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FIELD WORK REPORT

Mahi Wala 1 (MW-1): a Mesolithic site in the Thal desert of Punjab (Pakistan)

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1 Preface

The problem of the Early Holocene Mesolithic hunter-gatherers in the Indian Subcontinent is still a much debated topic in the prehistory of south Asia (Lukacs et al. 1996; Sosnowska 2010). Their presence often relies on knapped stone assemblages characterised by different types of geometric microlithic armatures[1] (Kajiwara 2008: 209), namely lunates, triangles and trapezes, often obtained with the microburin technique (Tixier et al. 1980; Inizan et al. 1992; Nuzhniy 2000). These tools were first recorded from India already around the end of the nineteenth century (Carleyle 1883; Black 1892; Smith 1906), and were generically attributed to the beginning of the Holocene some fifty years later (see f.i. Gordon 1958; Todd 1950; Gordon 1958).

The Mesolithic of the Indian Subcontinent is still nowadays badly known (Ajithprasad 2002: 156). Moreover, it is still considered by a few authors a transitional period that covers ca two thousand years between the end of the Upper Palaeolithic and the beginning of the Neolithic food producing economy (Misra 2002: 112). The reasons why our knowledge of the Mesolithic period in the Subcontinent in general is still insufficiently known is due mainly to 1) the absence of a detailed radiocarbon chronology to frame the Mesolithic complexes into each of the three climatic periods that developed at the beginning of the Holocene and define a correct time-scale for the development or sequence of the study period in the area (Misra 2013: 181–182), 2) the terminology employed to describe the Mesolithic artefacts that greatly varies author by author (Jayaswal 2002), 3) the inhomogeneous criteria adopted for the descriptions of the lithic assemblages, the retouched tools in particular, and the absence of a typological list universally employed by all authors (Raju 2002: 202), 4) the presence of very few reliable, accurately interpreted stratigraphic sequences (Misra 2013: 175), and 5) the absence of finds/sites from some large territories. This latter fact is most probably due to the scarcity of systematic research (Sosnowska 2010: Fig. 1 and 3).

In Pakistan, our knowledge of the period in question has greatly improved during the last forty years, thanks to the discovery of many sites around Karachi and its surroundings during the geoarchaeological surveys conducted in the 1970s by the late Professor Abdul Rauf Khan along the northern coast of the Arabian Sea and its neighbouring regions (Khan 1979). More recently, many surface scatters of Mesolithic artefacts, characterised by the systematic recurrence of trapezoidal geometric microliths, were discovered at the top of sand dunes in the Thar Desert lake district around the caravan city of Thari, in Upper Sindh (Biagi 2003-2004, 2008). Moreover, a few radiocarbon dates were obtained from one of the Kadeji River sites, north of Karachi, and from mangrove shell samples collected from the surface of some of the Mulri Hills sites discovered at the eastern outskirts of Karachi in the 1970s (Biagi 2018).

[1] In this paper the following measures are used to describe the length of the blanks: hypermicrobladelets and hypermicroflakelets (>1.25 cm), microbladelet and microflakelets (1.25 to 2.50 cm), bladelets and flakelets (2.50 to 5.00 cm).
The colours are those of the Munsell Soil Color Charts, 1992 Revised Edition (Macbeth, New York).

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Though these finds have slightly improved our knowledge of the Mesolithic in Sindh, sites of this period are so far totally unknown from other regions of Pakistan. This is most probably due to the absence of systematic surveys in geographic landscapes that are potentially ideal for the settling of prehistoric hunter-gatherers. Furthermore, our knowledge of the Upper Palaeolithic and Mesolithic periods in the northern provinces of the country is roughly the same as it was ca 60 years ago. It is indeed confined to the still debated finds from the Sanghao Cave in Khyber Pakhtunkhwa district (Dani 1964; Ranere 1982).

Therefore, the discovery of a knapped stone assemblage with microlithic backed tools and geometrics represents a groundbreaking point for the prehistory of Punjab. It opens new research perspectives in a promising territory that had never been explored before, where surveys are

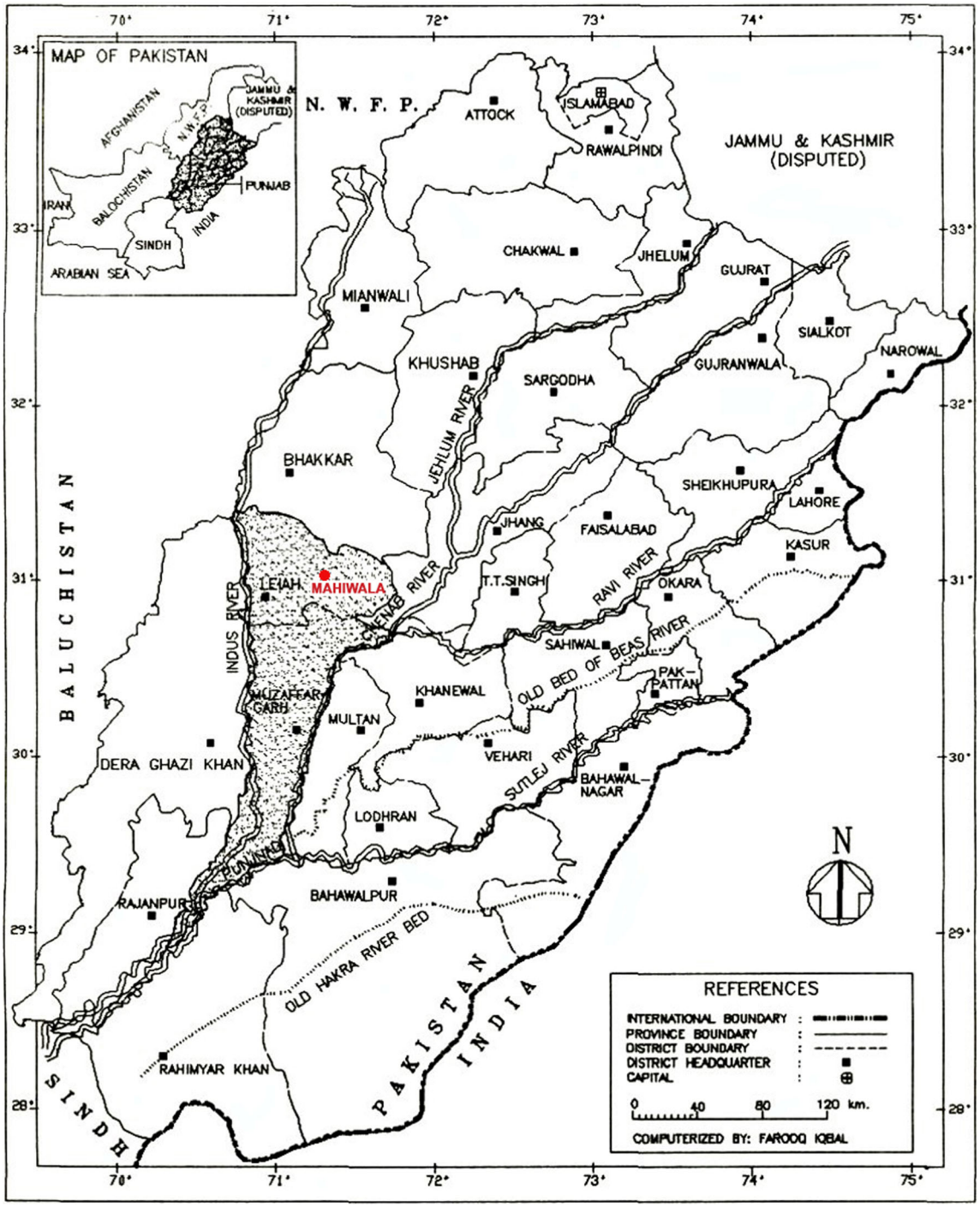

Fig. 1 Location of the Thal Desert in central Punjab (shaded area) with the approximate position of Mahi Wala (red dot)

undoubtedly to be continued in the future because of its great potential.

2 The Thal desert of Punjab

The Thal Desert, otherwise known as the "*great steppe*" (Ghauri 2018: 2), is part of the Sindh Sagar Doāb (*doāb* means "tract between two rivers"). It is a unique desert landscape of Punjab (central Pakistan) that extends for ca 10,000 km^2 between the courses of three eastern tributaries of the Indus, i.e. the Jhelum, Chenab and Ravi, and the Indus River itself (Fig. 1) (Beg 1993: 252). It consists of an almost treeless, arid and desolated territory characterised by peculiar formations of sand dunes or rolling sand plains (Higgins et al. 1974), whose composition has been interpreted as "*originally transported by a palaeo-Indus system characterized by different erosion and/or drainage patterns. It is possible that detritus now stored in the Thal Desert was largely generated originally from the huge sediment fluxes produced during glacier retreat at the beginning of the Holocene*" (Garzanti et al. 2005: 298). Only part of the Thal Desert has been recently turned into a cultivated land thanks to the construction of the Thal Canal and scattered wells, as the water table is not very deep because of the close proximity of water courses on the eastern and western sides of the tract (Bennett et al. 1967).

Only Sir Aurel Stein conducted a brief survey in the area in December 1931 (Stein 1937: 67–69). The research that led to the discovery of the finds from Mahi Wala 1 described in the present paper was carried out in September 2010 by one of the authors (ZSG), though preliminary data had been collected already at the end of 2009. In these latter years, the exploration of the Thal Desert was carried out around Mahi Wala, a hamlet located in the Chaubara Tehsil of Layyah District that is surrounded by sand dunes interspersed by small depressions (Ghauri 2018: 57) (Fig. 2).

Several archaeological sites have been discovered in this territory of the Thal Desert during the last decade, many of which have been attributed to the Hakra, Kot Diji and Indus periods, mainly on the basis of the characteristic of the associated pottery (Fig. 3). Moreover, besides Mahi Wala 1, other sites located around the homonymous small village yielded microlithic industries, which have been briefly illustrated in the first volume published on the archaeology of the territory (see Ghauri 2018: 203 and 204). The density of finds recovered during the surveys suggests that during the Early and Middle Holocene periods the environmental and climatic conditions that characterised the territory were more suitable than those of the present to human settling (Thal Desert 2013) (Fig. 4).

3 The lithic assemblage

The site of Mahi Wala 1 (MW-1) was discovered in the autumn of 2010 by one of the present authors (ZSG) (Ghauri 2018: 57–59). The site extends over a surface of ca. 35 acres. It consists of a palimpsest of human frequentations composed of several scatters of archaeological materials some of which yielded potsherds attributable on the basis of their typological characteristics and decorative patterns to the Hakra and Kot Diji cultures (Ghauri 2018: 141). In contrast, the lithic artefacts described in the present paper come from a well-defined findspot located ca 50 m southeast from the Chalcolithic/Bronze Age site, at 151 m of altitude at 31°03′37.33″ N-71°24′58.00″E. In this case, the lithic artefacts were not associated with ceramic potsherds (Fig. 2).

The knapped stone assemblage from Mahi Wala 1 is composed of 238 artefacts, among which are 7 retouched implements and 1 core rejuvenation blade (Table 1). Pieces obtained from a variety of pinkish grey chert (7.5YR6/2) predominate

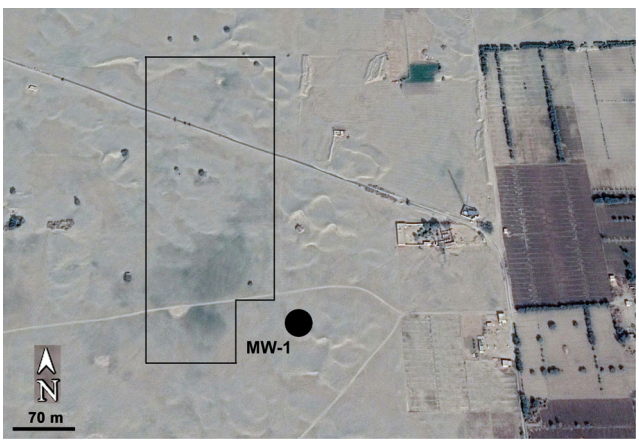

Fig. 2 Mahi Wala 1 (MW-1): Satellite view of the site west and south of the madrassa with the indication of the lithic spot described in this paper (dot) and the Chalcolithic/Early Bronze Age site (dark grey spot marked by the rectangle)

Fig. 3 Mahi Wala 1 (MW-1): Bronze Age potsherds from the surface of the sand dunes recovered *in situ* (photographs by Z.S. Ghauri)

(198: Type-1) (Fig. 5, n. 3). Four chert pieces are of a slightly different colour (10YR7/1 – light grey: Type-2) (Fig. 5, n. 5), 10 are burnt (Fig. 5, n. 2), 2 are fragments of corticated nodules 2 to 8 cm in diameter (7.5YR8/2 – pinkish white: Type-3) (Fig. 5, n. 4), and 22 are made from very dusky red (7.5R2.5/3) radiolarite (Type-4) (Fig. 5, n. 1). The 2 aforementioned fragments of nodules are covered with a smooth carbonatic cortex ca 1 mm thick of very pale brown colour (10YR 8/3), whose surfaces do not show any trace of water transport.

Moreover, the assemblage includes 2 more flakelets (Fig. 6) with different technological characteristics (use of direct percussion and facetted platform in one case) and coarser texture (quartzite?) that might suggest their attribution to an earlier period of frequentation. They are obtained from raw materials of brown (10YR4/3) (Fig. 6, n. 1) and grey (10YR5/1) colour (Fig. 6, n. 2) respectively. Their surfaces are more weathered/patinated than the other specimens of the assemblage of MW-1.

Out of the 198 artefacts chipped from chert of Type-1, 74 non-corticated and 50 corticated pieces are complete blanks (i.e. unretouched, unmodified flakes/blades). Together with 12 complete red radiolarite blanks and 1 flakelet of chert Type-2 they were measured (maximum length, width, and thickness) to develop the typometric length/width and length/thickness diagrams of Fig. 7a and 7b. The two scattergrams clearly show the hypermicrolithic character of the assemblage that is composed mainly of hypermicroflakelets less that 1.25 cm long, most probably residues of debitage and debris showing that the assemblage was produced on the spot. Moreover, the presence of several decortication flakes suggests that the raw material was brought to the place in the form of corticated nodules.

The retouched artefacts (Table 1) are represented by 2 geometric microliths, among which 1 is a scalene triangle with two direct, abrupt retouch sides (Fig. 8, n. 2), and the second is an isosceles trapeze with straight, oblique direct truncations on a bladelet (Fig. 8, n. 6). Other retouched implements consist of 1 curved perforator or *bec déjeté*, obtained from a flakelet with two convergent, direct, abrupt retouches (Fig. 8, n. 1), and 4 other backed tools. They are: 1 proximal fragment of microbladelet curved point obtained by abrupt, direct, right retouch (Fig. 8, n. 4), 1 medial fragment of microbladelet with abrupt, direct, left retouch (Fig. 8, n. 3), 1 complete microbladelet with abrupt, inverse, right retouch (Fig. 8, n. 5) and 1 medial fragment of a hypermicrobladelet with abrupt, direct, right, sinuous retouch (Fig. 8, n. 7). One distal microburin on a bladelet is also present (Fig. 8, n. 8), as well as 1 probable core rejuvenation bladelet (Fig. 8, n. 11).

A width/thickness scattergram (Fig. 7c) has been developed measuring 21 fragments of laminar blanks with a triangular cross-section (8 proximal, 3 medial, and 10 distal) in order to evaluate the modes of manufacture of this category of blanks. The results show that the microbladelets have a maximum width of 10 mm and a thickness of 4.5 mm. They are to be referred to the production of microbladelets with an average width of 6.8 mm, 1.8 mm thick. A few specimens show that hypermicrobladelets were also produced, with a minimum width of 3 mm, and 1 mm thick (see Fig. 8, nn. 9 and 10). Therefore, we can infer that the debitage objective was probably oriented towards the production of very small and standardized laminar blanks from which microlithic armatures were obtained, a process whose "*costs and benefits*" are being studied since just a few years (Pargeter and Shea 2019: 3).

The techno-typological and dimensional characteristics of the artefacts allow us to attribute the MW-1 assemblage to the Mesolithic period. The lithics were manufactured exploiting two main varieties of chert and radiolarite. The locations of their outcrops are still unknown, because they do not match

Fig. 4 Mahi Wala 1 (MW-1): Chert artefacts recovered *in situ* made from exogenous chert (photographs by Z.S. Ghauri)

Table 1 Mahi Wala 1 (MW-1): Most relevant techno-typological characteristics and attributes of the retouched tools

Description	Type of retouch	Retouch position	Type of blank	Condition	Measures (L, W, T)	Material	Colour (Munsell)	Figure 8
Isosceles trapeze	Deep, abrupt, direct	Proximal+distal truncations	Bladelet	Complete	19x8x2	Chert Type 1	7.5YR6/2 – Pinkish grey	n. 6
Scalene triangle	Deep, abrupt, direct	Truncation+Backed point	Bladelet	Complete	20x5x3	Chert Type 2	10YR7/1 – Light grey	n. 2
Curved perforator	Deep, abrupt, direct	Lateral+transversal	Microflakelet	Missing tip	19x29x3	Chert Type 2	10YR7/1 – Light grey	n. 1
Curved backed point	Deep, abrupt, direct	Left	Microbladelet	Distal fragment	(14)x7x2	Radiolarite Type 4	7.5R2.5/3 – Very dusky red	n. 4
Backed microbladelet	Deep, abrupt, direct	Left	Microbladelet	Medial fragment	(11)×5.5 × 1	Radiolarite Type 4	7.5R2.5/3 – Very dusky red	n. 3
Backed hypermicrobladelet	Deep, abrupt, sinuous, direct	Right	Hypermicrobladelet	Medial fragment	(8.5)×4.5 × 1.5	Radiolarite Type 4	7.5R2.5/3 – Very dusky red	n. 7
Backed microbladelet	Deep, abrupt, inverse	Right	Microbladelet	Complete	12.5x3x1	Radiolarite Type 4	7.5R2.5/3 – Very dusky red	n. 5
Distal microburin	Deep, abrupt, direct	Left notch	Bladelet	Complete	13x9x2	Chert Type 1	7.5YR6/2 – Pinkish grey	n. 8
Core rejuvenation bladelet	None	None	Bladelet	Complete	26x9x5	Chert Type 1	7.5YR6/2 – Pinkish grey	n. 11

Fig. 5 Mahi Wala 1 (MW-1): Raw material types exploited for making artefacts. Radiolarite, Type-4 (n. 1), chert, Type-1 (n. 3), corticated chert nodules, Type-3 (n. 4), chert, Type-2 (n. 5), and burnt chert (n. 2) (photographs by E. Starnini)

with any known raw material source described in the literature that was exploited in both Sindh and Punjab between the Palaeolithic and the metal ages (see Law 2011; Biagi et al. 2018).

Fig. 6 Mahi Wala 1 (MW-1): Weathered chert flakelets obtained by direct percussion: note the facetted platform of n. 1 (photographs by E. Starnini)

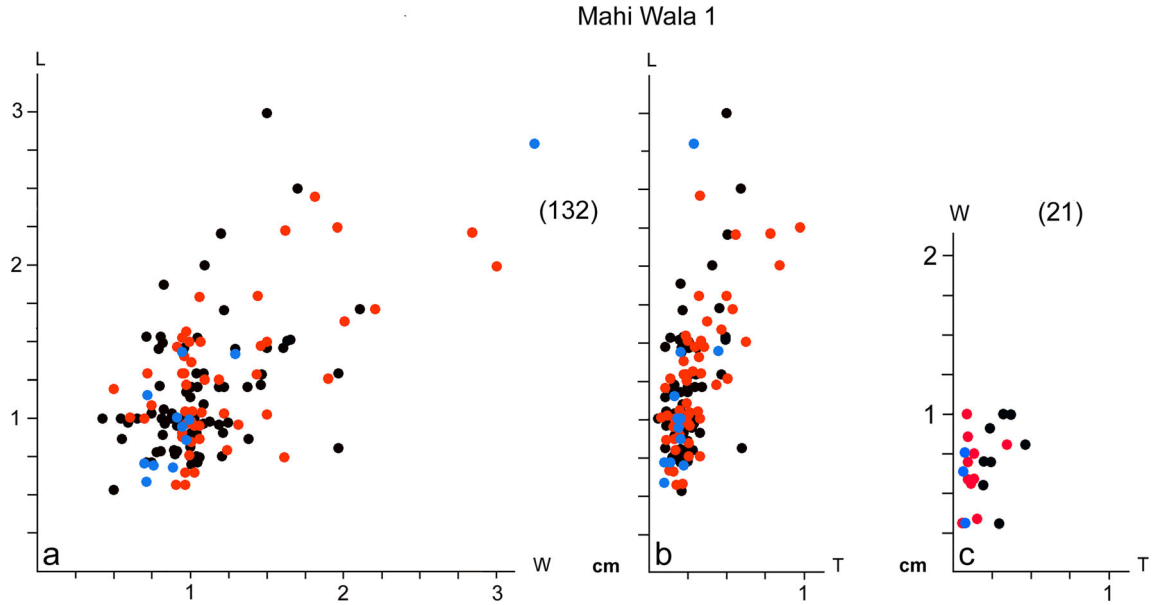

Fig. 7 Mahi Wala 1 (MW-1): Length/width (7a) and length/thickness (7b) diagrams of the complete, unretouched artefacts. Width/thickness diagram of the bladelet fragments (7c). Chert, non-corticated (black dot), chert, corticated (red dot), and radiolarite (blue dot) (drawing by P. Biagi)

4 Discussion

The importance of the lithic assemblage from Mahi Wala 1 is twofold. First of all, although it was collected from the surface, it testifies for the first time the presence of groups of early Holocene hunter-gatherers in the Thal Desert of Punjab. Second, that the raw materials exploited for making the MW-1 artefacts are undoubtedly different from those that were

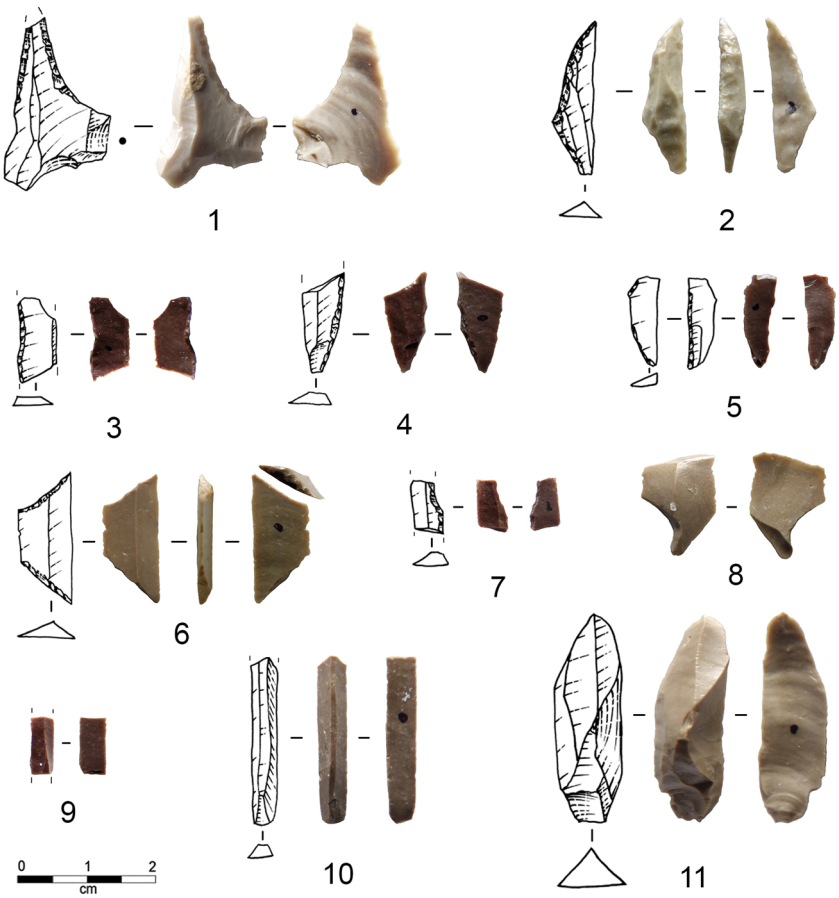

Fig. 8 Mahi Wala 1 (MW-1): Retouched tools and microbladelets. Curved perforator (n. 1), microlithic scalene triangle (n. 2), backed microbladelets (nn. 3, 5 and 7), microlithic backed point (n. 4), isosceles trapeze (n. 6), distal microburin (n. 8), unretouched narrow microbladelets (nn. 9 and 10), core rejuvenation bladelet (n. 11) (drawings by P. Biagi and E. Starnini, photographs by E. Starnini)

employed during the Indus Civilization period (Law 2011). They were most likely collected as pebbles/nodules from local/regional formations. The cortex preserved on some pieces (see Fig. 5, n. 4) does not show any trace of water-weathering due to fluvial transport. Therefore, we can exclude their provenance from a river alluvium source. In contrast, we suggest that they were collected from secondary deposits and debris.

Moreover, both the raw materials and the different typological characteristics of the tools, would point to (probably two) episodes of knapping activity that took place in the area in different times. From this perspective, the red radiolarite assemblage shows a higher index of microlithism that might be related to an earlier occupation period, most probably to the beginning of the Holocene, if we compare it with the artefacts made from the grey chert. Among the latter are one geometric trapezoidal armature and one microburin obtained from bladelets that should be attributed to the beginning of the Atlantic period (Biagi and Starnini 2016). We are well aware of the problem related with the application of tool chrono-typologies developed for the European lithic assemblages to South Asian contexts (see f.i. Rozoy 1968; Nuzhniy 2000).

However, the general aspects and techno-typological characteristics of the Mahi Wala 1 chipped stone artefacts would point to a Mesolithic age. This impression is based also on the striking similarities of this assemblage with some industries retrieved from the Thar Desert in Sindh that have been attributed to the Mesolithic on the basis of the systematic recurrence of a characteristic microlithic tool-kit. It includes also isosceles trapezoidal geometrics, obtained from bladelets with the microburin technique (Biagi and Veesar 1998-1999; Biagi 2008) that are typologically very different from the horned types recovered from the aceramic Neolithic occupations and burials of Mehrgarh (Inizan and Lechevallier 1985) and Central Asia (Brunet 2004).

To sum up, the discovery of Mesolithic assemblages in the Thal Desert of Punjab opens new perspectives to the study of the last hunter-gatherers in the north-western territories of the Indian Subcontinent during the first millennia of the Holocene. Though this topic is still badly known, scarcely studied, and the presence of geometric microliths in the region largely debated, mainly as regards their chronology, technology, shape and dimensional variability (Hiscock et al. 2011; Lewis 2017), the new finds show that groups of Early Holocene hunter-gatherers most probably exploited very different environmental landscapes both in Sindh (Biagi 2003-2004) and in Punjab. Their presence contributes to the interpretation of the problems related to the behaviour of the last hunter-gatherers in the Indus Valley and its neighbouring territories.

Furthermore, the discoveries made by one of the authors (ZSG) at Mahi Wala show that not only the northern territories of the Arabian Sea coast and the Thar Desert lakes of Upper Sindh were seasonally settled during the Mesolithic (see Khan 1979; Biagi 2008), but also other suitable landscapes located close to important freshwater courses that flow as a part of the complex Indus River basin system (Khan and Adams 2019).

The retouched tools of the assemblage from Mahi Wala 1 are represented by characteristic types, among which are geometric microliths, microbladelets and 1 micro-point obtained by abrupt retouch, and 1 microburin. They consist of a typical lithic inventory of the Mesolithic period as it is known from some of the aforementioned Thar Desert lake district sites (see Biagi and Veesar 1998-1999).

As reported above, the absolute chronology of the Mesolithic period in the greater Indus Valley is still badly known because of the scarcity of radiocarbon dates (Biagi 2018). Moreover, the temporal sequence of the different sites and their related assemblages is also poorly known, mainly because of the unsatisfactory methods employed for their study (Ajithprasad 2002; Sosnowska 2010). Nevertheless, the systematic occurrence of microlithic assemblages in well-defined geographic territories is very important for the interpretation of the events that took place in this part of the Indian Subcontinent just after the end of the last Ice Age.

Finally, it is important to remark that the localities with Early Holocene microlithic industries are sometimes resettled or frequented also in later periods. They often occur in present desert landscapes of Pakistan, showing that during past (more humid) climatic periods better ecological conditions attracted human groups to live in the region.

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