-preserved faunal remains amidst abundant iron–manganese concretions [30]. The fauna is dominated by *Equus* (cf. *altidens?*) ([13], Vera Eisenmann, in letteris).

The assemblage of Bizat Ruhama, ca 1000 artefacts (Fig. 8), is of exceptionally small dimensions, the mean length being 25 mm (Fig. 8). Renewed excavations have shown that the small artefacts are found in the entire site (Zaidner, pers. commun.).

A crude piercing tool dominates the tool kit (Figs. 8, 1–5) with about one third of the tools [37], accompanied by notches, denticulates and a few racloirs. There are no handaxes at Bizat Ruhama, but the bifacial retouch was known and served to shape two small bifacial points (Fig. 8, 10–11).

The small size of the industry is due to the exclusive use of small pebbles as raw material. The small pebbles, 40–70 mm long, are of a high-quality flint which was sought by the knappers (Fig. 9). Large nodules of the medium-quality, brecciated Mishash flint [16] are abundant in the vicinity of the site, but were not used at Bizat Ruhama. The brecciated flint was widely used, though, by the Late Acheulean groups at Ruhama to produce bifaces and large flake artefacts [17].

The small pebbles were knapped using a single procedure: first, the pebble was broken to prepare a plain, non-cortical striking platform (Fig. 9); flakes were then

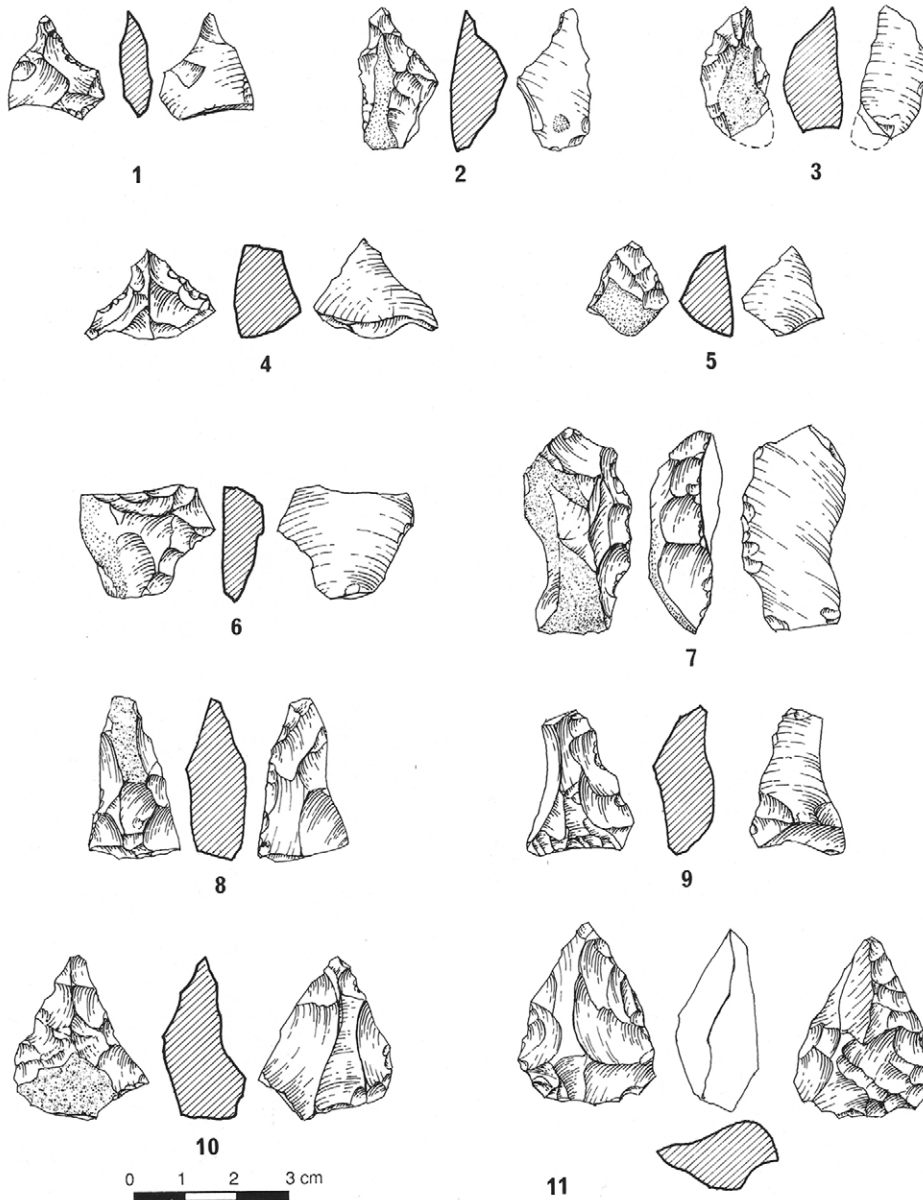


Fig. 8. Bizat Ruhama artefacts: 1–5, piercing tools; 6–8, racloirs; 10,11, bifacial points (from [30]).

Fig. 8. Objets trouvés à Bizat Ruhama : 1–5, outils perforants ; 6–8, racloirs ; 10,11 pointes bifaces (d'après [30]).

removed from this platform (Fig. 9). Plain and dihedral butts dominate, while cortical butts form less than 1% of the assemblage [37].

The microlithic size of the Bizat Ruhama assemblage thus stems from the decision to use solely a high-quality flint and to avoid the brecciated variety. Hence, the small size is due to a deliberate choice, not to environmental constraints.

5. Discussion

The dispersal out of Africa was a multi-phase phenomenon with different groups reaching the Levant at different moments, each with its characteristic material culture. The hominines associated with these dispersal episodes are unknown, as none of the occurrences described here yielded human remains.

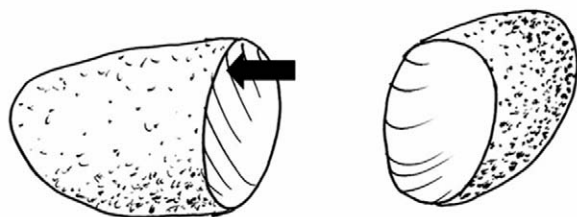


Fig. 9. Bizat Ruhama, a typical pebble-core.

Fig. 9. Cœur d'un *pebble* typique de Bizat Ruhama.

Correlating the episodes of dispersion and their different material cultures with the climatic record is not feasible at present, given the poor accuracy of dating in the period under consideration [3]. A glimpse into past vegetation is offered by two water logged sites in the Jordan valley – GBY, ca. 0.8 Myr [11] and Ohalo, from the height of the Last Glacial, ca. 23 ka [15]. In both cases, the vegetation very closely resembles that of the present, indicating largely similar climatic conditions.

Some inter-group differences are apparently due to a deliberate choice rather than to environmental adaptations: the use of basalt, the preference for cleavers and the small-size industry. The use of basalt was confined to only two Lower Palaeolithic sites, Ubeidiya and GBY. Basalt was used regardless of its presence in the vicinity of the site. For example, basalt is abundant around the Acheulean sites of Baram, Yiron [23,28] and Berechat Ram [8]; yet in these sites basalt was entirely ignored and flint was the exclusive raw material utilized. The negligible role of basalt in the Lower Palaeolithic is further illustrated at the site of Maayan Baruch [33], where out of some 8000 bifaces, about 40 are made of basalt, the rest being of flint (A. Asaf, pers. commun., November 2004).

On the basis of the Jordanian evidence, the dominance of cleavers was explained on functional grounds, as part of some special-activity lake-shore sites [24]. This hypothesis is, however, not corroborated by the evidence at hand: a number of lake-shore Acheulean

sites in the Levant have no cleavers, for example Holon [5,36] or Berechat Ram [8]. Thus cleavers too, like the use of basalt, may have been a cultural trait characterising certain hominine groups.

The small artefacts of Ruhama, finally, seem to result from the decision to use a specific raw material, as argued above, hence it is a cultural trait. To what extent differences in material culture mirror other aspects of the extinct cultures is unknown.

Ubeidiya is the possible ancestor of the widespread Acheulean cultures that dominate the Lower Palaeolithic of southwestern Asia [1]. In the late and final phases of the Acheulean, the Levallois technique is both typical and frequent. These phases were perhaps ancestral to the Levallois–Mousterian of the Levantine Middle Palaeolithic. Throughout the Acheulean tradition (1.4–0.2 Myr), the handaxes portray a regular development by their formal and morphometric attributes [32].

6. Conclusion

The dispersion out of Africa had started, as seen in Yiron, earlier than hitherto assumed. It seems, in fact, that hardly had hominines master the skill of knapping hard rocks (Roche, this issue), they had started the march to the world.

Far from being deficient in cognitive abilities (cf. [35]), the hominines of the early dispersals were skilled in planning and precision knapping [29]. Furthermore, they have adhered to specific technological procedures over long periods, which probably required teaching.

The Lower Acheulean of Ubeidiya appears more open to trial and more innovative than the other occurrences discussed here. Ruhama and BGY, technologically rigid and conservative, have subsequently disappeared from the archaeological record of the Levant.

The recent discoveries in eastern Jordan bear upon the widely held notion of the 'Levantine Corridor' [24]. By 'corridor', a strip of land ca. 10–50-km wide is generally meant. The new discoveries enlarge the width of the corridor five fold, which questions the very validity of the term.

Acknowledgments

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Références

- [1] O. Bar-Yosef, Prehistory of the Levant, *Annu. Rev. Anthropol.* 9 (1980) 101–133.
- [2] O. Bar-Yosef, N. Goren-Inbar, *The Lithic Assemblages of Ubeidiya.*, Qedem 34, The Institute of Archaeology, The Hebrew University, Jerusalem, 1993.
- [3] R.S. Bradley, *Quaternary Paleoclimatology*, Allen and Unwin, Boston, MA, USA, 1999.
- [4] K. Brunnacker, W. Boenigk, G. Bruder, G.G. Hahn, A. Ronen, W. Tillmanns, *Artefakte im Altquartär von Obergaliläa (Nordisrael)*, *Eiszeitalter Gegenwart* 39 (1989) 109–120.
- [5] M. Chazan, Typological analysis of the Lower Paleolithic site of Holon, Israel, *J. Isr. Prehist. Soc.* 30 (2000) 7–32.
- [6] D. Gilead, Cleavers in the Early Palaeolithic industries in Israel, *Paleorient* 1 (1973) 73–86.
- [7] N. Goren, *The lithic assemblages of Ubeidiya, Jordan Valley*, PhD thesis, Hebrew University, Jerusalem, 1981.
- [8] N. Goren-Inbar, The lithic assemblages of Berechat Ram Acheulian site, Golan Heights, *Paleorient* 11 (1985) 7–28.
- [9] N. Goren-Inbar, I. Saragusti, An Acheulian biface assemblage from Gesher Benot Yaaqov, Israel: Indications of African affinities, *J. Field Archaeol.* 23 (1996) 15–30.
- [10] N. Goren-Inbar, C.S. Feibel, K.L. Verosub, Y. Melamed, M.E. Kislev, E. Tchernov, I. Saragusti, Pleistocene milestones on the Out-of-Africa Corridor at Gesher Benot Yaaqov, Israel, *Science* 289 (2000) 944–974.
- [11] N. Goren-Inbar, E. Werker, C.S. Feibel, *The Acheulian Site of Gesher Benot Yaaqov: The Wood Assemblage*, Oxbow Books, Oxford, UK, 2002.
- [12] C. Guérin, Première biozonation du Pléistocène européen, principal résultat bio-stratigraphique de l'étude des *Rhinocerotidae* (Mammalia, Perissodactyla) du Miocène terminal au Pléistocène supérieur d'Europe occidentale, *Geobios* 15 (1982) 593–598.
- [13] C. Guérin, V. Eisenmann, M. Faure, Les grands mammifères du gisement Pléistocène moyen de Latamne (vallée de l'Oronte, Syrie), in: P. Sanlaville, J. Besançon, L. Copeland, S. Muhesen (Eds.), *Le Paléolithique de la vallée moyenne de l'Oronte (Syrie)*, B.A.R. S587, Oxford, 1993, pp. 169–178.
- [14] A. Horowitz, *The Quaternary of Israel*, Academic Press, New York, 1979.
- [15] M.E. Kislev, O. Simchoni, Reconstructing the palaeoecology of Ohalo II, an Early Epipalaeolithic site in Israel, in: S.L.R. Mason, J.G. Hather (Eds.), *Hunter-gatherer archaeobotany: perspective from the Northern Temperate zone*, Archetype Publications, London, 2002, pp. 179–184.
- [16] Y. Kolodny, Lithostratigraphy of the Mishash Formation, Northern Negev, *Isr. J. Earth Sci.* 16 (1967) 57–73.
- [17] M. Lamdan, D. Ziffer, J. Huster, A. Ronen, *Prehistorical Archaeological Survey of Nahal Shiqma*, Regional Council Shaar Hanegev, 1977 (in Hebrew).
- [18] S.A. Laukhin, A. Ronen, G.A. Pospelova, Z.V. Sharonova, V.A. Ranov, J.-M. Burdukiewicz, V.A. Volgina, A. Tsatskin, New Data on the Geology and Geochronology of the Lower Palaeolithic Site Bizat Ruhama in the Southern Levant, *Paleorient* 27 (2001) 69–80.
- [19] M.D. Leakey, *Olduvai Gorge, excavations in Beds I and II, 1960–1963*, Cambridge University Press, 1971.
- [20] H. de Lumley, A. Fournier, J. Krazepkowska, A. Echassoux, L'industrie du Pléistocène inférieur de la grotte du Vallonet, Roquebrune-Cap-Martin, Alpes-Maritimes, *L'Anthropologie* 92 (1988) 501–614.
- [21] B. Madsen, N. Goren-Inbar, Acheulian giant core technology and beyond: an archaeological and experimental case study, *Eurasian Prehist.* 2 (2003) 3–52.
- [22] D. Mor, D. Levitte, G. Steinitz, B. Lang, The Volcanic History of Ramat Dalton (Upper Galilee) according to K–Ar–Dating. Israel Geological Society, Annual Meeting, 1987 pp. 93–94.
- [23] M. Ohel, The Acheulean of the Yiron Plateau, Israel, BAR S307, Oxford, UK, 1986.
- [24] L.A. Quintero, P.J. Wilke, G.O. Rollefson, The Eastern Levant, the Pleistocene and Paleoanthropology, *ACOR Newslett* 16 (2004) 1–3.
- [25] A. Ronen, The Paleolithic Archaeology and Chronology of Israel, in: F. Wendorf, A.E. Marks (Eds.), *Problems in Prehistory: North Africa and the Levant*, SMU Press, Dallas, 1975, pp. 229–248.
- [26] A. Ronen, Paleolithic Industries in Israel, in: A. Horowitz (Ed.), *The Quaternary of Israel*, Academic Press, New York, 1979, pp. 296–307.
- [27] A. Ronen, The Yiron Gravel Lithic Assemblage: Artifacts Older than 2.4 My in Israel, *Archäol. Korresp.* 21 (1992) 159–164.
- [28] A. Ronen, D. Gilead, P. Meller, G. Bruder, Notes on the Pleistocene Geology and Prehistory of the Central Dishon Valley, Upper Galilee, Israel, *Quartär* 25 (1974) 13–23.
- [29] A. Ronen, M. Inbar, M. Klein, K. Brunnacker, Artifact-bearing gravels beneath the Yiron basalt, *Isr. J. Earth Sci.* 29 (1980) 221–226.
- [30] A. Ronen, J.M. Burdukiewicz, S.A. Laukhin, Y. Winter, A. Tsatskin, T. Dayan, O.A. Kulikov, V.K. Vlasov, V.V. Semenov, The Lower Palaeolithic Site Bizat Ruhama in the Northern Negev, Israel, *Archaeol. Korresp.* 28 (1998) 163–173.
- [31] A. Ronen, B. Lang, M. Lechevallier, Gaining lithic expertise in the Epi-Palaeolithic, *Lithic Technol.* 28 (2003) 107–112.
- [32] I. Saragusti, Changes in the Morphology of Handaxes from Lower Paleolithic Assemblages in Israel, PhD thesis, The Hebrew University, Jerusalem, 2002.
- [33] M. Stekelis, D. Gilead, Maayan Baruch, Mitekufat Haeven 8, 1966 (in Hebrew).
- [34] E. Tchernov, C. Guérin, Conclusion sur la faune du gisement Pléistocène ancien d'Ubeidiyah (Israël) : implications paléocéologiques, biogéographiques et stratigraphiques, in: E. Tchernov (Ed.), *Les Mammifères du Pléistocène inférieur de la vallée du Jourdain à Ubeidiya*, Mém. Trav. n° 5, Centre de recherche français de Jérusalem, 1986.
- [35] N. Toth, The Oldowan reassessed: A close look at early stone artefacts, *J. Archaeol. Sci.* 12 (1985) 101–120.
- [36] T. Yizraeli, A Lower Palaeolithic site at Holon, *Isr. Explor. J.* 17 (1967) 144–152.
- [37] Y. Zaidner, A. Ronen, J.-M. Burdukiewicz, L'industrie microlithique du Paléolithique inférieur de Bizat Ruhama, Israël, *L'Anthropologie* 107 (2003) 203–222.