The Mesolithic Settlement of Sindh

A Preliminary Assessment

Paolo Biagi

2004

THE MESOLITHIC SETTLEMENT OF SINDH (PAKISTAN): A PRELIMINARY ASSESSMENT

Paolo BIAGI*

Abstract

The discovery of Mesolithic sites in Upper and Lower Sindh is of fundamental importance for the study of the Early Holocene communities that inhabited the territory around the beginning of the Holocene. Microlithic chipped stone assemblages have been discovered in two distinct regions: the Thar Desert of Upper Sindh, and along the coast of the Arabian Sea and on the terraces of the rivers that flow into it, around the Karachi Gulf (Lower Sindh).

The variable characteristics of the chipped stone assemblages seem to indicate different chronological periods of habitation and models of exploitation of the natural resources. Due to the rarity of organic material, only one Lower Sindh site has been so far radiocarbon-dated. The typological analysis of the assemblages, currently under way, will lead to a more detailed definition of the periods represented at the different sites. At present the only parallels can be extended to the microlithic sites of Rajastan and Gujarat, in India, a few of which consist of radiocarbon-dated, stratified settlements.

Preface

During the last thirty years, our knowledge of the Mesolithic of Sindh has greatly increased, thanks to the new discoveries made in the Thar Desert, along the southernmost fringes of the Rohri Hills in Upper Sindh (Biagi & Veesar 1998–1999), the re-analysis of the materials recovered by Todd and Paterson (1947) on the terraces of the Lyari River at Karachi, and the systematic study of the assemblages collected by A. Rauf Khan on the Mulri Hills (Karachi) and many other sites, mainly located along the banks of the streams that flow into the Arabian Sea in Lower Sindh (Khan 1979a) (Fig. 1).

The Mesolithic of the Indian Subcontinent is still an argument of debate by several authors. For instance G. L. Possehl (2003: 31) believes that "*confusion over the definition of Mesolithic – settlement and subsistence versus typology – has mudded much writing on Indian sites with microlithic technology*"[1]. In contrast, Misra (2002: 112) suggests that "*the Meso-*

* Dipartimento di Scienze dell'Antichità e del Vicino Oriente, Ca' Foscari University, Venice, Palazzo Bernardo, San Polo 1977, I-30125 Venezia. E-mail: pavelius@unive.it. This paper has been written with the support of a grant from the Italian Ministry of Foreign Affairs and the Ce.Ve.S.C.O.

[1] According to this author (Possehl 2003: 31) "*dwelling on tool typologies is not likely to be the most profitable way to understand these aspects of the human career*", because "*some authors simply imply, or even state, that if a tool assemblage contains microliths, it is thereby Mesolithic. This equation has little utility since it raises such questions as to what percentage of microliths present is necessary to classify a body of material as Mesolithic. Is the Mature Harappan village of Allahdino a Mesolithic site because it has a few microlithic tools?*". The few microlithic lunates from Allahdino (Hoffman & Cleland 1977: 75) come from the lowermost settlement phase and their morphology, size, thickness and retouch technology are very variable. Furthermore the term "microlith" is very generic, such as that of "geometric tool"; in effect they do not have to be necessarily related with the occurrence of Mesolithic or Early-Middle Holocene chipped stone assemblages. This is the reason why, contrary to what suggested by Possehl (2003: 31), a detailed typological list of the "microlithic" flint assemblages is absolutely necessary, in order to classify the different types, which effectively recur during each period. As far as I know, a detailed typological list of the geometric microliths of the Indian Subcontinent has never been compiled. This might be the reason why, for instance, the typical Chalcolithic Amri Culture (Casal 1964) elongated, scalene triangles, obtained from bladelets with a deep, abrupt retouch (Cleland 1987: 100), which in most cases have a worn or broken point, suggesting a bore function, are classified as microliths, while in effect they are not. Such tools are exclusively characteristic of

lithic or Middle Stone Age represents a transition, lasting only a few thousand years, between the Palaeolithic or Old Stone Age, spanning half-a-million years, and the Neolithic period", while Allchin *et al*. (1978: 99) consider that "[the] *Mesolithic is a more comprehensive cultural term, as it designates their position in the industries of hunting groups, or communities partly dependent upon hunting, in many cases overlapping in time with settled agricultural and urban communities*".

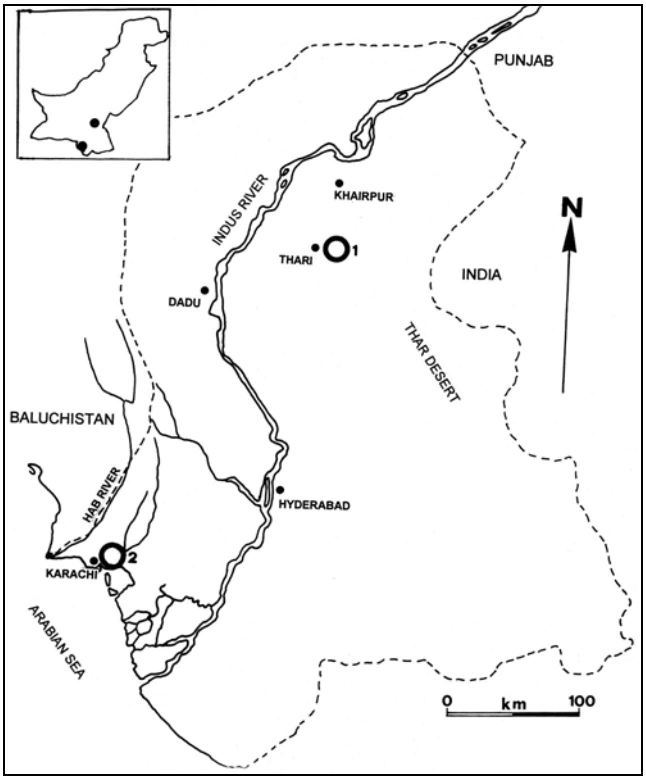

Fig. 1. Approximate location of the two main areas of Sindh, with evidence of Mesolithic settlement. 1: the Thar Desert east of Thari; 2: the area surrounding Karachi (drawing by the author).

Even though there is little doubt that the stratigraphic sequence of the first post-Pleistocene communities of the Indian Subcontinent can be traced within the deposits of a restricted number of sites which are distributed in various geomorphologic and climatic environments (see for instance Misra 1973, 1985; Sharma *et al*. 1980; Sali 1989), their absolute chronology is poorly known. The results obtained so far cover a period of a few millennia (Misra 2001: 500). This might be also due to the small number of radiocarbon dates, the high standard of deviation among the results, and the different materials and laboratories in which the samples have been processed (Agrawal 1985: 64; Chakrabarti 1999: 99). Nevertheless, the new assays from the site of Inamgoan near Pune would suggest that "*the beginning of the microlithic industries can therefore be assigned to c. 10,000 BC*", that is, to the Early Holocene (Misra 2002: 123).

characteristic of the Amri Culture (Possehl 1988: 170), whose radiocarbon dates fall between 4710±110 uncal BP (TF-864: Amri, Period IB) and 4485±110 BP (TF-863, Amri, Period IA) on charcoal, and 5240±40 uncal BP (GrN-27053) (Tharro Hills) on Oyster shells. According to OxCal v3.5 (Bronk Ramsey 1998), the calibrated dates of these samples, at 2 sigmas, are respectively 3750–3100, 3550–2850 and 3510–3300. This latter date has been calibrated using the Marine98 calibration curve (Stuiver *et al*. 1998), DeltaR 248±24 (von Rad *et al*. 1999). Furthermore it is difficult to understand why Possehl (2003: 29) considers the Amri-Nal phase contemporary with that of Kot-Diji. The radiocarbon dates of this latter are systematically more recent, the flint assemblages totally different, and in no case the occurrence of the above-mentioned triangular tools has ever been recorded.

The sites of Upper Sindh

Several surveys carried out between 1995 and 2002 east of the former caravan town of Thari in the Thar Desert led to the discovery of a number of archaeological sites of different ages, along the dunes that surround the salt-lake basins of this region (Figs. 2 and 3). A very similar environmental landscape is that of the adjacent western Rajastan (India), where many Mesolithic sites have been discovered and partly excavated (Misra 1977). The saline lakes are supposed to have formed inside depressions, which result "*from the blocking of drainage lines by aeolian deposition or by a decrease in discharge, which has disrupted the flow along a complete river system*" (Allchin *et al*. 1978: 11). The top of the dunes, which are presently covered with a sparse vegetation of shrubs and trees, often yielded microlithic flint assemblages, which are represented by different types of geometric tools (Mayank *et al*. 1999: 292; Misra 2002: 114). The presence of these artefacts would suggest that the Thar Desert dunes stabilized during the climatic amelioration of the beginning of the Holocene (Goudie 1973: 31; Ghosh 1977: 164; Hegde 1977: 173; Misra *et al*. 1980: 23), as the pollen data from the sediments of Lake Didwana indicate. It is now widely accepted that "*Mesolithic hunter-gatherers, with the newly-developed microlithic technology probably first appeared at this time*" (Misra & Rajaguru 1989: 317). The results of the most recent studies show that around the beginning of the Holocene the lakes were freshwater (Singh 1971: 183), very shallow, with a fluctuating water table, which abruptly began to rise during the Middle Holocene, just after the middle of the seventh millennium uncal BP[2] (Enzel *et al*. 1999; Tandon & Jain 2001).

The first Mesolithic site of Upper Sindh was discovered in 1995 (Biagi & Kazi 1995), and a couple more in the following years (Shar *et al*. 1996; Biagi & Shaikh 1998–1999). During the 2001 and 2002 surveys most of the sites were found along the dunes that surround the salt-lakes of Khāt Sim, Jamāl Shāh Sim, Ganero and Sāin Sim (Biagi & Veesar 1998–1999) (Fig. 4). Biagi (2006) described the discoveries made until 2001, while the archaeological sites recorded in 2002 are shown in Table 1. A few more sites were published later by Mallah *et al*. (2002).

All the Mesolithic assemblages of the Thari district are obtained from Rohri Hills flint, the nearest outcrops of which are located some 5 km east of Khāt Sim. The industries show some typological and dimensional differences, even in the types of the geometric tools (Fig. 5). Table 2 summarizes their main characteristics. The trapezoidal arrowheads, which are, in most cases, of an isosceles shape and variable dimensions, are particularly important (Fig. 6). These specific tools indicate that many of the sites were inhabited during the Late Mesolithic, most probably around the beginning of the Atlantic climatic period. Isosceles trapezes represent 60.0%, 71.4% and 80.0% of the tools, at GNR4, SS4 and SS6, respectively,[3] suggesting that these three sites were settled exclusively for hunting purposes. Although their chronology cannot be established with certainty because of the absence of datable organic material, the occurrence of hypermicrolithic triangles, protogeometrics, and backed blades and points as well as cores with microflakelet detachments should attribute them to an earlier stage in the development of the Mesolithic (or perhaps in some cases to the end of the Late Palaeolithic) (Biagi 2006). The occurrence of cores, crested blades and a few microburins indicate that these tools

[2] Two samples of freshwater molluscs collected from the ancient shorelines of Lunwāro Sim and Sāin Sim yielded two almost identical results. From the first site (27°02'00" Lat N - 68°48'00" Long E) a sample of *Parreysia trembolus* (Benson) produced a date of 2460±50 uncal BP (GrN-24967), while from the second (27°05'07" Lat N - 68°41'12" Long E), one specimen of *Bellamya bengalensis* (Lamark) yielded a result of 2400±50 uncal BP (GrA-23640). Although these dates cannot be calibrated with certainty, since the reservoir effect of this region is still unknown, the results are very interesting. They show that, during the Iron Age, the shorelines of these two basins were some 3 m higher than those of the present, during a period which has yielded no traces of habitation in the surveyed area.

[3] GNR4 (Ganero 4), SS4 (Sāin Sim 4) and SS6 (Sāin Sim 6).

were manufacture *in loco*. The flint seam of light yellowish brown colour (10YR 6/4)[4] employed for their manufacture is most probably to be sought along the southern fringes of the Rohri Hills.

Fig. 2. The salt-lake district of the Thar Desert in Upper Sindh, in the background, as it appears from an altitude of some 4000 metres. The westernmost limit of the sand dunes is clearly visible as well as a seasonal bed of the Indus (?) in the foreground (photograph by the author).

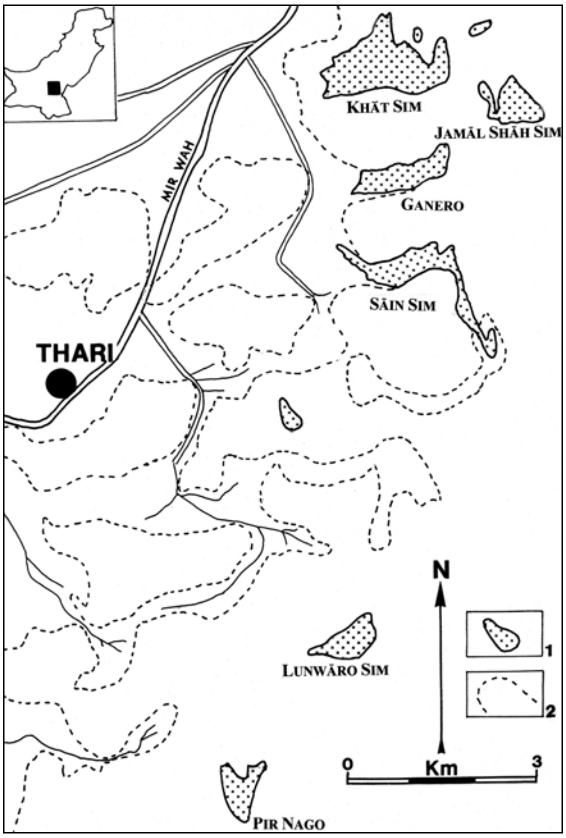

Fig. 3. The territory east of the town of Thari, with the indication of the saline basins around which the Mesolithic sites have been discovered. 1: salt-lakes; 2: westernmost extension of the Thar Desert sand dunes (drawing by the author).

[4] Colours of the Munsell Soil Color Charts 2000.

Fig. 4. The salt-lakes of Lunwāro Sim (top) and Khāt Sim (bottom) (photographs by the author).

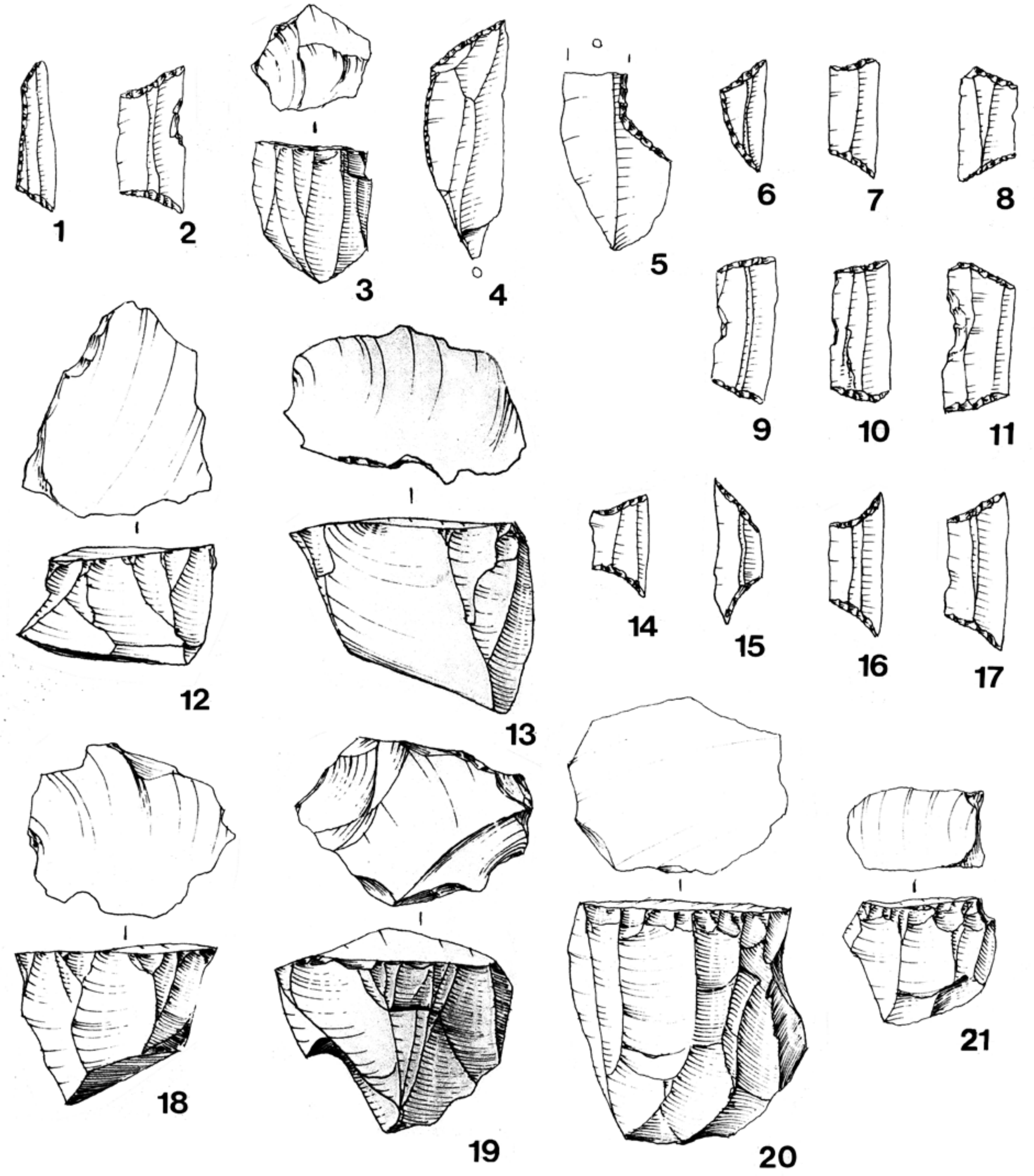

Fig. 5. Flint assemblages from the Mesolithic sites discovered during the January 2002 survey around the lakes of Khāt Sim (KS) and Sāin Sim (SS). 1: KS1, backed bladelet and truncation; 2: KS1bis, isosceles trapeze; 3: KS5, subconical core; 4: SS1, backed point and truncation; 5: notched bladelet; 19: SS3, subconical core; 6: SS4, triangle; 7–11: isosceles trapezes; 12, 13 and 18: subconical cores; 14–17: SS6, isosceles trapezes; 20: subconical core; 21: SS9, subconical core. M=1:1 (drawings by the author and G. Almerigogna).

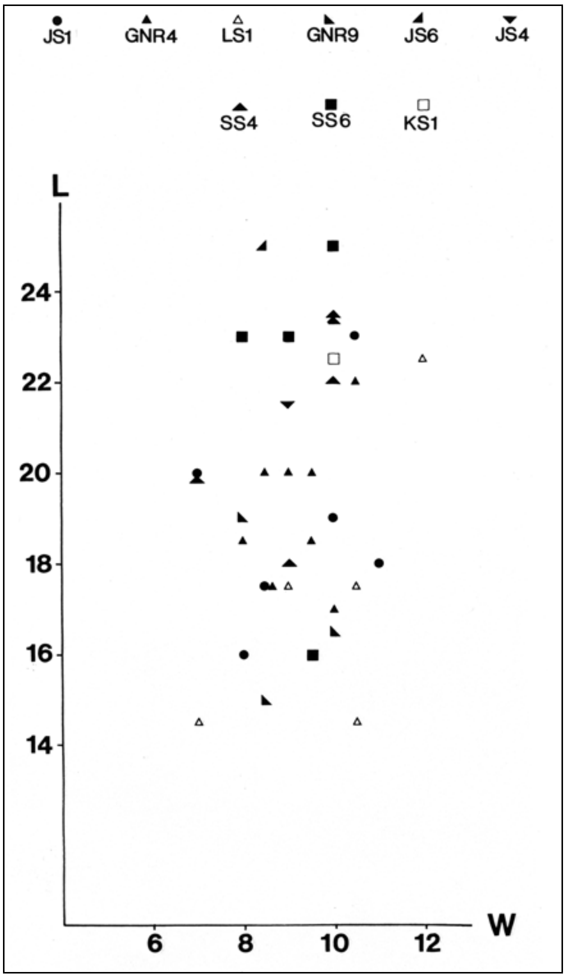

Fig. 6. Length-width scattergram of the trapezoidal geometrics from the Thar Desert Mesolithic sites of Upper Sindh. Scale in centimetres (drawing by the author).

Table 1. Location and cultural attribution of the sites of the Thari district discovered in 2002.

Site	Latitude N	Longitude E	Cultural attribution	Assemblages
KS1	27°06'35"	68°39'59"	Mesolithic ?, Kot Dijian	Pottery and flints
KS1bis 27°06'35"	27°06'35"	68°39'57"	Mesolithic	Trapeze
KS2	27°06'33"	68°40'16"	Kot Dijian	Pottery and flints
KS3	27°06'32"	68°40'30"	Uncertain	Atypical flints
KS4	27°06'59"	68°40'50"	Kot Dijian	Pottery and flints
KS5	27°07'25"	68°40'40"	Mesolithic ?	Microbladelet core
SS1	27°04'44"	68°40'42"	Mesolithic ?	Backed bladelet and Truncation
SS2	27°04'43"	68°40'43"	Uncertain	End scraper and Burin
SS3	27°04'56"	68°40'43"	Mesolithic	Hypermicrobladelet core
SS4	27°04'58"	68°40'47"	Mesolithic	Typical instruments
SS5	27°04'57"	68°40'55"	Buddhist	Pottery and flints
SS6	27°04'23"	68°40'57"	Mesolithic	Typical instruments
SS7	27°04'26"	68°40'20"	Buddhist	Pottery and flints
SS8	27°04'39"	68°40'36"	Kot Dijian ?	Retouched bladelet
SS9	27°04'40"	68°40'38"	Mesolithic	Typical core
SS10	27°05'10"	68°41'16"	Kot Dijian ?	Scatter of broken bladelets
SS11	27°04'40"	68°41'37"	Uncertain	Atypical flints

Table 2. Main characteristics of the flint assemblages of the Mesolithic sites of the Thari district discovered during the 2001–2002 surveys.

	JS1	JS2	JS3	JS4	GNR1	GNR2	GNR4	GNR7	GNR9	GNR10	KS1	KS1bis	KS5	SS1	SS4	SS6	SS9
Unretouched artefacts	1131	925	1112	681	51	244	537	613	913	105	75	0	0	0	109	38	226
(complete)	202	250	291	185	31	59	170	148	233	52	36	0	0	0	46	20	68
Cores	18	12	8	5	1	2	2	6	5	0	1	0	1	0	4	1	1
(fragments)	4	0	0	0	0	1	0	1	1	0	0	0	0	0	1	0	0
Crested blades/flakes	1	1	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0
Burins	0	4	1	2	1	0	0	0	1	0	0	0	0	0	0	0	0
Trapezes	6	0	0	1	0	0	9	0	3	0	0	1	0	0	5	4	0
(truncations)	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Triangles	2	1	0	1	0	1	2	0	0	2	0	0	0	0	1	0	0
Backed points	5	6	1	2	0	0	0	0	1	1	0	0	0	0	0	0	0
Backed points and Truncation	0	1	1	0	1	0	0	0	0	0	1	0	0	1	0	0	0
(fragments of backed tools)	7	8	3	5	0	0	0	1	6	0	0	0	0	0	0	0	0
Microburins	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Retouched bladelets	3	3	0	1	0	3fr	1fr	1fr	6fr	0	1	0	0	0	1	0	0
Straight points	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Side scrapers	0	2fr	0	0	0	0	0	0	8 (7fr)	1	0	0	0	0	0	1	0
Abrupt retouched flakes	1	1	0	1	0	0	3	0	2	0	0	0	0	0	0	0	0

The sites of Lower Sindh

The discovery of microlithic tools in Lower Sindh was reported for the first time by Todd and Paterson (1947), who collected a few flint artefacts from the banks of the Lyari River, some 8 miles northeast of Karachi, during the forties (Allchin 1979: 198, 1985: 132; Biagi 2004a). Apart from this assemblage which includes a few geometric tools, the most important discoveries were made by Prof. A. Rauf Khan (1979a) on the Mulri Hills (Fig. 7), just south of the Karachi University Campus. These hills, which cover an area of some 7 square miles, are now highly urbanized. This is why all the prehistoric sites discovered between the end of the sixties and the beginning of the seventies have been totally destroyed.

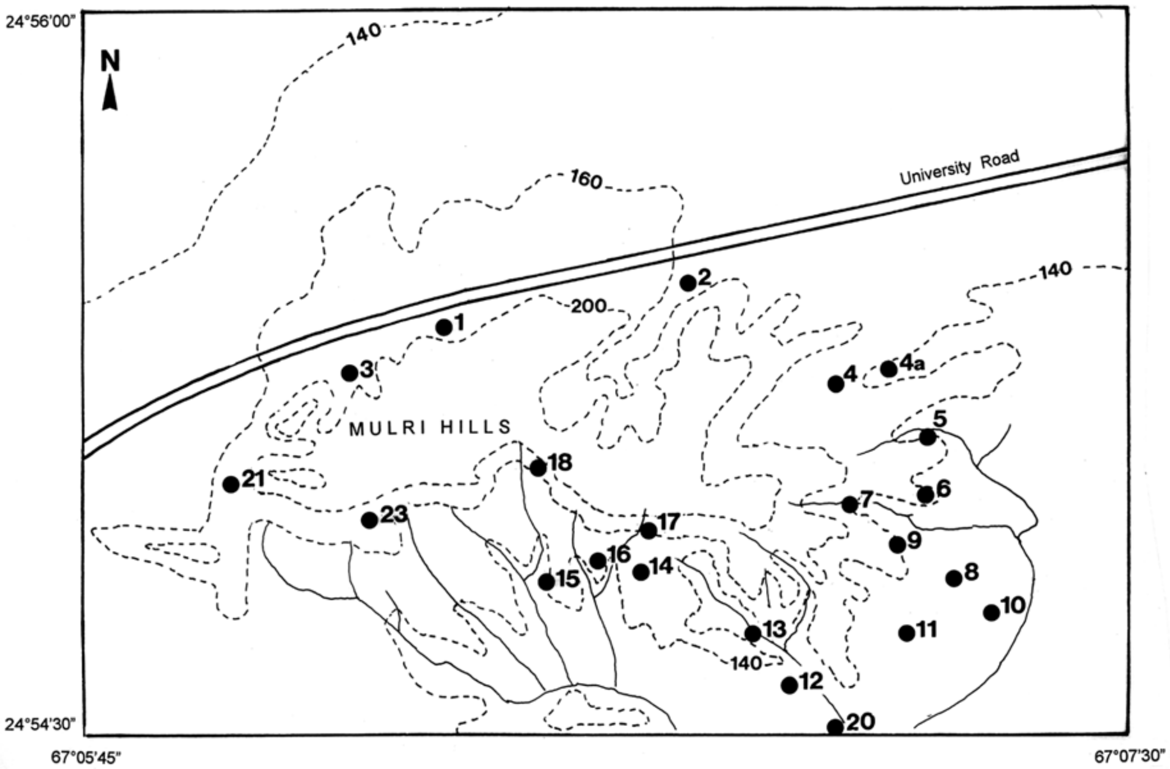

Fig. 7. Distribution map of the archaeological sites discovered on the Mulri Hills (Karachi). Altitudes in feet (drawing by the author).

The Mulri Hills are composed of variegated beds partly developed on the sedimentary bedrocks of the Miocene upper Gaj formation. They consist "*of alternate thin laminae of siltstone layers of medium to fine grained, friable, yellowish sandstone and shale of olive green colour with stringers of ferrogineous material of yellowish brown colour. These variegated beds are alternated with limestone beds of brown colour, thin to medium bedded, which contain irregular, creamy white nodules"* (Zaidi *et al*. 1999: 39). Their flat, weathered surface, some 220–230 feet above sea level, was originally covered with a clayey deposit of "red soil". It was later eroded away and it is now preserved only in a few pockets along the fringes of the hills. Their edges are covered with deposits of aeolian sand up to a thickness of some 8 feet. The hills are crossed by two main series of faults, which run in an east–west and northwest–southeast direction, along which a few springs open. They are probably one of the main reasons for the prehistoric settlement of the area. According to the field notes of Prof. Rauf Khan (pers. comm. 2002), most of the sites were located along the faults, often close to freshwater springs.

All the prehistoric sites of the Mulri Hills are distributed along the slopes of the hills. They seem to indicate different periods of occupation. Most of them are to be attributed to the end of the Palaeolithic and the Mesolithic. In contrast, site Mulri Hills 3 (MH3) yielded three patinated *Levallois* flakes, which should belong to the Early-Middle Palaeolithic. Although the detailed typological analysis of the

Mulri Hills industries is still under way, a few preliminary observations can be made:

1) All the assemblages were obtained almost exclusively from small flint pebbles of various colours, whose outcrops are still unknown. A. Rauf Khan (1979a: 12) suggests that they might have been collected from Eocene rocks "*somewhere in Sind Kohistan*". A very small percentage of the artefacts was chipped from liver-coloured Gadani jasper.
2) The cores can be subdivided into different classes, from circular, centripetal microflakelet detachments to subconical and cylindrical microbladelet detachments (Fig. 8). These classes might help reconstruct the chronological and cultural identity of the different sites.
3) The typological composition of the assemblages varies: the most diagnostic tools are the geometrics, which are represented by lunates, triangles and trapezes; these latter are often obtained with the microburin technique. All the geometric tools can be subdivided into different sub-classes, which do not necessarily recur together at all of the sites. A unique class of isosceles trapezes obtained with an abrupt, steep, bipolar retouch has been produced from blades with triangular, or more often trapezoidal cross-section. The variability of the shapes, type of retouch and elongation index of the geometric tools is noticeable.
4) A number of tools, often obtained from bladelets, can be classified as protogeometrics. They are abrupt retouched bladelets or points with an adjacent truncation sometimes obtained with the microburin technique.
5) Of great importance is the occurrence of typologically distinctive (thick) curved, backed points retouched from bladelets or bladelet-like flakelets. They are obtained with an abrupt, steep retouch, sometimes bipolar, alternate, or mixed. These tools might belong to the end of the Late Palaeolithic period.
6) The occurrence of a great number of denticulated and notched bladelets or bladelet-like flakelets is known exclusively from site MH12 (Fig. 9) (Khan 1979b: 64). It is important to point out that this is the only site which yielded a great variety of trapezoidal geometrics and the highest number of microburins (Fig. 10).

According to a few field observations written by A. Rauf Khan[5], the sites with microlithic geometrics often characterized by the presence of lunates lay above the sand layer that covered the slopes of the hills; in contrast, part of site MH12, which yielded a great quantity of curved backed points, was not buried by the sand and lay on the surface of the weathered limestone bedrock[6] (Fig. 11).

At present, Mulri Hills 18 (MH18) is the only radiocarbon-dated site of the hills. It was located along the southern upper ridge, close to the top of the mesa. The MH18 assemblage is composed of 172 artefacts among which are 16 cores (5 subconical, 4 prismatic, 6 polyhedric and 1 turtle-shaped), 20 instruments (6 curved backed points, 2 wide lunates, 3 trapezes, 1 backed bladelet and truncation, 2 probable straight awls and 6 retouched bladelets), 46 complete, unretouched artefacts and 90 fragments (Fig. 12). One single piece of *Terebralia palustris* mangrove shell has been dated to 5790±70 uncal BP (GrA-23639), which corresponds to 4160–3790 cal BC (95%)[7].

---

[5] "*Spring issues at this point: the site is a projection immediately south of this spring. This is the only site of older nature than the sites of lunates above the accumulated sands. The site was already…*(phrase illegible) *…that it could not be buried completely by the sand…..It shows long occupation. There are some stone slates lying on…..In this area limestone is completely eroded under the sand. There is a thin layer of cemented wind blown sand with a very rough surface. Under this stratum follow stones made of sandstone….".* These notes have been transcribed from the original text written on one of the paper bags containing prehistoric material collected from site MH12.

[6] A. Rauf Khan (1979a: 11) never mentions the Mulri Hills in his paper. He only generically refers to "*one area of concentration around the University Campus*".

[7] The calibration of this date has been obtained following the method already described in footnote 1.

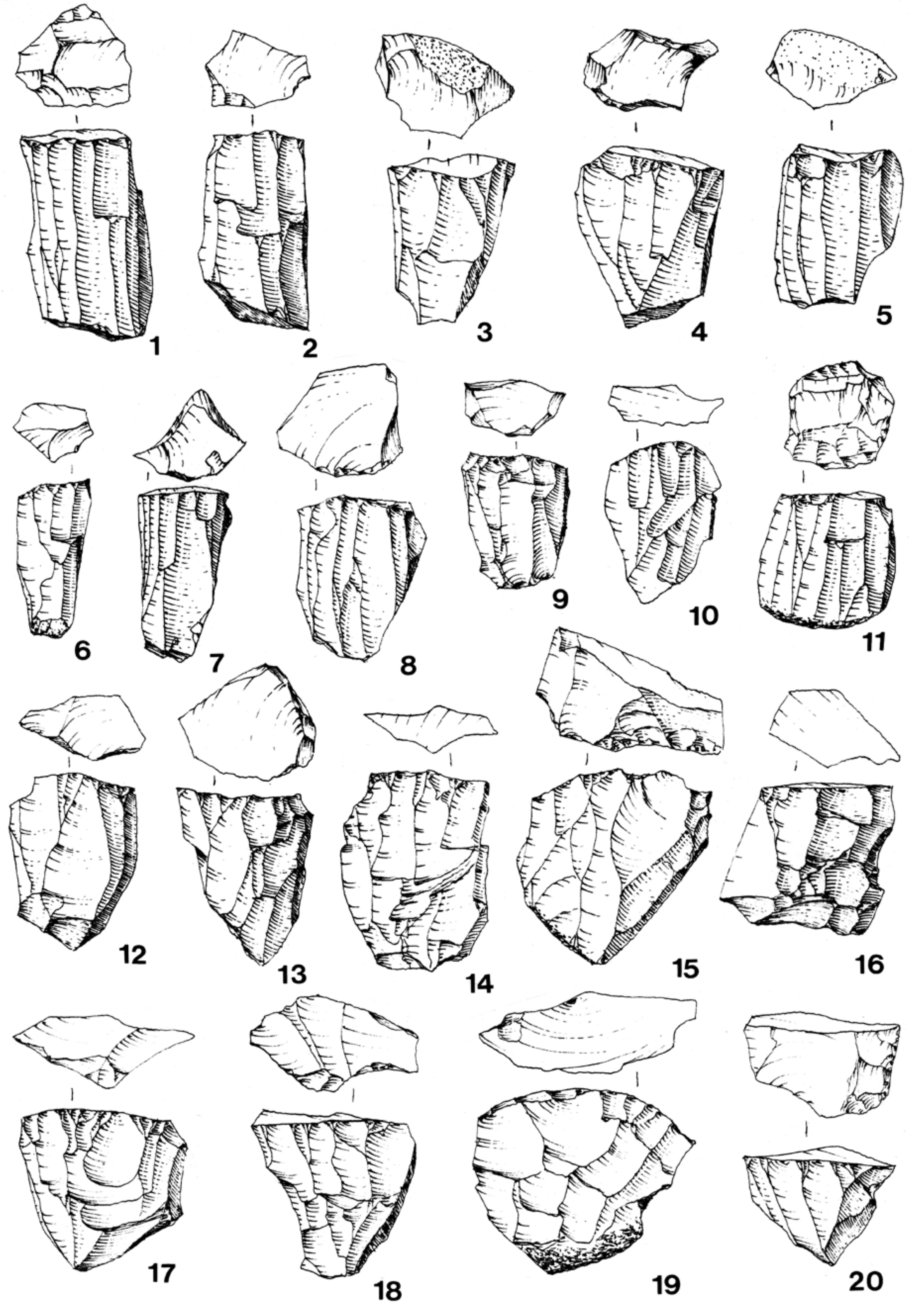

Fig. 8. MH12. 1–20: different types of cores. M=1:1 (drawings by the author and G. Almerigogna).

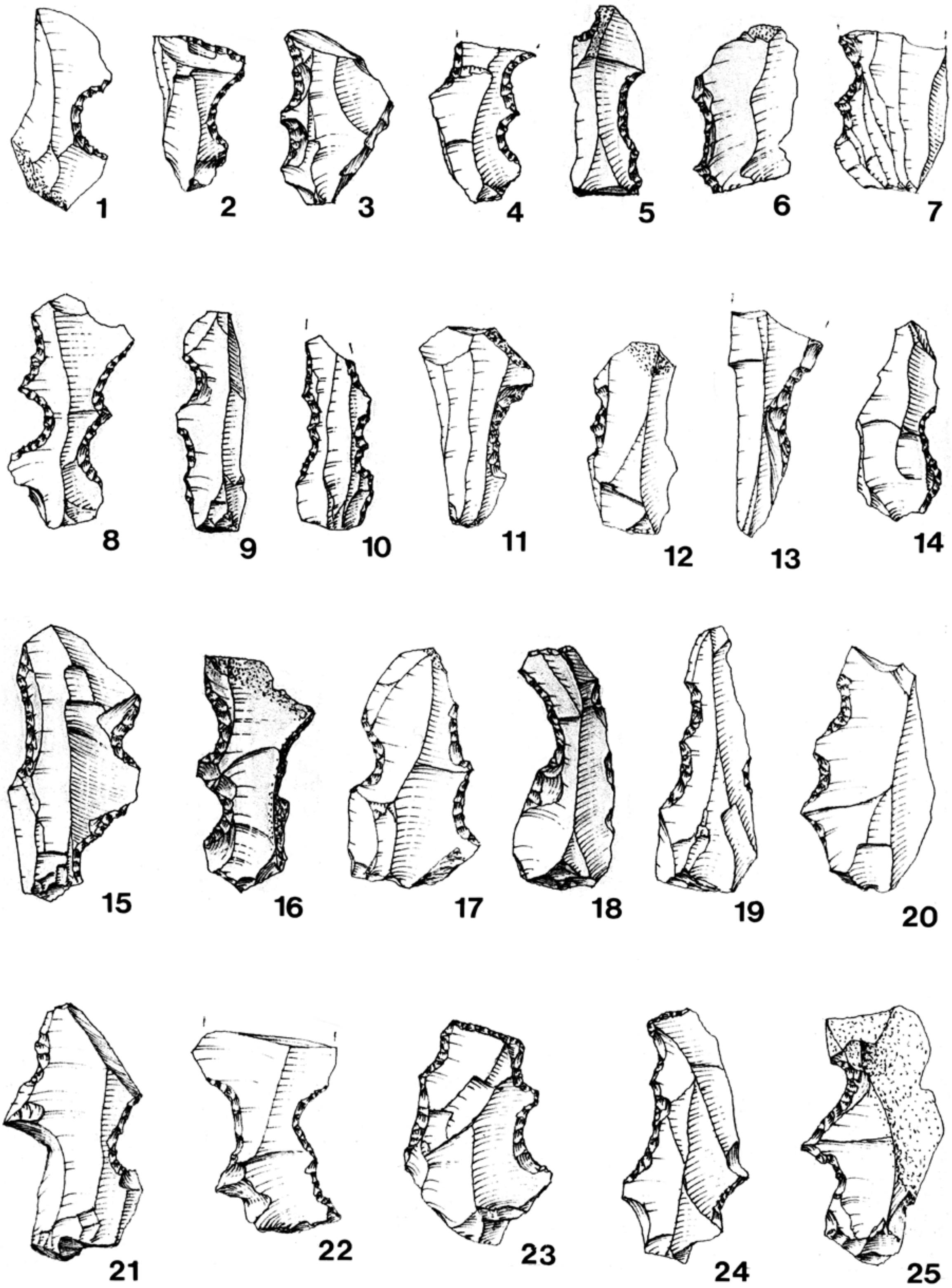

Fig. 9. MH12. 1–25: denticulated and notched bladelets. M=1:1 (drawings by the author and G. Almerigogna).

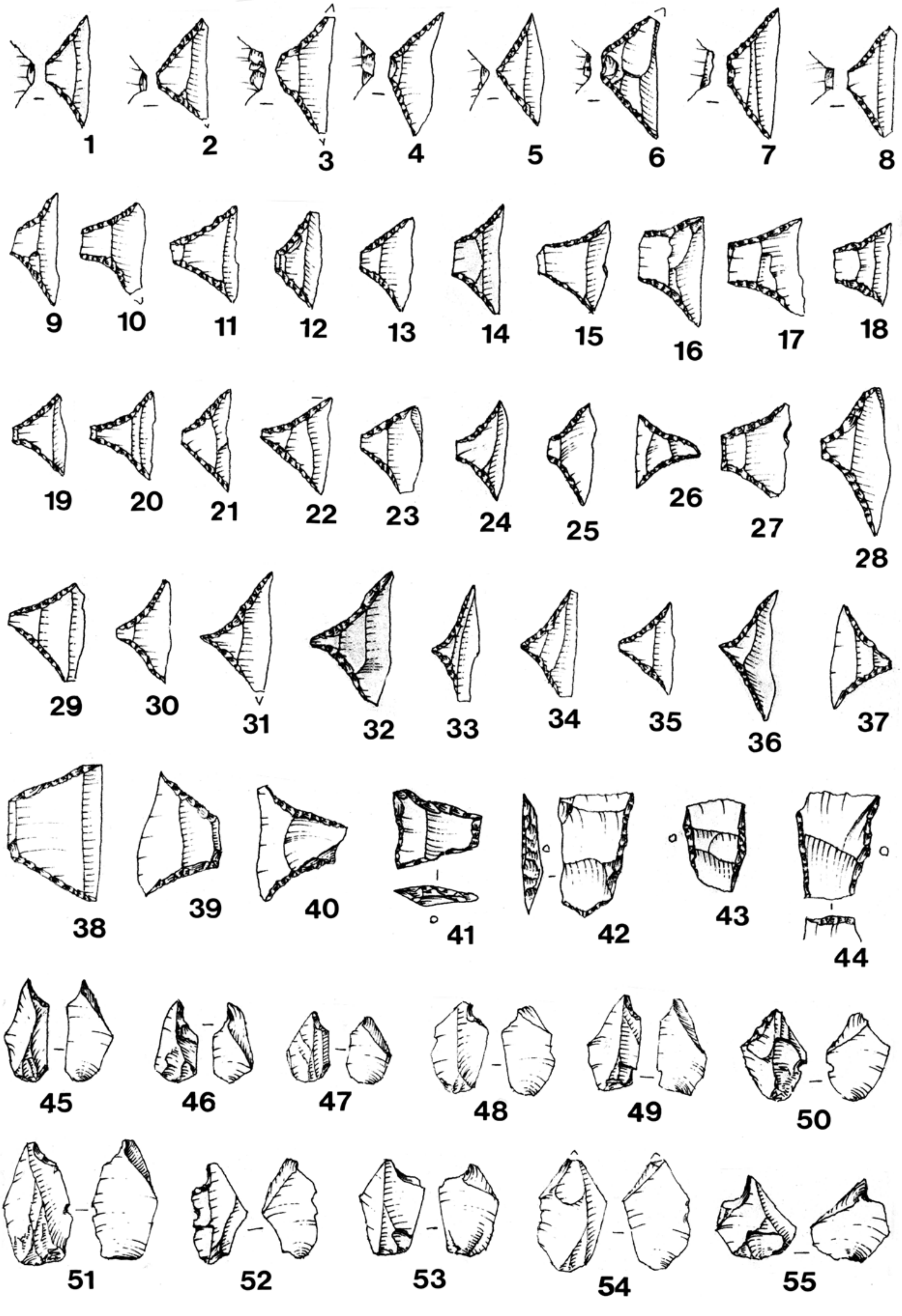

Fig. 10. MH12. 1–44: different types of trapezoidal geometrics; 45–55: proximal microburins. M=1:1 (drawings by the author and G. Almerigogna).

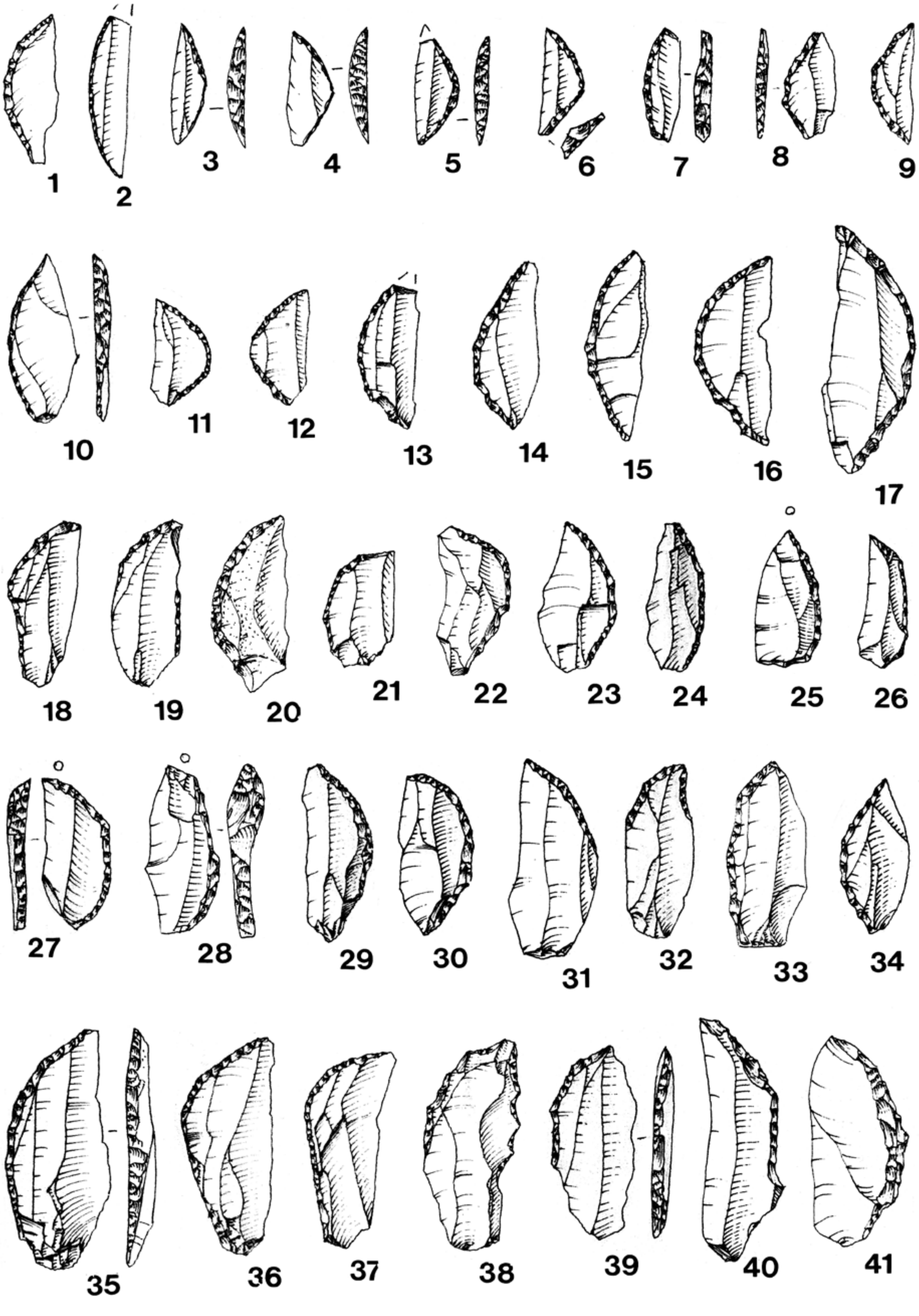

Fig. 11. MH12. 1–17: different types of lunates; 18–41: curved backed points. M=1:1 (drawings by the author and G. Almerigogna).

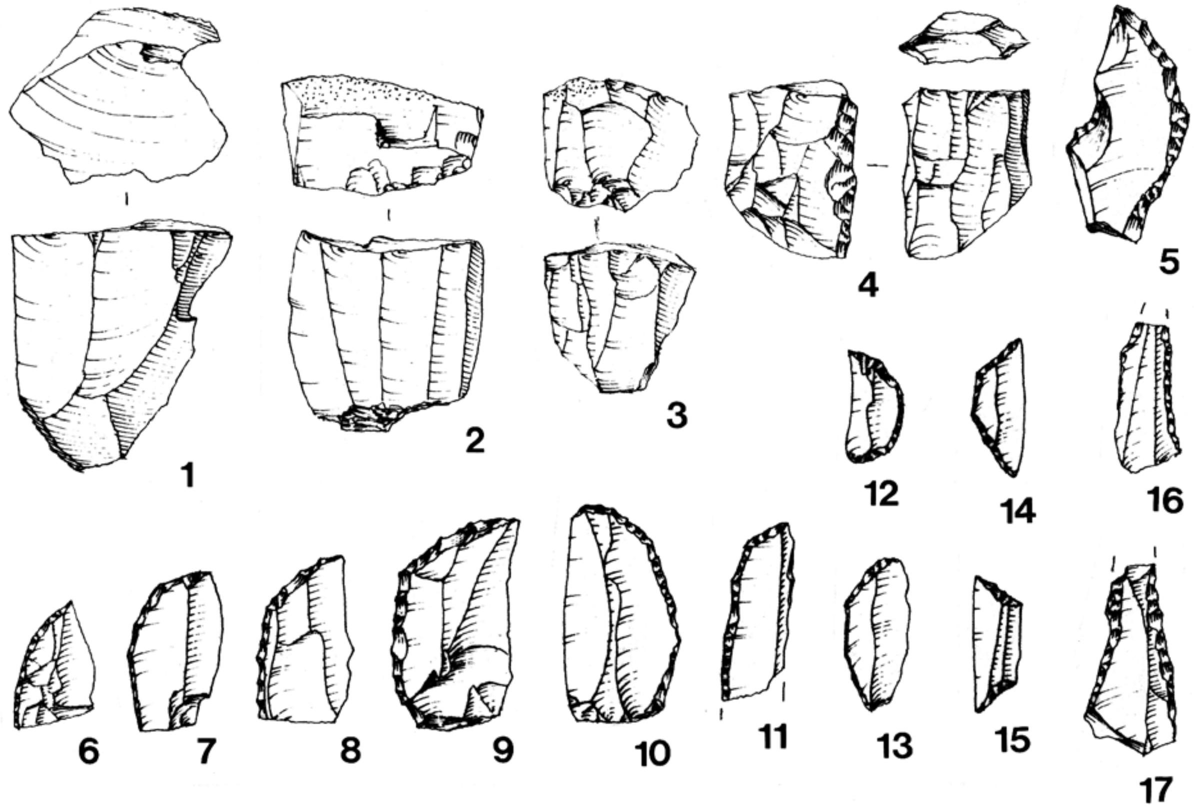

Fig. 12. MH18: chipped stone assemblage. 1–4: cores; 5–10: curved backed points; 11: backed bladelet and truncation; 12–13: lunates; 14–15: trapezes; 16–17: perforators (?) (drawings by the author and G. Almerigogna).

Other important discoveries were made a few kilometres northeast of Karachi, along the banks of the streams that flow into the Malir River, more precisely, from west to east, the courses of the Khonkar, Thaddo, Langheji, Mol and Khadeji. Unfortunately, the exact location of most of the sites found during the surveys carried out by A. Rauf Khan is unknown. More sites were found further to the south, at Rehri for instance (Fig. 13), along the terrace which lies in front of the mangrove swamp of Kadiro Creek. Other finds come from the right bank of Ran Pethani, which flows straight into the Arabian Sea a few kilometres east of Rehri.

A few more scatters of flints were recovered west of Karachi, close to the village of Mendiari, west of the Sona Pass, which crosses the southernmost fringes of the Khirthar Range. They come from the terraces of the Hab River, which *"after forming the western boundary of southern Sind, falls into the sea west of Cape Monze*" (Blandford 1880: 29). A. Rauf Khan (1979a: 11) observed that the sandstone outcrop just right of Cape Monze "*is a good quality aquifer and dozens of springs are located even now within this belt, and support many of the existing settlements. There are indications of many more springs within it which have now ceased to flow or have turned brackish or salt"*.

According to this author, most of the Mesolithic sites of this area are characterized by microlithic lunates, although many isosceles trapezoidal arrowheads are common to some of them, while others, which are supposed to belong to the end of the Late Palaeolithic, are represented by curved backed points obtained with an abrupt, deep, bipolar retouch (Fig. 14).

Discussion

The discovery of Late Palaeolithic and Mesolithic sites in Sindh is of major importance for the archaeology of the country, whose prehistory was based almost exclusively on the Chalcolithic and Bronze Age settlements of the Pre-Indus and Indus Civilisation until very recently (see for instance Possehl 2002). Although most of Sindh has been poorly investigated, there are a few territories, such as the Thar Desert dunes that surround the Rohri Hills near Thari, and the banks of the rivers that flow into the ocean near Karachi, which are very rich in sites of these two periods.

The detailed chronology of the Late Pleistocene and Early Holocene industries is difficult to assess because of the absence of datable organic materials; nevertheless a few observations can be made on the assemblages that characterize the two different regions. All the sites of Upper Sindh have been discovered in a very limited territory rich in salt-lakes. They are located very close to the flint outcrops of the Rohri Hills. All the sites which are characterized by scatters of flint artefacts lie on the top of stabilized dunes that surround the lakes. Many of these sites yielded a few geometric tools, which, in most cases, are represented by isosceles trapezes, with oblique, straight truncations, obtained from bladelets: Their dimension varies site by site (Fig. 6). The occurrence of these tools suggests that the encampments were temporarily settled during an advanced period of the Mesolithic, most probably for hunting purposes. The presence of cores, debitage flakes and waste pieces indicate that the tools were manufactured locally. The absence of ceramic potsherds and polished stone tools would exclude their attribution to the beginning of the Neolithic. Other sites, such as those of Jamāl Shāh Sim (JS2, JS3 and JS4) might be slightly older, because of the absence of trapezes and the abundance of abrupt retouched pieces, among which are points, bladelets, protogeometrics and triangular geometrics (Biagi & Veesar 1998–1999: 117). Of particular importance is site JS2, which yielded a few curved, backed points, which strongly recall similar instruments from the Mulri Hills and Khadeji Gorge in Lower Sindh.

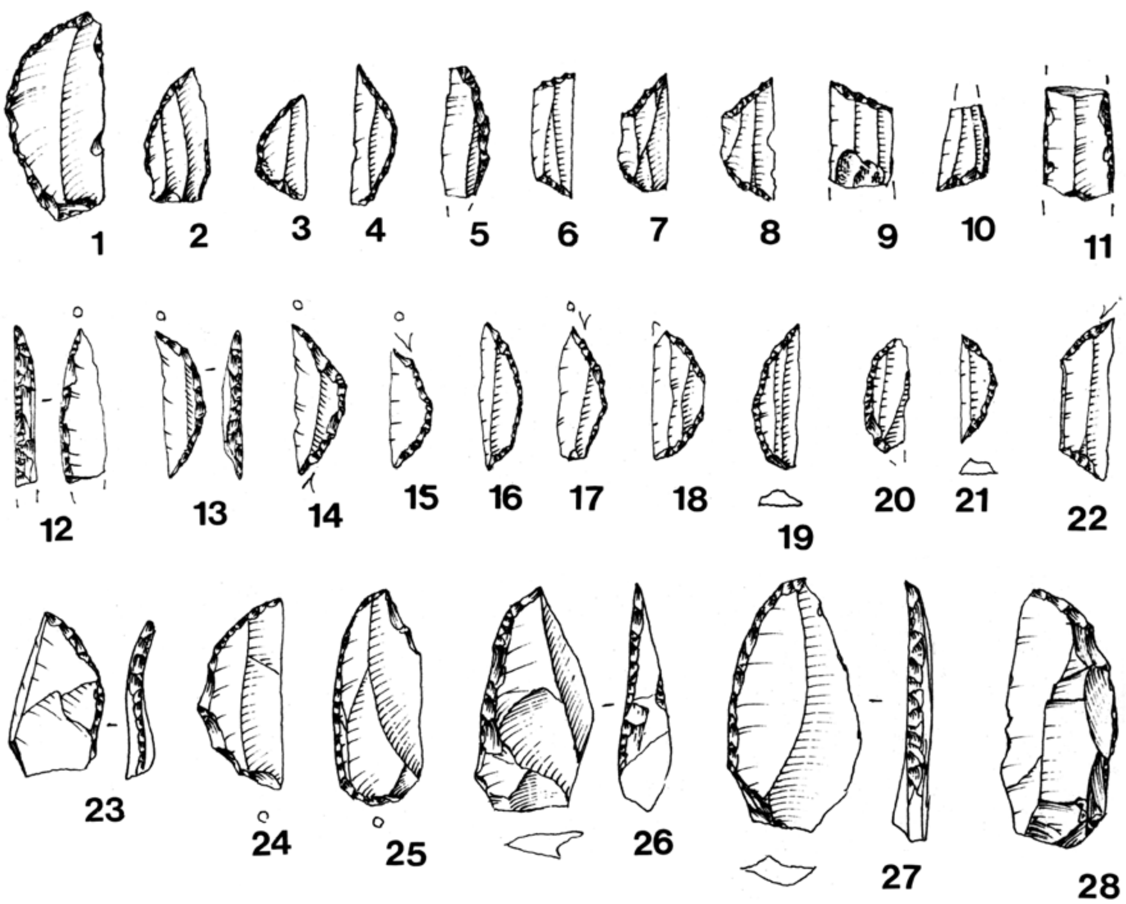

Fig. 13. Chipped stone assemblages from Rehri 1. 1–2: curved backed points; 3–5: lunates; 6–8: trapezes; 9: truncation; 10: backed bladelet and truncation; 11: retouched bladelet. Rehri 3. 12: backed point; 13–21: lunates; 22: trapeze. Rehri 4a. 23–28: curved backed points. M=1:1 (drawings by the author and G. Almerigogna).

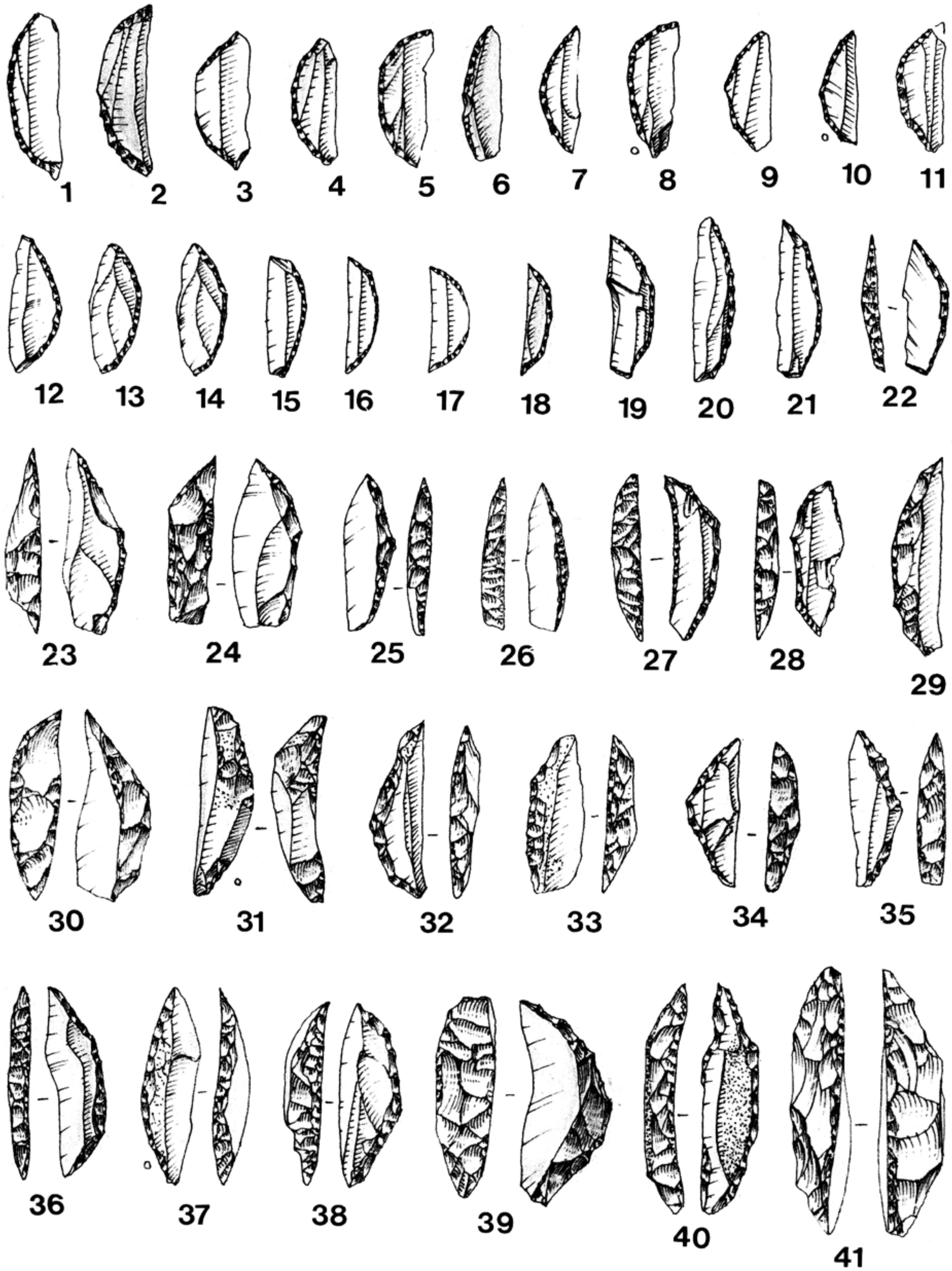

Fig. 14. MH14. 1–22: different types of lunates; 23–41: curved backed points. M=1:1 (drawings by the author and G. Almerigogna).

At present the mobility patterns of the last hunter-gatherers can be established only on the basis of the circulation of the flint materials employed for the manufacture of the tools. Their estimated radius is much shorter than that proposed for the same populations of Rajastan (Khanna 1993), most probably because the investigated area is too small.

The picture is even more complicated when we take into consideration the sites of Lower Sindh. Although the typology of these assemblages has not been studied in detail, the Mulri Hills flint industries seem to represent different periods of occupation, which most probably cover a long period of time, between the end of the Palaeolithic and the end of the Mesolithic. The most diagnostic instruments are curved backed points,[8] geometric tools (different types of lunates, triangles and trapezes), denticulated bladelets and a few classes of cores. Their presence/absence or percentage varies site by site, suggesting that they are not all contemporaneous. Also the typological variability of the trapezoidal geometrics might be chronologically representative. It is important to point out that MH12 yielded a great number of these latter tools, while they are rarer at other sites, where the geometrics are represented mainly by different types of microlithic lunates. Their dimension varies at MH12, while the few specimens from the other Mulri Hills sites fall into well-defined clusters. The dimensional differences between the Mulri Hills trapezes and those of the Thari sites are evident from Figs. 15 & 16. Also, other types of isosceles trapezes (transversal arrowheads?) obtained from long blades (Fig. 17) might be of great importance for the chronological assessment of the Mulri Hills and other assemblages of the Karachi region.

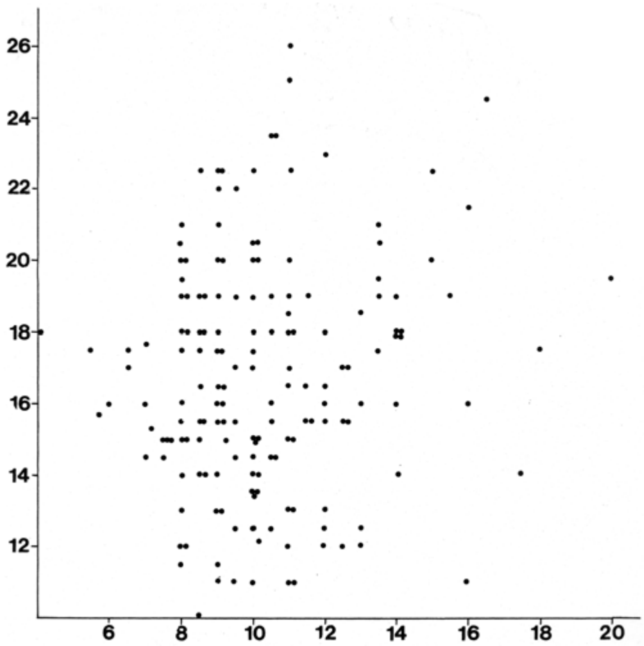

Fig. 15. Length-width scattergram of the trapezoidal geometrics from site Mulri Hills 12 (MH12) in Lower Sindh. Scale in centimetres (drawing by the author).

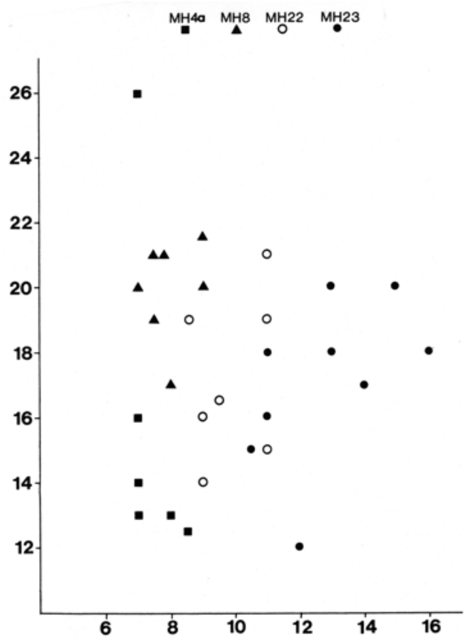

Fig. 16. Length-width scattergram of the trapezoidal geometrics from other Mulri Hills sites (MH4a, MH8, MH22 and MH23) in Lower Sindh. Scale in centimetres (drawing by the author).

[8] Regarding these tools, A. Rauf Khan (1979a: 13) wrote that "*the most characteristic tool of the Upper Palaeolithic is a knife like tool, with strongly curved and steeply blunted back and very sharp and more or less straight cutting edge. It is a beautiful tool derived from the Chatelperronian tradition. It is a little less than two inches long. …… Best specimen of this tool were collected from Khadeji gorge. They are present at many other sites also*".

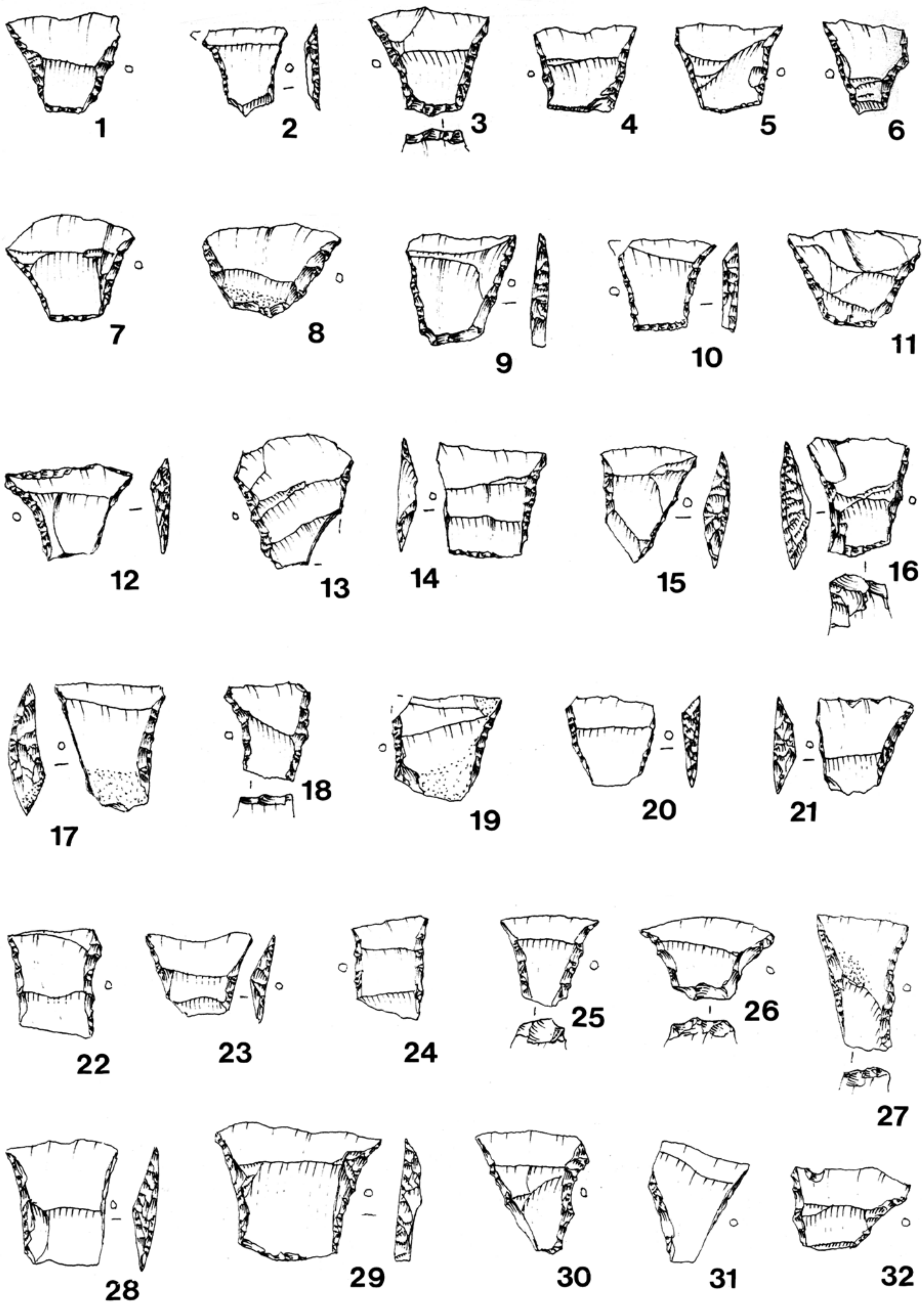

Fig. 17. Trapezes (transversal arrowheads) from Khadeji Gorge left bank (1–21) and Buda Ran Pethani 8 (22–32). M=1:1 (drawings by the author and G. Almerigogna).

Conclusion

The discovery of flint assemblages attributable to the end of the Palaeolithic and Mesolithic in Sindh fills a gap in our knowledge of these two periods in this part of the Indian Subcontinent. Although there is no doubt that the Thar Desert sites of Upper Sindh can be closely linked with those of Rajastan, the assemblages of Lower Sindh represent a new and more problematic discovery.

Didwana (Singh *et al*. 1972), Bagor (Misra 1982; Inizan & Lechevallier 1995) and Budha Pushkar (Allchin & Goudie 1974) are amongst the most important Mesolithic sites of the Great Indian Desert. They all show similarities with those of Upper Sindh especially for their geographic and geomorphologic location. The distribution of Mesolithic sites on the top of stabilized dunes seems to be linked with a moist phase during which the lakes were freshwater basins (Goudie *et al*. 1973; Wasson *et al.* 2002). If this view is correct, most of the flint assemblages of the Thar Desert recovered during the 1995–2002 surveys, characterized by trapezoidal geometrics, are to be referred to this climatic period.

The assemblages of Lower Sindh are more problematic; they still need to be studied in detail, in order to establish their chrono-typological sequence. The only radiocarbon date so far available has been obtained from a *Terebralia palustris* mangrove shell fragment collected from the surface of MH18. Although this date might not correspond to that of the flint assemblage, other Mesolithic sites of India, such as those of Adamgarh and Bhimbetka (Possehl 1994) yielded similar results. In any case this date indicates that a mangrove environment was already established along the Karachi Gulf around the beginning of the fourth millennium cal BC. A slightly earlier date comes from a *Terebralia palustris* shell-midden discovered on the southern shoreline of the small bay of Daun (Daun 1) (Fig. 18), along the Las Bela coast of Balochistan, a few kilometres south of the Gadani headland (Snead 1969). This date (6380±40 uncal BP: GrN-26368) (Biagi 2004b: 16) can be related to the beginning of the exploitation of the mangrove swamp resources of the northern coast of the Arabian Sea. Just after 7000 uncal BP, when the sea level was a few metres higher (Gupta 1972; Hashimi *et al*. 2002: 300), the environment of some coastal strips was significantly different from that of the present. It is during this period that the first shell-middens began to be settled. It is surprising that the whole Makran coast of Balochistan, which has been recently surveyed intensively, did not yield any trace of either Mesolithic or shell-midden sites (Besenval & Sanlaville 1990; Dales & Lipo 1992; Besenval 1997).

The occurrence of Mesolithic settlements in Gujarat is of particular importance, because of their vicinity to the Karachi Gulf. Although the environmental history of the Early Holocene of this region is poorly known, the pollen analyses show that during the Early Holocene "*(prior to 7000 BP) vegetation in this area begins with open, almost treeless stretches of grassland with chenopods.* Holoptelea, *one of serial elements, invaded the grassland about 7000 years ago and constituted the riverine forest which declined about 5000 years ago*" (Sharma & Chauhan 1991: 69). The Mesolithic assemblages come from the surface and the uppermost deposits of the dunes, sometimes buried in 40–150 centimetres of sand (Misra & Pandya 1989). This suggests that "*Mesolithic man lived in Gujarat at a time when the dunes were in active formation*" (Sonawane 1984: 26). Other sites are known from quite different landscapes, along or close to river courses that flow into the Gulf of Cambay. Sometimes they are well stratified below Bronze Age layers, as in the case for Oriyo Timbo (Rissman & Chitalwala 1990).

To sum up: some of the Indian stratigraphic sequences are of basic importance for a preliminary assessment of the chrono-typology of the Mesolithic of the Indian Subcontinent. Among these are the following:

1) the sand dune of Patne in Maharastra (Sali 1989), where the Early Holocene series of period III has been subdivided into three different stages of development, the first two of which (IIIA and IIIB) belong to the Early Mesolithic, and the third (IIIC) to the Late Mesolithic;

Fig. 18. The shell-midden of Daun 1 along the Las Bela coast of Balochistan, from the east (top) and a particular of the surface of the same site with Terebralia palustris *mangrove shells, two small stone querns and a hammerstone (bottom) (photographs by the author).*

2) Bagor, a sand dune in the Mewar Plain, whose assemblages vary from period I (lower) to period III (upper), with. "a decrease in the number of scalene bladelets and especially of long scalene triangles with a short small side is obvious in Period III, while the number of rectilinear backed bladelets is proportionally more stable" (Inizan & Lechevallier 1995: 19);

3) Chopani-Mando in the Belan Valley, where the microlithic assemblages have been subdivided into three main stages of development, from the Early Mesolithic up to the beginning of the Neolithic; this latter period is characterized by the appearance of trapezoidal geometrics (Sharma *et al*. 1980).

Although these series are sometimes problematic, because of the absence or unreliability of the radiocarbon results, nevertheless they indicate that the Mesolithic chipped stone assemblages of the Indian Subcontinent vary according to their chrono-typological characteristics.

The data currently available do not seem to support Possehl's (2002: 73) idea of a "*symbiosis between hunter-gatherers and settled folk in the subcontinent*", which led to an interaction between the hunter-gatherers and the agriculturalists in the region. This view, largely based on the stratigraphy and radiocarbon chronology of Bagor (Misra 1973), Langhnaj and other Gujarati sites (Bhan 1994) is not accepted by the present author for the following reasons:

1) the results of the recent surveys in the Thar Desert of Upper Sindh led to the discovery of many sites of different ages, such as Mesolithic, Kot Dijian, Indus Valley, Buddhist and Islamic. The flint industries, which characterize the technocomplexes of the first three periods, are clearly different, as in the case of the Mesolithic, from the Kot Dijian and the Indus Valley assemblages (Biagi & Veesar 1998–1999);
2) the typological study of the Chalcolithic chipped stone industries from Amri (Casal 1964) and the Tharro Hills (Majumdar 1934: 21) has confirmed the uniqueness of the typological characteristics of the Amri Culture chipped stone assemblages – they are totally different from both the microlithic Mesolithic complexes, the Neolithic Mehrgarh (Lechevallier 1980, 1984) and the Bronze Age Kot Diji and Indus industries (Inizan & Lechevallier 1990; Marcon & Lechevallier 2000);
3) a new set of radiocarbon dates, recently obtained from the Mesolithic, Ganga Valley sites of Damdama and Lekhaia, have yielded reliable results; they show that these two settlements belong to the ninth millennium uncal BP (Lukacs *et al*. 1996: 306; Lukacs 2002: 53);
4) the soil analysis of the Gujarati sequence of Oriyo Timbo (Hedge 1990) demonstrates that the microlithic assemblages from layers 5 and 6 come from a well-defined horizon, which is clearly separated from the overlying Bronze Age settlement of the same site. A similar situation is known at Adamgarh, where a Mesolithic layer, radiocarbon-dated to the half of the sixth millennium uncal BP, is stratified below a Neolithic-Chalcolithic occupation phase (Joshi 1989).

All these data show that in spite of hundreds of microlithic sites which have been discovered in this territory, the Mesolithic of the Indian Subcontinent is poorly known. The main goals, which are necessary to achieve a reasonable knowledge of this period, consist in the definition of 1) the Mesolithic sequence and tool-types that characterize each single period in the different areas of the Subcontinent, thanks to the systematic typological analysis of the chipped stone assemblages; and 2) the absolute chronology of the different Mesolithic phases. The currently available radiocarbon chronology of the Indian Mesolithic is often unreliable. This is the main reason why a programme of new radiocarbon dates is absolutely necessary in order to answer to this fundamental requirement.

The sites of Upper and Lower Sindh show that the last hunter-gatherers of the Early Holocene temporarily settled environmentally different landscapes. At present, in the absence of datable organic materials, their chronology can be tentatively established only through the typological analysis of the lithic assemblages, and their comparison with those of the radiocarbon-dated series of the neighbouring countries. Further research in the region will be aimed at the discovery of stratified sites, the definition of their absolute chronology, and the study of their subsistence economy and the mobility patterns of the populations that inhabited the area around the beginning of the Holocene.

Aknowledgements

The author is very grateful to Dr. B. A. Voytek (Berkeley University, USA) for revising the original English text, and to J. Meadow (Institute of Archaeology, University College London, UK) for the calibration of the radiocarbon dates mentioned in the text.

References

AGRAWAL, D. P, 1985. *The Archaeology of India*. Scandinavian Institute of Asian Studies. Monograph Series 46. Curzon Press, London.

ALLCHIN, B., 1979. Stone Blade Industries of Early Settlements in Sind as Indicators of Geographical and Socio-economic Change. In: Taddei, M. (ed.), *South Asian Archaeology 1977*. Istituto Universitario Orientale, Seminario di Studi Asiatici, Series Minor VI, 173–211. Intercontinentalia, Naples.

ALLCHIN, B., 1985. Some Observations on the Stone Industries of the Early Holocene in Pakistan and Western India. In: Misra, V. N. & Bellwood, P. (eds.), *Recent Advances in Indo-Pacific Prehistory*. 129–136. Oxford and IBH, New Delhi-Bombay-Calcutta.

ALLCHIN, B. & GOUDIE, A., 1974. Pushkar: Prehistory and Climatic Change in Western India. *World Archaeology* 5/3, 358–368.

ALLCHIN, B., GOUDIE, A. & HEDGE, K., 1978. *The Prehistory and Archaeology of the Great Indian Desert*. Academic Press, London, New York, San Francisco.

BESENVAL, R., 1997. The Chronology of Ancient Occupation in Makran. Results of the 1994 Season at Miki Qalat, Pakistan Makran. In: Allchin, R. & Allchin, B. (eds.), *South Asian Archaeology* 1995/1, 199–235. Oxford & IBH Publishing Co., New Delhi.

BESENVAL, R. & SANLAVILLE, P., 1990. Cartography of Ancient Settlements in Central Southern Pakistani Makran: New Data. *Mesopotamia* 25, 79–146.

BHAN, K. K. 1994. Cultural Development of the Prehistoric Period in North Gujarat with Reference to Western India. *South Asian Studies* 10, 71–90.

BIAGI, P., 2004a. The Early Holocene Lithic Assemblages of Sindh. In: *Studi di Archeologia in Onore di G. Traversari.* 93–110. L'Erma di Bretschneider, Rome.

BIAGI, P., 2004b. New radiocarbon dates for the prehistory of the Arabian Sea coasts of Lower Sindh and Las Bela in Balochistan (Pakistan). *Rivista di Archeologia*, 28, 5–16. Venezia.

BIAGI, P., 2006. New Discoveries of Mesolithic Sites in the Thar Desert (Upper Sindh, Pakistan). In: Olijdam, E., Spoor, R. H. & Deich-Van der Meuthen, W. (eds.), *Intercultural relations between South and Southwest Asia. Studies in Commemoration of E.C.L. During Caspers (1934–1996)*. BAR International Series. Oxford (in press).

BIAGI, P. & KAZI, M. M., 1995. A Mesolithic Site near Thari in the Thar Desert (Sindh-Pakistan). *Ancient Sindh* 2, 7–12.

BIAGI, P. & SHAIKH, N., 1998–1999. Preliminary Report of the Surveys and Excavations Carried out by Members of the "Joint Rohri Hills Project" in January–February 2000. *Ancient Sindh* 5, 65–75.

BIAGI, P. & VEESAR, G. M., 1998–1999. An Archaeological Survey in the Neighbourhood of Thari in the Thar Desert (Sindh, Pakistan). *Ancient Sindh* 5, 93–118.

BLANDFORD, W. T., 1880. *The Geology of Western Sind*. Memoirs of the Geological Survey of India XVIII.

BRONK RAMSEY, C., 1998. Probability and dating. *Radiocarbon* 40/1, 461–474.

CASAL, J-M., 1964. *Fouilles d'Amri*. Klinckseck, Paris.

CHAKRABARTI, D. P., 1999. *India. An Archaeological History. Palaeolithic Beginnings to Early Historic Foundations*. Oxford University Press, New Delhi.

CLELAND, J. H., 1987. Lithic Analysis and Culture Process in the Indus Region. In: Jacobson, J. (ed.), *Studies in the Archaeology of India and Pakistan*. 91–116. Aris & Philips, Warminster.

DALES, G. F. & LIPO, C. P. 1992. *Exploration on the Makran Coast, Pakistan. A Search for Paradise*. Contributions of the Archaeological Research Facility 50. University of California at Berkeley.

ENZEL, Y., ELY, L. L., MISHRA, S., RAMESH, R., AMIT, R., LAZAR, B., RAJAGURU, S. N., BAKER, V. R. & SANDLER, A., 1999. High-Resolution Holocene Environmental Changes in the Thar Desert, Northwestern India. *Science* 284, 125–128.

GHOSH, R. N., 1977. Photogeological Studies on Ancient Water Regimes of Rajastan Rivers. In: Agrawal, D. P. & Pande, B. M., (eds.), *Ecology and Archaeology of Western India.* 157–166. Concept Publishing Company, Delhi.

GOUDIE, A. S., 1973. The Environmental background to early man in the dry zone of North-Western India: The geomorphic evidence for climatic change. In: Hammond, N. (ed.), *South Asian Archaeology.* 29–37. Duckworth, London.

GOUDIE, A. S., ALLCHIN, B. & HEDGE, K. T. M., 1973. The former Extension of the Great Indian Desert. *Geographical Journal* 139/2, 243–257.

GUPTA, S. K., 1972. Chronology of the Raised Benches and Inland Coral Reefs of Saurashtra Coast. *Journal of Geology* 1972, 357–361.

HASHIMI, N. H., NIGAM, R., NAIR, R. R. & RAJAGOPOLAN, G., 2002. Holocene Sea Level Fluctuation in Western Indian Continental Margin: An Update. In: Radhakrishna, B. P. & Merh, S. S. (eds.), Vedic Sarasvati. Evolutionary History of a Lost River of Northwest India. Geological Society of India. *Memoir* 42, 297–302. Bangalore.

HEDGE, K. T. M., 1977. Late Quaternary Environment in Gujarat and Rajastan. In: Agrawal, D. P. & Pande, B. M. (eds.), *Ecology and Archaeology of Western India*. 169–180. Concept Publishing Company, Delhi.

HEDGE, K. T. M, 1990. A Note on the Analysis of Chiroda Soil Samples. In: Rissman, P. C. & Chitalwala, Y. H. (eds.), *Harappan Civilization and Oriyo Timbo.* 142–144. Oxford & IBH Publishing Co., New Delhi-Bombay-Calcutta.

HOFFMAN, M. A. & CLELAND, J. H., 1977. *The Lithic Industry at Allahdino. A Metric and Quantitative Analysis of an Harappan Activity System*. Papers of the Allahdino Expedition 2, 1–150. New York.

INIZAN, M.-L. & LECHEVALLIER, M., 1990. A Techno-economic Approach to Lithics. Some Examples of Blade Pressure Debitage in the Indo-Pakistani Sub-continent. In: Taddei, M. (ed.), *South Asian Archaeology* 1987, 43–89. IsMEO, Rome.

INIZAN, M.-L. & LECHEVALLIER, M., 1995. Pressare Debitage and Heat Treatment in the Microlithic Assemblage of Bagor, Northwest India. *Man and Environment* 20/2, 17–21.

JOSHI, J. P., 1989. Adamgarh. In: Ghosh, A. (ed.), *An Encyclopedia of Indian Archaeology* 2, 1–3. Munshiram Manoharlal, New Delhi.

KHAN, A. R., 1979a. Ancient Settlements in Karachi Region. *Grassroots* 3/2, 1–24. Jamshoro.

KHAN, A. R., 1979b. New Archaeological Sites in Las Bela. A Neolithic Settlement Discovered. *Grassroots* 3/2, 62–79. Jamshoro.

KHANNA, G. S., 1993. Patterns of Mobility in the Mesolithic of Rajastan. *Man and Environment* 18/1, 49–55.

LECHEVALLIER, M., 1980. Les armatures de faucille de Mehrgarh, Pakistan. Un example d'évolution d'un outillage spécialisé du VIe millénaire au milieu du IIIe millénaire av. J.C. *Paléorient* 6, 259–267.

LECHEVALLIER, M., 1984. The flint industry of Mehrgarh. In: Allchin, B. (ed.), *South Asian Archaeology* 1981, 41–51. Cambridge University Press, Cambridge.

LUKACS, J. R., 2002. Hunting and gathering strategies in prehistoric India: a biocultural perspective on trade and subsistence. In: Morrison, K. D. & Junker, L. L. (eds.), *Forager-Traders in South and Southeast India*. 41–61. Cambridge University Press, Cambridge.

LUKACS, J. R., PAL, J. N. & MISRA, V. D., 1996. Chronology and Diet in Mesolithic North India: a Preliminary Report of new AMS 14C Dates, δ13C Isotope Values and their Significance. In: Afanas'ev, G., Cleuziou, S., Lukacs, J. R. & Tosi, M. (eds.), *Colloquium XXXIII – Bio-archaeology of Mesolithic India: an Integrated Approach:* 310–312. XII International Congress of Prehistoric and Protohistoric Sciences. 16 The Prehistory of Asia and Oceania. ABACO, Forlì.

MAJUMDAR, N. C., 1934. *Explorations in Sind. Being a report of exploratory survey carried out during the years 1927–28, 1929–30 and 1930–31*. Indus Publications, Karachi.

MALLAH, Q. H., SHAIKH, N. & VEESAR, G. M., 2002. Complementary Role of the Rohri Hills and the Thar Desert in the Development of the Indus Valley Civilization: New Research. *Asia Pacific: Perspectives* 2/1, 21–31. University of San Francisco Center for the Pacific Rim.

MARCON, V. & LECHEVALLIER, M., 2000. Lithic Industries of the Indo-Iranian Border. Technological Approach of Blade Debitage in the Assemblages of Mehrgarh, Nausharo and Miri Qalat in Balochistan, Pakistan. In: Taddei, M. & De Marco, G. (eds.), *South Asian Archaeology* 1997, 215–246. IsIAO, Rome.

MAYANK, J., TANDON, S. K., BHATT, S. C., SINGHVI, A. K. & MISHRA, S., 1999. Alluvial and Aeolian Sequences Along the River Luni, Barmer District. Physical Stratigraphy and Feasibility of Luminescence Chronology Methods. In: Radhakrishna, B. P. & Merh, S. S. (eds.), Vedic Sarasvati. Evolutionary History of a Lost River of Northwest India. Geological Society of India. *Memoir* 42, 273–296. Bangalore.

MISRA, V. N., 1973. Bagor: a Late Mesolithic Settlement in Northwest India. *World Archaeology* 5 (1), 92–110.

MISRA, V. N., 1977., Prehistory and Palaeo-environment of Rajastan. In: Agrawal, D. P. & Pande, B. M. (eds.), *Ecology and Archaeology of Western India* 31–54. Concept Publishing Company, Delhi.

MISRA, V. N., 1982. Bagor: The Archaeological Setting. In: Lukacs, J. R., Misra, V. N. & Kennedy, K. A. R. (eds.), *Bagor and Tilwara: Late Mesolthic Cultures of Western India*. 9–20. Deccan College Postgraduate and Research Institute, Poona.

MISRA, V. N., 1985. Microlithic Industries in India. In: Misra, V. N. & Bellwood, P. (eds.) *Recent Advances in Indo-Pacific Prehistory*. 111–122. Oxford and IBH, New Delhi-Bombay-Calcutta.

MISRA, V. N., 2001. Prehistoric human colonization of India. *Journal of Bioscience* 26/4, 491–531.

MISRA, V. N., 2002. The Mesolithic Age in India. In: Settar, S. & Korisettar, R. (eds.) *Indian Archaeology in Retrospect, volume 1. Prehistory. Archaeology of South Asia*. 111–126. Manohar, New Delhi.

MISRA, V. N. & PANDYA, S., 1989. Mesolithic Occupation around Danshura, District Sabarkantha, Gujarat: Preliminary Study. *Man and Environment* 14/1, 123–127.

MISRA, V. N. & RAJAGURU, S. N., 1989. Palaeoenvironment and Prehistory of the Thar Desert, Rajastan, India. In: Frifelt, K, & Sørensen, P. (eds.), *South Asian Archaeology* 1985, 296–320. Scandinavian Institute of Asian Studies Occasional Paper 4. Curzon Press, London.

MISRA, V. N., RAJAGURU, S. N., AGRAWAL, D. P., THOMAS, P. K., HUSAIN, Z. & DUTTA, P. S., 1980. Prehistory and Environment of Jayal, Western Rajastan. *Man & Environment* 4, 21–31.

POSSEHL, G. L., 1988. Radiocarbon Dates from South Asia. *Man and Environment* 12, 169–196.

POSSEHL, G. L., 1994. *Radiometric Dates for South Asian Archaeology*. Philadelphia.

POSSEHL, G. L., 2002. Harappans and hunters: economic interaction and specialization in prehistoric India. In: Morrison, K. D. & Junker, L. L. (eds.), *Forager-Traders in South and Southeast India*. 62–76. Cambridge University Press, Cambridge.

POSSEHL, G. L., 2003. *The Indus Civilization. A Contemporary Perspective*. Vistaar Publications, New Delhi.

RISSMAN, P. C. & CHITALWALA, Y. H., 1990 (eds.). *Harappan Civilization and Oriyo Timbo*. Oxford & IBH Publishing Co., New Delhi-Bombay-Calcutta.

SALI, S. A., 1989. *The Upper Palaeolithic and Mesolithic Cultures of Maharastra*. Deccan College Post Graduate and Research Institute, Pune.

SHAR, G. M., NEGRINO, F. & STARNINI, E., 1996. The Archaeological Finds from Duhbi (Thar Desert, Sindh, Pakistan). *Ancient Sindh* 3, 39–47.

SHARMA, C. & CHAUHAN, M. S., 1991. Palaeovegetation and Palaeoenvironmental Inferences from the Quaternary Palynostratigraphy of the Western Indian Plains. *Man and Environment* 16/1, 65–71.

SHARMA, G. R., MISHRA, V. D., MANDAL, D., MISHRA, B. B.& PAL, J. N., 1980. *From Hunting and Food Gathering to Domestication of Plants and Animals. Beginnings of Agriculture*. Studies in History, Culture and Archaeology, IV. Abinash Prakashan, Allahabad.

SINGH, G., 1971. The Indus Valley Culture seen in the context of post-glacial climatic and ecological studies in north-western India. *Archaeology and Physical Anthropology in Oceania* 6, 177–189.

SINGH, G., JOSHI, R. D. & SINGH, P. A., 1972. Stratigraphic and Radiocarbon Evidence for the Age and Development of Three Salt Lake Deposits in Rajastan. *Quaternary Research* 2, 496–505.

SNEAD, R. E., 1969. *Physical Geography Reconnaissance: West Pakistan Coastal Zone*. University of New Mexico Publications in Geography, 1. Albuquerque.

SONAWANE, V. H., 1984. Prehistoric Cultures of the Panchmahals, Gujarat. *Man and Environment* 8, 20–30.

STUIVER, M., REIMER, P. J. & BRAZIUNAS, T. F., 1998. High-precision radiocarbon age calibration for terrestrial and marine samples. *Radiocarbon* 40/3, 1127–1151.

TANDON, S. K. & JAIN, M., 2001. Late Quaternary Environments – Focus on the Thar and its Western Margins. In: *First International Symposium on Kāmpilya Project*, 17–24. CNR, Padova.

TODD, K. R. U. & PATERSON, T. T., 1947. *A Flint Microlithic Industry from Karachi, India*. Paper submitted for publication to the Proceedings of the Prehistoric Society (unpublished).

VON RAD, U., SCHAAF, M., MICHELS, K. H., SCHULZ., H., BERGER, W. H. & SIROCKO, F., 1999. A 5000-yr record of climatic change in varved sediments from the oxygen minimum zone off Pakistan, northeastern Arabian Sea. *Quaternary Research* 51, 39–53.

WASSON, R. J., RAJAGURU, S. N., MISRA, V. N., AGRAWAL, D. P., DHIR, R. P., SINGHVI, A. K. & RAO, K. K. 2002. Geomorphology, Late Quaternary Stratigraphy and Palaeoclimatology of the Thar Dune Field. In: Radhakrishna, B. P. & Merh, S. S. (eds.), Vedic Sarasvati. Evolutionary History of a Lost River of Northwest India. Geological Society of India. *Memoir* 42, 219–223. Bangalore.

ZAIDI, S. M. S., QUADRI, M., HAMID, G. & BILAL, M., 1999. The Landform Inventory and Genesis in the Mulri Hills Area, Karachi East. *Journal Geographic* 2/1, 39–48. Karachi.