Garm Roud 2, Iran : bladelet production and cultural features of a key Upper Palaeolithic site south of the Caspian Sea

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ABSTRACT

For more than twenty years, Iran has focused a great deal of research on the emergence and development of Upper Palaeolithic industries. South of the Caspian Sea, the site of Garm Roud 2, dated to 33878 ± 3300 Cal BP, is one of the rare sites with the site of Mirak to have yielded stratified evidence of occupation from this period. This paper presents the results of the typo-technological analysis of the lithic assemblage collected during the 2006 to 2008 excavation campaigns. This one is focus on a bladelet production, straight and twisted. Very few similarities appear between this assemblage and those from the sites in the Zagros and the rest of Iran, the dates of which are generally earlier (about 35 to 40000 Cal BP). Garm Roud 2 yield original evidence and may be seen as a key site for understanding Upper Palaeolithic technocomplexes in this area and the development of bladelet production.

Key-words: Upper Paleolithic, Garm Roud, Northern Iran, Baledet production, Bladelets, Lithic industries

RESUME

Depuis plus d'une vingtaine d'années, l'Iran a concentré de nombreux travaux concernant l'émergence et le développement des industries du Paléolithique supérieur. Au sud de la Mer Caspienne, le site de Garm Roud 2, daté de 33878 ± 3300 Cal BP, fait partie des rares gisements avec celui de Mirak à avoir livré une occupation de cette période en stratigraphie. Nous présentons ici les résultats de l'analyse typo-technologique de l'assemblage lithique collecté lors des campagnes de fouille de 2006 à 2008. Il apparaît une diversité des chaînes opératoires axées sur une production de lamelles, rectilignes et torses. Cet assemblage montre très peu de ressemblances avec les sites du Zagros et du reste de l'Iran, généralement plus anciens. Garm Roud 2 constitue un témoignage original et un site-clé pour la définition des techno-complexes du Paléolithique supérieur et pour la compréhension du développement du débitage lamellaire dans cette région.

Mots clés : Paléolithique supérieur, Garm Roud, Iran du Nord, Production lamellaire, Lamelles, Industries lithiques

1 INTRODUCTION

Due to its location between the Caspian Sea and the Persian Gulf and between the Middle East and East Asia, the Iranian Central Plateau and neighboring areas, the Zagros and Alborz mountains are of particular importance to issues relating to Palaeolithic settlement and mobility. This large region of Central Asia was probably occupied very early since the Lower Paleolithic (e.g., Biglari, Shidrang, 2006; Biglari et al., 2004; Coon, 1951; Hole, Flannery, 1967; Olszewski, Dibble, 1993; Smith, 1986). Many sites are located in the Zagros Mountains, mainly from the Middle and Upper Palaeolithic (e.g., Conard et al., 2013; Coon, 1951; Hole et Flannery, 1967; Olszewski, Dibble, 1993; Otte et al., 2009; Smith, 1986), but the quality of the archaeological information is highly variable.

New international programs have been running in the country for more two decades. In addition to new surface discoveries, previously known sites have been revisited and several new stratified settlements have been identified and excavated (e.g., Asgari et al., 2006; Bazgir et al., 2014; Berillon et al., 2007, 2009; Biglari et al., 2009; Conard et al., 2006; Gashidian et al., 2009; Jaubert et al., 2005, 2009; Otte et al., 2007, 2009; Roustai et al., 2004; Vahdati Nasab, 2011; Vahdati Nasab, Clark, 2014; Vahdati Nasab et al., 2019). Much more reliable archaeological assemblages and chronological data have thus been obtained and have renewed perceptions of the Palaeolithic in Iran and Central Asia.

As regards the Upper Palaeolithic, reconsideration of the Zagros sites began in the 2000s after a reassessment of the Warwasi collections (Olszewski, 1999; Olszewski, Dibble, 1993, 1994, 2006; Otte, Kozłowski, 2004, 2007; Otte et al., 2009, 2012). This raised the question of the origin and cultural area of the Aurignacian: some authors suggest that the Aurignacian originated in Iran, from a local Mousterian, and then spread to the Near East and Europe (Otte, Kozłowski, 2004, 2007, 2009), while others maintain that it is clearly distinct from the Middle Palaeolithic and/or hypothesise that Upper Palaeolithic cultures in Iran are very diverse and not only Aurignacian (Bordes, Shidrang, 2009, 2012; Conard, Ghasidian, 2011; Ghasidian et al., 2017; Olszewski, 2009; Tsanova, 2013). But the debate was mostly limited to caves and rock shelters from Zagros including Warwasi (Otte, Koslowski, 2007; Tsanova, 2013), Yafteh (Bordes, Shidrang, 2009; Hole, Flanney, 1967; Otte et al., 2011, 2012), Gar Arjeneh (Bazgir et al., 2014; Hole, Flannery 1967; Otte, Biglari, 2004), Gar-é-Boof (Conard, Ghasidian. 2011; Conard et al., 2006; Gashidian et al., 2017), Guilvaran and Kaldar (Bazgir et al., 2014, 2017; Becerra-Valdivia et al., 2017) or Gar-é-Khar (Shidrang et al., 2016; Young, Smith, 1966). Out of Zagros, Upper Paleolithic sites are almost absent and the debate is thus limited. Only 3 sites are currently know (they are mostly surface open-air sites and unfortunately they didn't yield chronostratigraphic data): Sefid-ab (Shidrang, 2009), Delazian (Albofathi et al., 2018; Vahdati-Nasab, Clark, 2014) in the northern zone of the Iranian Central Plateau. In the same area, Mirak was originally described as Middle Paleolithic surface site (Rezvani, 1990; Rezvani, Vahdati-Nasab, 2010); recent excavations by the joint French-Iranian Palaeoanthropological Program yielded to the discovery of in situ archaeological assemblages including an upper and an intermediate assemblages with Upper Paleolithic affinities (Vadhati-Nasab et al., 2019). Garm Roud 2 appears to be the only know in Central Alborz (Asgari et al., 2006; Berillon et al., 2007, 2009; Berillon, Asgari Khanegha, 2016).

The site of Garm Roud 2 was discovered in 2005 and was excavated from 2006 to 2008 by the French-Iranian Palaeoanthropological Program (FIPP). The digs yielded a rich assemblage, from an *in situ* and stratigraphically clear archaeological level relating to the end of OIS 3, and corresponding to a short occupation related to a hunting halt (Berillon et al., 2007, 2009; Berillon, Asgari Khanegha, 2016). Preliminary studies provided a large lithic assemblage, focused on a bladelet production, with evident Upper Paleolithic affinities

(Albofathi et al., 2018; Berillon et al., 2009; Chevrier et al., 2006; Chevrier, 2016). Its location outside the Zagros, in central Alborz, and the quality and dating of its context, the lithic assemblage of Garm Roud 2 as a whole, expanded with the material collected from the excavations, appeared to be informative and able to bring material to the debate. In this context it was necessary to reconsider the entire lithic assemblage by a systematic and extensive examination of the lithic typo-technological diversity and the reduction sequences and to compare it to available assemblages from the Iranian Central Plateau and the Zagros to the Middle East and Central Asian regions.

2 BACKGROUND OF GARM ROUD 2

Garm Roud 2 is an open-air site in a clear stratigraphic context located in the province of Mazandaran, 20 km south of the Caspian Sea, near the city of Amol (Berillon, Asgari Khaneghah, 2016; Berillon et al., 2007) (fig.1). The single 5 cm-thick archaeological deposit (unit 8) is preserved in a valley bottom palaeosol. It appears in the Baliran fluvial sedimentary sequence, which is about 15 m-thick at the location of the site (Antoine et al., 2006, 2016). The weighted average of three radiocarbon dates obtained from *in situ* charcoal situates the archaeological level at 33,878 ± 3,300 Cal BP (Antoine et al., 2016) (fig.2). The 18m^2 excavation yielded a significant concentration of nearly 50,000 archaeological remains including 11,148 lithic artefacts. The minor vertical dispersion and the good preservation of the archaeological remains indicates minor post-depositional disturbance (Berillon, Asgari Khaneghah, 2016). Technical homogeneity of the lithic assemblage was expected and addressed by the two first analyses of a selection of this assemblage (Abolfathi et al., 2018; Chevrier, 2016).

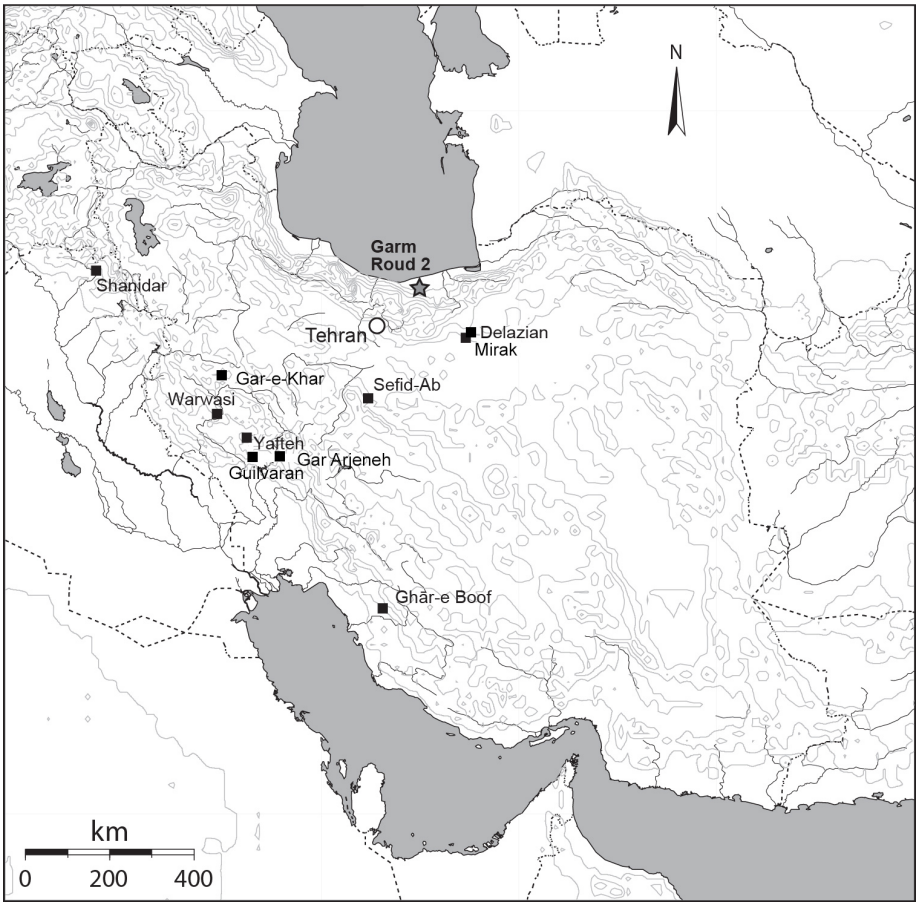

Figure 1. Location of Garm Roud 2 and main sites listed in the paper

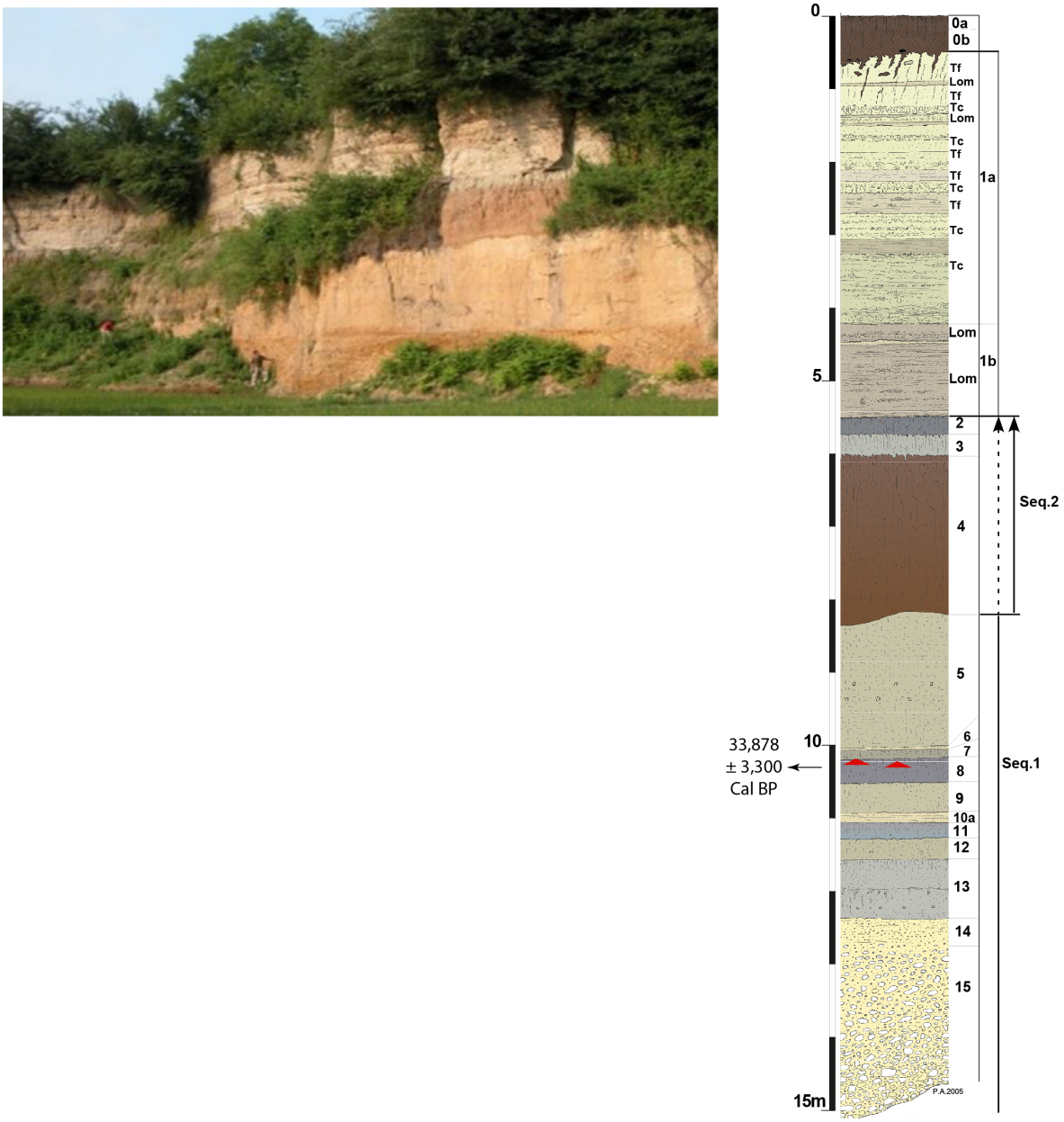

Figure 2. View and stratigraphic sequence of Garm Roud 2 in the Baliran formation, and dating of the archaeological occupation (after Berillon, Asgari Khaneghah, 2016) (photo FIPP 2005)

3 MATERIAL AND METHOD

As the quantity of lithic material is very large (11,148 artefacts), this study relates to the whole lithic assemblage coordinated in situ during the 3 campaigns (2006-2008) (2,516 pieces); additional observations were made on those without coordinates (8,418 artefacts) (tabl.1 and tabl.2). The procedure focused on cores, blanks production (flakes, blades and bladelets), tools and retouched pieces. We discarded waste, undetermined pieces and most damaged fragments as well as chips and flakes smaller than 2.5 cm long. Finally after this whittling down, the lithic series contains 899 pieces (tabl.2).
Using a classical technological approach, the aim of this analyse is to understand the overall process of the technical system, from the procurement of raw material to the production aims.

This article presents thus a study of the raw material and the different technological classes that has produced an overall and dynamic view of the lithic production at Garm Roud 2.

	N 2006-2008	N 2005 (from survey; Berillon et al., 2007)	Summ
Uncoordinated artefacts	8418	-	8418
Coordinated artefacts	2516	214	2730
Flakes cores	*14*	*-*	*14*
Bladelet cores	*29*	*2*	*31*
Bladelets	*505*	*27*	*532*
Blades	*49*	*2*	*51*
Flakes, fragments, chips	*1491*	*68*	*1559*
Waste	*362*	*114*	*476*
Undetermined	*66*	*1*	*67*
Summ	10934	214	11148

Table 1 – Number and composition of the coordinated and uncoordinated artefacts of Garm Roud 2 during the 2005 survey and the 2006-2008 excavations

Coordinated artefacts	N 2006-2008 sample
Flakes cores	14
Bladelet cores	29
Bladelets	435
Blades	49
Flakes	372
Summ	899

Table 2 - Composition of the lithic assemblage of Garm Roud 2 after shorting (2006-2008 sample)

4. RESULTS

4.1 Raw material

The raw materials in the Garm Roud 2 assemblage are varied and can be divided into limestone, chert/flint, quartz, siltstone and rhyolite (tabl.3). Limestone and chert/flint are broadly are dominant (85.8%). These raw materials are locally available in the channel of coarse gravel located near the site as pebbles of various size and colours. Knapping quality is generally medium to good. Some excellent and probably exogenous chert/flint of various colours seem also have been used. This is an important argument discussing the mobility of Garm Roud 2 group(s). However, the small number of these pieces precludes discussion about the original morphology of the blocks. A more detailed petrographic study and identification of raw material outcrops would be necessary in the future. In the typo-technological study that follows, we specify the nature of the raw materials only when they do not seem to be local or when they are of superior quality.

Limestone	Chert/flint	Quartz	Siltstone	Rhyolite	Total
451	75	67	16	4	613
73.57%	*12.23%*	*10.93%*	*2.61%*	*0.65%*	*100%*

Table 3 – Raw materials composition of the Garm Roud 2 lithic assemblage

4.2 Blank production

The lithic assemblage thus include 899 artefacts and is composed of two main blank categories: mainly bladelets and flakes. Although more rare, some blades are also present.

4.2.1 Flakes

Flakes represent more than 40% of the selected assemblage (n=372). Two broad categories can be distinguished: products from flake cores and waste from bladelet reduction. The first category relate to thick flake ranging from 25 mm to 80 mm long and removed by hard stone percussion. These products present frequent cortical surfaces and various morphologies: short, wide, elongated and *débordant*. They are linked to the unidirectional, bidirectional and multidirectional flakes cores present in the assemblage (n=14) and mainly made on pebbles (fig.3). Some of them can be considered as blanks for bladelet cores as. We therefore have to consider two purposes for these flakes, as both core blanks and blank tools.
The second category relates to waste from bladelet production. Indeed the assemblage is also composed of some core microtablets and flakes with one or several straight and/or twisted bladelet scars (fig.8).

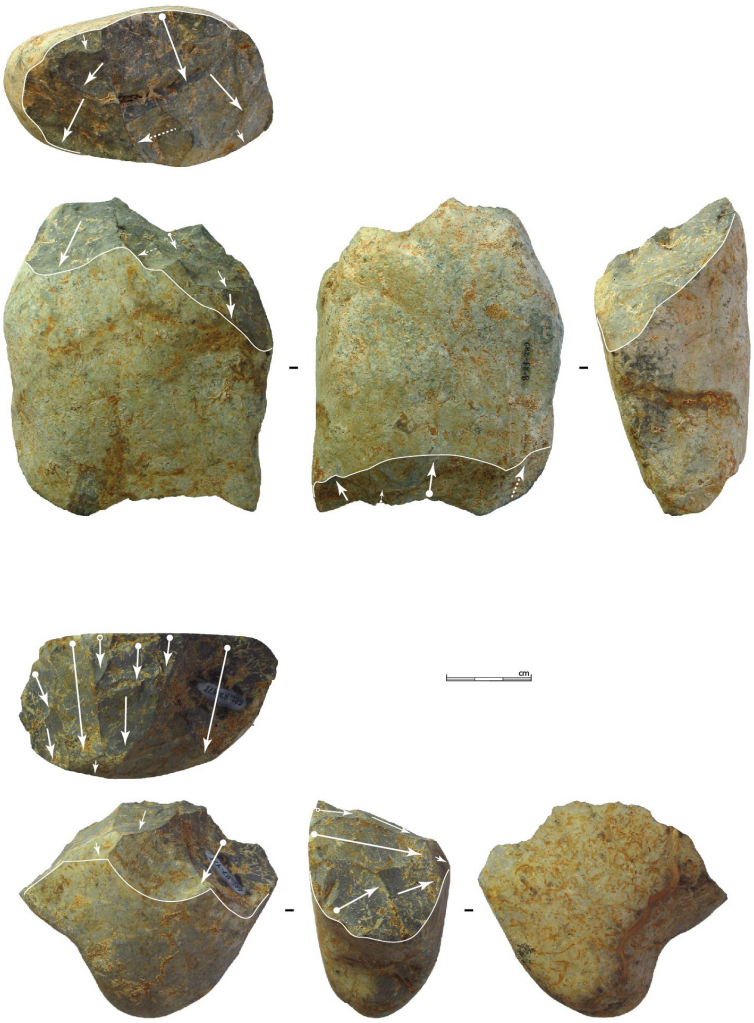

Figure 3. Garm Roud 2. Flakes cores on pebble (photo B. Chevrier)

4.2.2 Blades

Ranging from 30 to 40 mm long, blades represent less than 6% of the selected lithic series (n=49). This group includes two blades categories produced by soft percussion: main-intended blades and preparation/maintenance blades for bladelet or blade production (fig.4, n°17 to 20, 26 and 28). The main-intended blades are characterized by various morphologies (with convergent or parallel edges) and various side face, mainly straight and in some cases curve or twist. The direction of the removal on their dorsal face is unidirectional testifying a production on prismatic cores. All blade are made on exogenous raw material (flint – or high-quality chert – is over-represented). The absence of blade cores and blade preparation / maintenance indicates that they were produced at another site and imported into Garm Roud 2.
Some blades (around 7 or 8 pieces) relate to preparation and maintenance phases but especially for bladelet production. These display the remains of crest hinged scars on their ventral face. Among them, some pieces clearly reflect perfectly controlled production of twisted bladelets, usually carried out on excellent exogenous raw materials (fig.4, n°20).

4.2.2 Bladelets

Bladelets represent more than 45% of the selected lithic production (n=435) and can be classified in two main categories: main-intended bladelets (n=327) and preparation / maintenance bladelets (n=108). The raw materials are the same for all bladelets and soft percussion was used as confirmed several "bulb spallings" on proximal part of the products (Pelegrin, 2000). Among the main-intended bladelets and despite the high percentage of broken bladelets (n=301, 69.2%) it is possible to distinguish two subgroups: straight and twisted bladelets. They result from several reduction strategies: a main *in situ* production and a secondary outside production.

4.2.2.1 Straight bladelets

Straight bladelets represent 54,7% of the main-intended bladelet production (n=179/327). Ranging from 12 to 38 mm long and from 3,5 to 7 mm wide with an average of 5.5 mm in width, these pieces have various morphologies and are more or less regular (fig.4, n°1 to 9 and n° 21 to 23). Two sub-categories can be distinguished: badelets with convergent edges and points and parallel bladelets. Most of them have been produced *in situ* and result from different *débitage* modalities.
Mainly baldelets with convergent edges have been produced from convergent bladelet cores on flakes (around 17 pieces) (fig.5). Unidirectional baldelet reduction took place along a dihedral narrow face of the flake (fig.5 n°1 – right view; fig.6) or along a wide or a flat surface. In this case the removals are located on the ridges of the wide or flat surface (fig.5 n°1 – left view; fig.5 n°4, n°5; fig.7). In both case, the series of narrow and convergent removal are short (10 to 41 mm long) and followed by numerous hinged scars. Convergent bladelet cores show few preparation stigmas and only one or two cores shows unilateral cresting. The striking platforms may be flat (large scar, cortical or fracture surface) or prepared.
Parallel bladelets and some bladelets with convergents edges have been produced from parallel bladelet cores on flakes (around 8 pieces) (fig. 5 n°2 and n°3; fig. 7). The bladelets were removed from a wide, flat surface, on an edge. *Débitage* is unidirectional but one core shows scars in two opposite directions (possibly indicating maintenance of the flaking surface). Series of removals are often short but we cannot exclude the hypothesis of longer

series. Again, hinged scars are frequent due to consumption of the carina (fig.5, n°2). The striking platform is always flat and is either a natural surface, a large removal or part of a lower face. In only one or two cases, it has been maintained by one or more scars.
Some cores (around 4 pieces) have several flaking surfaces in association (convergent and/or parallel). The production may be similar or different on the same core, but never occur over the entire block (fig.5 n°1 and n°2).
Besides these main types of cores, are also presents more complex prismatic bladelet cores (around 4 pieces) (fig.5, n°6). Limestone and chert/flint were used, both local and exogenous. The cores display a relatively long series of convergent and/or parallel removals on a wide and slightly convex flaking surface. Preparation of the cores would have been an important phase during which crests, especially posterior ones, were probably made. Maintenance focused on the striking platforms, with the removal of core microtablets from the flaking surface on at least one piece (fig.5, n°6).

4.2.2.2 Twisted bladelet

Twisted bladelets represent 45,3% of the main-intended bladelet (n=148/327) and are characterized by a marked twist (n=61) or a moderate twist (n=87) (fig.4, n°10 to 16). They are mainly ranging from 14 and 38 mm long and from 4,5 to 7 mm wide (for an average of 5.5 mm in width). Apart from a few pieces in which fortuitous torsion occurred during production, the bladelets with a marked twist indicate high-quality and perfectly controlled production. For example, some of these bladelets have short proximal scars: these were needed to shift the guide ridge and the required impact point to twist the removals (fig.4, n°13 and 15). The direction of the twist is overwhelmingly counter-clockwise (n=55, 90.2%). As regards the moderately twisted bladelets (fig.4, n°13 and 16), without a matching core, it is difficult to demonstrate intentional production. Several assumptions need to be considered such as: an intentional production; an opportunistic production mixed in with other bladelets; unintended by-products. Although some pieces are probably in the last category, the large number of these bladelets supports the first two hypotheses. A brief review of the direction of the twists shows that it is mostly counter-clockwise, as in the bladelets with a marked twist.
Given the cores studied, the presence of twisted bladelets is surprising as they do not relate to any identified core in Garm Roud 2. It seems that some of the twisted baldelets were imported into the site. However, some maintenance flakes and blades present at Garm Roud 2 show twisted bladelet scars suggesting that twisted bladelets were also produced on the site. Moreover, given that some waste flakes display both straight and twisted bladelet scars, the hypothesis of opportunistic twisted bladelet *débitage* is also possible.

4.2.2.3 Preparation and maintenance bladelets

Some bladelets are clearly linked with the preparation or maintenance of bladelet cores. Among them are present bladelets with a thick triangular or trapezoidal section, crested and sub-crested bladelets relating the early stages of production (fig.8 n°1, n°2, n°3, n°4, n°5, n°9). Regarding maintenance phases, some bladelets were used to restore lateral and distal convexities. It is thus possible to recognise thick, narrow bladelets with convergent or parallel edges, on which hinged removals can be observed on the proximal part, and sometimes one or two abrupt side edges (fig.8, n°6).

4.3 Tools

Most of the main-intended bladelets, blades and flakes are not retouched and represents probably the main tools of the lithic assemblage of Garm Roud 2.
Retouched tools are mainly made up of retouched bladelets (n=64) (tabl.4; fig.4, n°1 to 3, 5, 7, 9, 13 to 16, 28). It should be note that the twisted retouched bladelets are over-represented compared to their percentage in the total number of bladelets (n=31/64, 48.4%). This could indicate imports of a larger number of finalised twisted bladelets than straight bladelets, which is also suggested by the absence of cores and the very few remains from twisted bladelet debitage. The retouches are located on the dorsal face of the blanks, on one or both sides and are often short and semi-abrupt. None of them can be considered as *stricto sensu* Dufour bladelet (for a review of the different definitions of Dufour bladelet, see Lucas, 1997) and only one (uncoordinated) bladelet shows a convergent retouch forming an Arjeneh point. The percentage of broken retouched bladelets (n=55/64, 85.9%) is much higher than for all bladelets (69.2%). Their condition may partly explain why they were left behind at Garm Roud 2, but a specific intention cannot be excluded, which could be tested through a study of the fractures. The length of the unbroken retouched bladelets ranges from 15.5 to 33.5 mm. Analysis of their mesial width shows a high degree of homogeneity, with 45 retouched bladelets between 4.5 and 6 mm wide (70.3%) . Apart from modifications due to wear and tear, the retouches therefore seem to have been made to adjust the morphology of the bladelet, especially in width, rather than to create a cutting edge. It is therefore likely that some unretouched bladelets were also used for similar purposes because they were of a suitable size.
We also note the presence of some common tools: two endscrapers on flakes (fig.4, n°25), a dihedral burin on a blade produced with an excellent and probably exogenous raw material (fig.4, n°26), five retouched blades, two burins on small flakes (although they could be accidental removals) and four retouched flakes with a marginal retouch.

Retouched baldelets	Endscrapers	Dihedral burin	Burins	Retouched blades	Retouched flakes	Total
64	2	1	2	5	4	78
82.05%	*2.57%*	*1.28%*	*2.57%*	*6.41%*	*5.12%*	*100%*

Table 4 – Number of retouched tools at Garm Roud 2

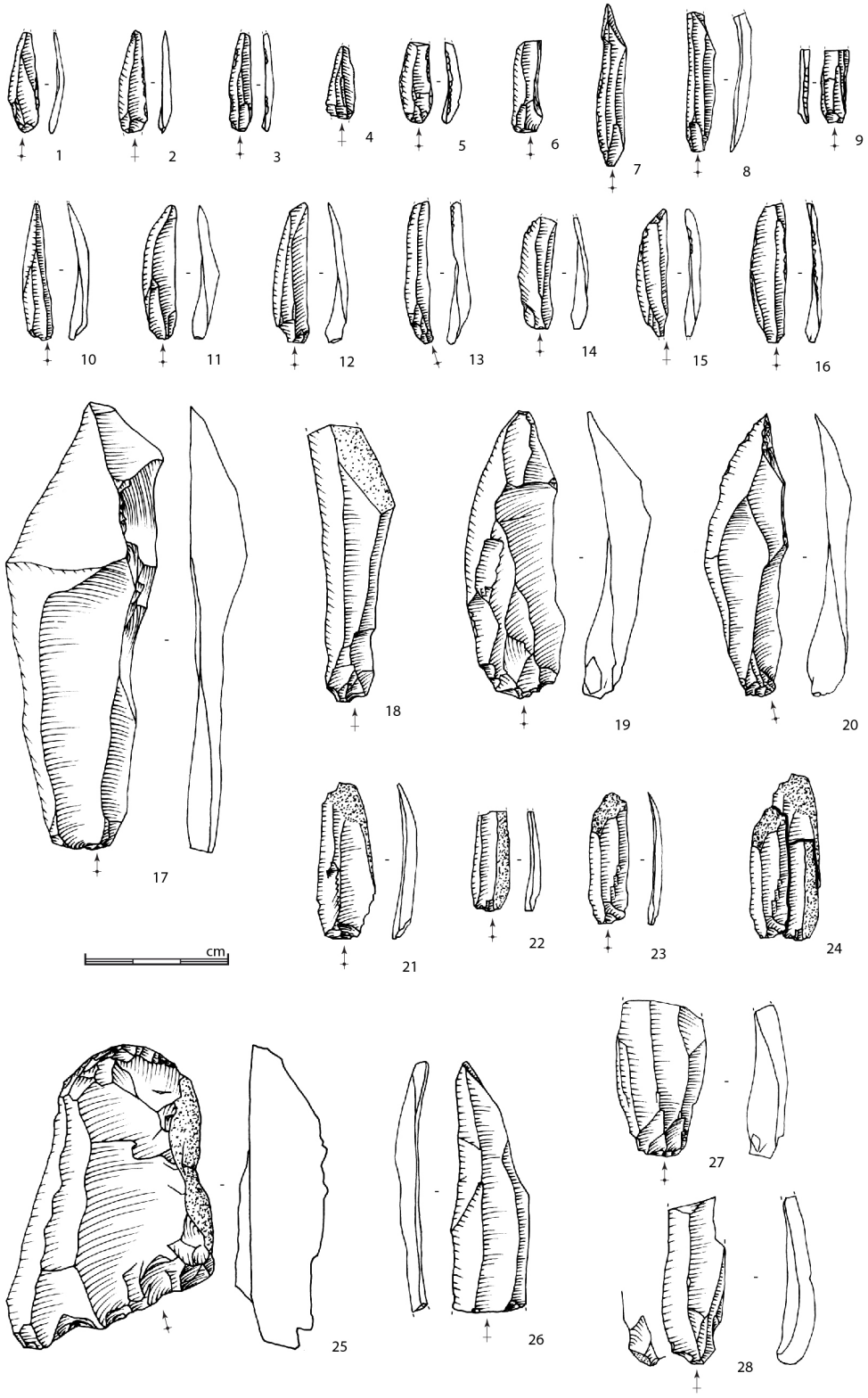

Figure 4. Garm Roud 2. Bladelets, blades and tools. N°1 to 9, 21 to 23: straight bladelets (n°1 to 3, 5, 7 and 9: retouched bladelets). N°10 to 16: twisted bladelets (n°13 to 16: retouched bladelets). N°17 to 20, 26 to 28: blades (n°26: burin; n°28: retouch blade on the proximal part). N°24: refitting of bladelets n°21 to 23. N°25: endscraper on flake (drawing B. Chevrier)

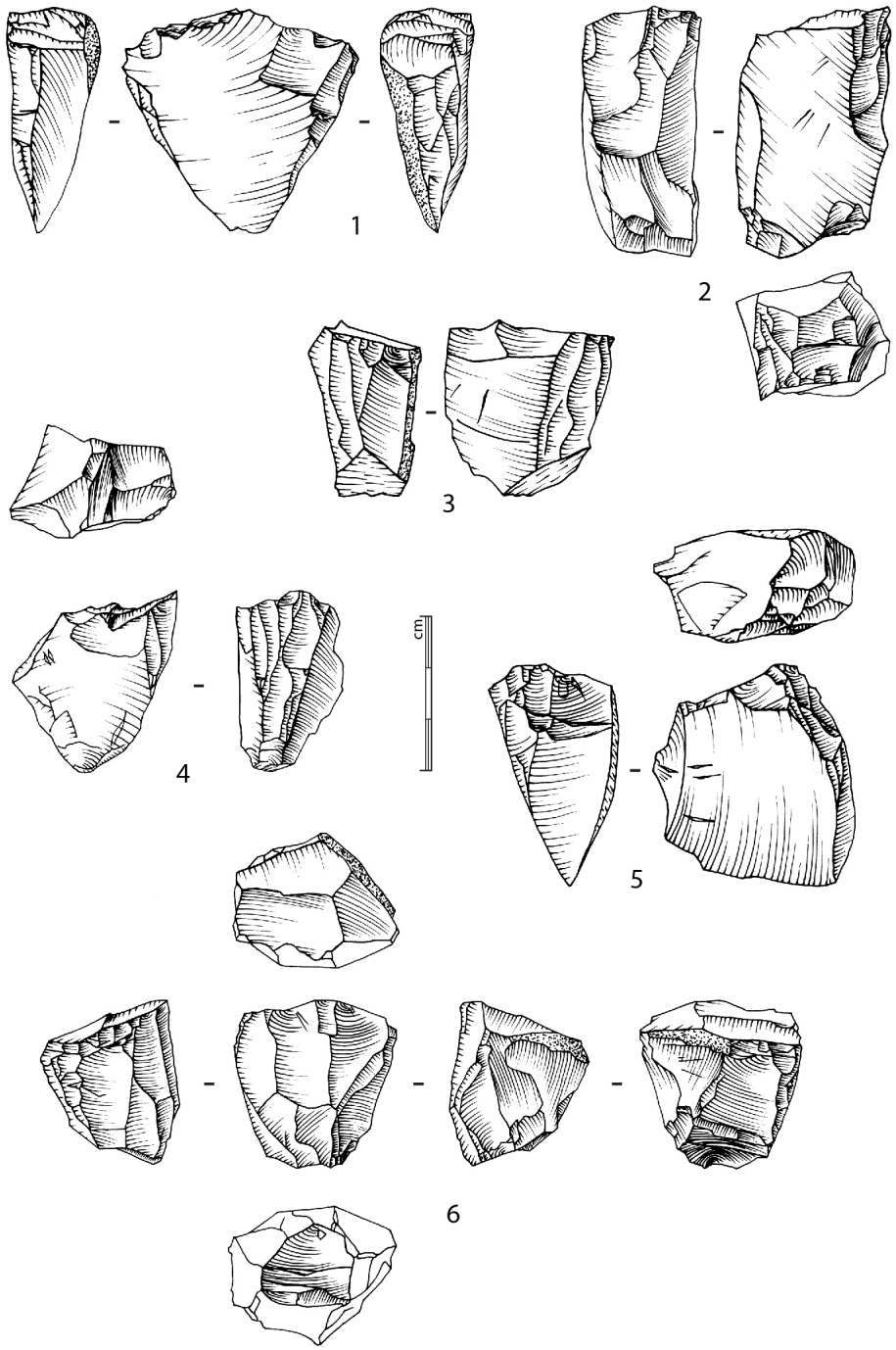

Figure 5. Garm Roud 2. Bladelet cores. N°1 to 5: convergent and parallel bladelet cores; n°6: complex bladelet core (drawings B. Chevrier).

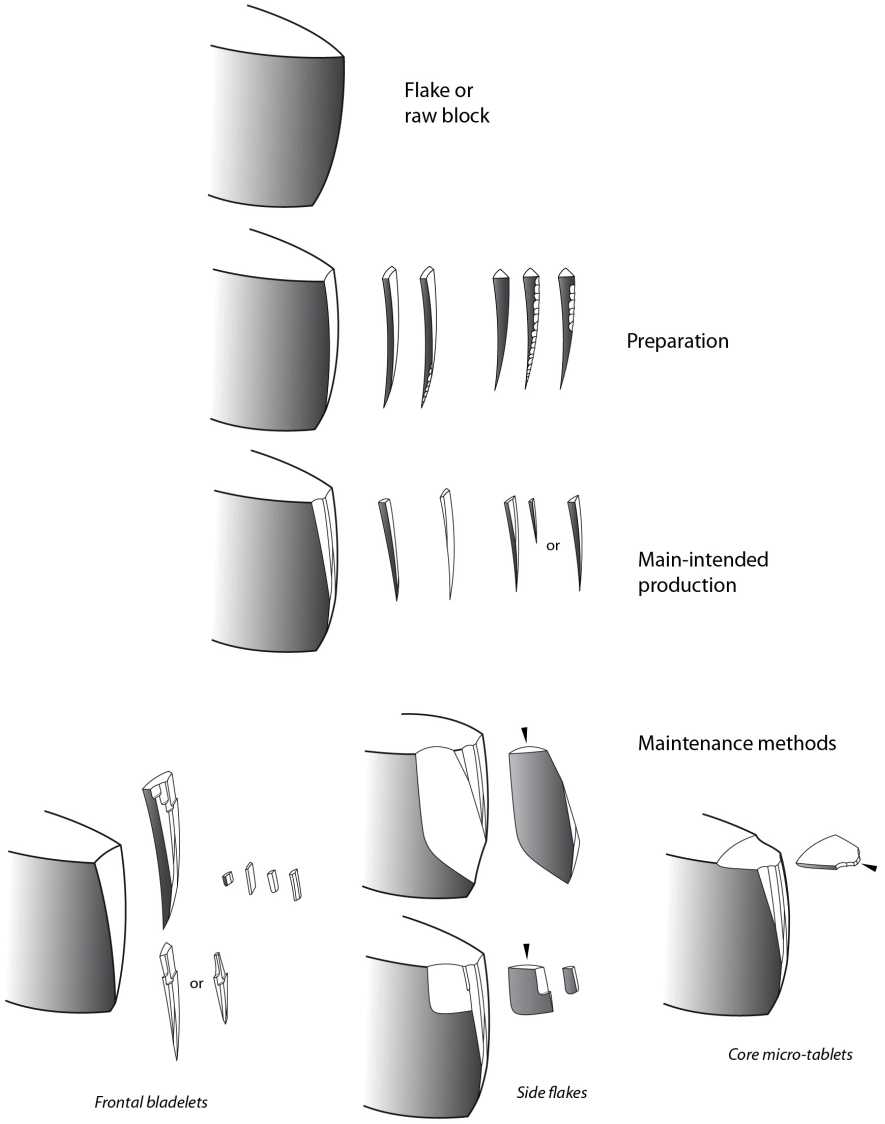

Figure 6. Garm Roud 2. Summary of the preparation, intended volumes, production and maintenance of the convergent bladelet cores

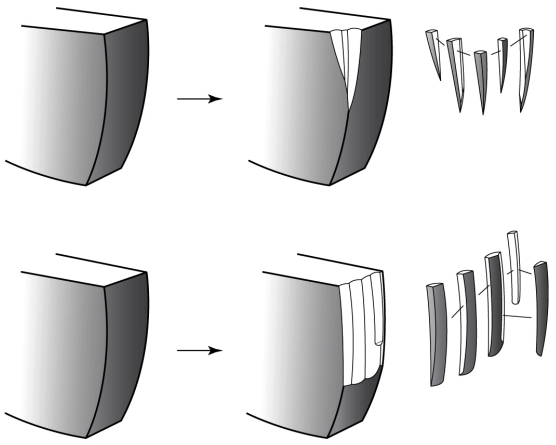

Figure 7. Garm Roud 2. Summary of the production and intended volumes of the convergent bladelet cores (on top) and the parallel bladelet cores (at the bottom) (schemas B. Chevrier)

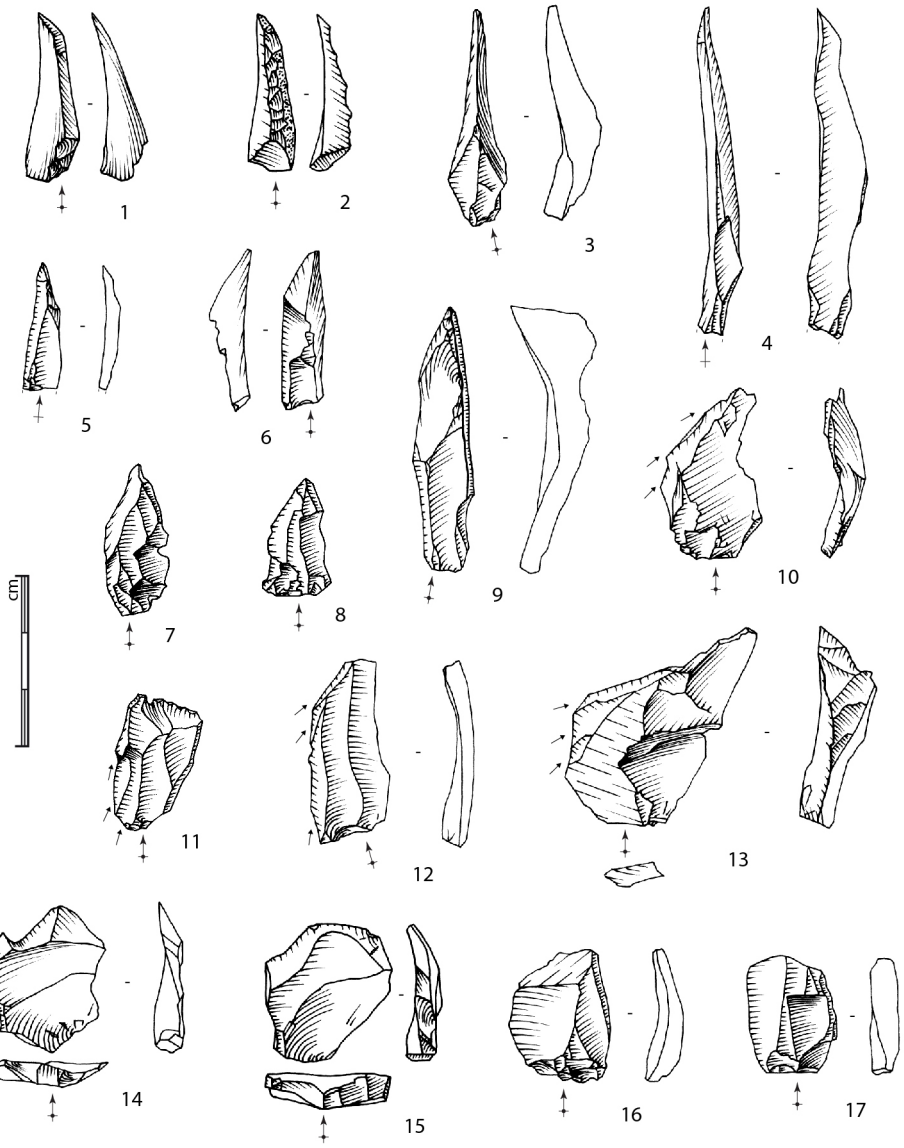

Figure 8. Garm Roud 2. Preparation and maintenance bladelets and flakes. The small arrows on n°10 to 13 indicate bladelet removals (drawings B. Chevrier)

5. DISCUSSION

5.1 Main contributions

The technological analysis of the Garm Roud 2 lithic assemblage show a variety of *chaînes opératoires* mainly focused on bladelet production and to some extent on flakes. Representing more than 45% of the blanks, bladelets, straight or twisted, show a homogeneity and regularity of their mesial widths around 4.5 and 6 mm. Their mesial width is controlled either during *débitage* or by a short or very short, direct, semi-abrupt or more rarely abrupt retouch. As regards straight bladelets, parallel or with convergent edges, all stages of production are represented at Garm Roud, from the acquisition of the raw material through the exploitation of the blocks and the production of blanks and tools. Indeed, as regards flake cores and some bladelet cores, the raw materials were collected locally. These blocks are flaked or broken, and while the flakes may have been retouched to make tools (e.g. endscrapers), they were

mainly used as blanks for simple convergent and parallel bladelet cores. As regard twisted bladelets, no twisted bladelet cores have been identified: it seems that some of the twisted bladelets were imported into Garm Roud 2, but it is likely that *débitage* of such bladelets occured on the site. The presence of a large number of these bladelets and of some maintenance flakes and blades points to several production patterns: very well controlled *débitage* of bladelets and probably opportunistic production in combination with other kinds of bladelets. A small number of cores relate to prismatic or pyramidal designs and also produced bladelets. These point to more complex technical intentions requiring more preparation and maintenance. It is possible that these cores were prepared and partially used elsewhere, then imported to Garm Roud 2 before being left on the site. Apart from bladelets and flakes, some blades mainly made on exogenous raw material are also present at Garm Roud 2. No evidence supports the idea of a continuity of blade and bladelet reduction strategy: the absence of blade cores and preparation / maintenance blades therefore shows that production was done elsewhere, on exogenous raw materials of excellent quality.
As regards tools, straight and twisted bladelets, unretouched or retouched, are the main components of the toolkit. These are associated with rare common tools related to domestic use (endscrapers, burins). We note the absence of Dufour bladelet and Arjeneh points, two major components of the Zagros Aurignacian industries.
Based on these observations as well as on all archaeological data (e.g. remains of large fragmented mammals with marks of percussion and cut marks, burned bone fragments and lithic artefacts in association with numerous charcoal fragments) the assemblage has been interpreted as representing a single and fairly brief occupation most likely linked to butchering activities and to hunting-related trips (Berillon, Asgari Khaneghah, 2016). In the future, a micro wear analysis of the tools as well as of the retouched bladelets's breakages will allow us to discuss whether this industry is linked only to specialized activities (butchery and/or hunting) and short occupation and/or due to the small excavation area and/or to a cultural tradition.

5.2 Regional comparisons

The Upper Paleolithic sites are, in the Central Iranian Plateau and neighbouring areas, mainly concentrated in the Zagros and its foothills. If we consider only stratified sites that have delivered reliable information (Shanidar, Yafteh, Warwasi, Ghār-e Boof, Kaldar), these are very few in number and for old excavations, lithostratigraphic methods have seldom been used, so that the assemblages from some of these sites (e.g. Yafteh, Warwasi) relate to artificial collections, covering different settlements (Braidwood, Howe, 1960; Braidwood et al., 1961; Conard, Ghasidian, 2011; Olszewski, Dibble, 1993; Otte, Kozłowski, 2007; Otte et al., 2007; 2012; Solecki, 1963). However, they help to understand evolutionary trends and reflect the presence or the absence of some classes in these archaeological sequences.
Yafteh is currently the best known site in Zagros thanks to new excavation campaigns in the late 2000s (Otte et al., 2011, 2012). The whole sequence relates only to the Upper Palaeolithic and the dates from Hole and Flannery's excavations (29,000-38,000 BP) have been reassessed (Otte et al., 2011; Zwyns et al., 2012), as new samples are now considered to link the entire sequence to a single early phase dated to 33,000 to 35,000 BP, i.e. 37,000 to 39,000 Cal BP. These results may match the earliest Shanidar (Iraq) layer C dates, at 28,000 to 36,000 BP (Solecki, 1963). With these new data, we can dismiss the idea of a comparison with the most recent Garm Roud 2 lithic assemblage (33,878 ± 3,300 Cal BP) and discard the previously suggested hypothesis of a possible link based on the most recent dates from Hole and Flannery's excavations (Berillon et al., 2007; Chevrier et al., 2006; Otte et al., 2011; Zwyns et al., 2012). Moreover, the new results on the Garm Roud 2 reduction sequences confirm the

distinction between this site on the one hand and the Zagros Aurignacian (Yafteh, Warwasi, Shanidar C in particular) linked to the Levantine Aurignacian on the other hand (Olszewski, 2009; Otte, Kozłowski, 2004, 2007). If the high proportion of typological burins is still a constant criterion, the significant number of endscrapers, carinated pieces, pointed bladelets such as Arjeneh points and *lamelle Dufour* in the Zagros Aurignacian, means that Garm Roud 2 must be distinguished from this complex. Furthermore, the technological analysis of the Yafteh industries describes a stratigraphically lower set composed of long, straight or curved bladelets and pointed and *lamelle Dufour* on the one hand, and an upper complex with small twisted bladelets, *lamelle Dufour* and burins on the other hand (Bordes, Shidrang, 2009, 2012), which also suggests clear differences with Garm Roud 2. Otherwise, the recent investigations carried out in Kaldar cave and Gilvaran cave and the data relating to the Upper Paleolithic lithic industries, clearly attributed to the Zagros Aurignacian (Bazgir et al., 2014, 2017), also show clear differences with Garm roud 2.

N.J. Conard and E. Ghasidian (2011) and Ghasidian et al. (2017) have put forward the hypothesis of a cultural group that differs from the Zagros Aurignacian: the Rostamian. This is located in the southern Zagros and has been defined from the Ghār-e Boof site in particular, where bladelet debitage on blocks using soft stone percussion and wide twisted bladelets with a direct abrupt or semi-abrupt retouch on one or both sides, called Rostamian bladelets, have been recognised. These were found together with small twisted retouched bladelets, a few inverse-retouched bladelets, endscrapers and a very few Arjeneh points. These features clearly distinguish Garm Roud 2 from the Rostamian assemblages, which is also suggested by the early dates of Ghār-e Boof: 31,000-37,000 BP, i.e. 35,000 to 41,000 Cal BP.

Out of Zagros, in the Iranian Plateau, Sefid-ab has yielded no date because the assemblage was collected on the surface (Otte, Kozłowski, 2007; Shidrang, 2009). However, based on the presence of bladelet Dufour, carinated burins and endscrapers, it has been linked to a recent phase of the Zagros Aurignacian. The Garm Roud 2 assemblage therefore cannot be linked with the Sefid-Ab collection.

At last, in the northern fringe of the Iranian Central Plateau, the lithic assemblages of the open-air sites of Delazian and Mirak - the nearest Paleolithic sites to Garm Roud 2 - are the witness of several occupations by different entities during the Upper Paleolithic (Vahdati-Nasab, Clark, 2014 ; Vahdati-Nasab et al., 2019). The lithic industry of Delazian, although collect on the surface, is focus on straight bladelet production mainly from prismatic cores and on twisted bladelets knapped from carinated cores. The toolkit is various and composed of diverse retouched bladelets including bladelet Dufour and numerous endscrapers, carinated endscrapers and burins (Abolfathi et al., 2018). If this assemblage share clear affinities with the lower and the recent phases of the Zagros Aurignacian (Abolfathi et al., 2018; Vahdati-Nasab, Clark, 2014), its typo-technological features distinguish Delazian from Garm Roud 2.

In the same area, the open-air site of Mirak, recently excavated yielded in situ archaeological assemblages including an upper assemblage with Upper Paleolithic affinities but disturbed and poorly preserved and an intermediate assemblage with a mixt of artefacts with Upper and Middle Paleolithic affinities (Vahdati-Nasab et al., 2019). This intermediate assemblage, which may be affiliate to an Early Upper Paleolithic or even to an Initial Upper Paleolithic is characterized by a production of Levallois flakes (points and flakes), blades and straight, curve and some twisted bladelets knapped from unidirectionnal – prismatic – cores and narrow-face cores on flakes. These two assemblages are dated by OSL in the ranges of 21-28ky and 26-33ky respectively (Heydary et al., 2020). Despite a difficult comparison between the assemblage of Garm Roud 2 and those of Mirak, their composition and the sharing of some common features as well as ages highlight how complex the question of Upper and Early Upper Paleolithic in the area.

How to explain the presence of such different typo-technological entities in the different Iranian area? Do connections exist – expansions of humans and/or ideas – between Garm Roud 2 and this part of the Alborz with the neighboring or more distant regions during the Early Upper and Upper Paleolithic? Or do these different entities reflect independent techno-cultural developments carried out during these Paleolithic periods?

To the west of the Iranian regions, in the Levant, two main technocomplexes from the Early Upper Paleolithic are present, the Early Ahmarian focus on *blade/bladelet industries* and the Aurignacian focus on *flake industries* (Gilead, 1981; Marks, 1981). The Early Ahmarian seem to be around 43-42 ka BP (Belfer-Cohen, Goring-Morris, 2014) with a multiplication of occupations around 34 to 30 ka BP including those, for example, of Qadesh Barnea (Gilead, Bar-Yosef, 1993) in the southern, Umm el Tlel area 2 (e.g. layer I4'c') (Ploux, Soriano, 2003) and Wadi Khara 16R (Kadowaki et al., 2015) in the northern inland regions, Ksar-Akil X-XI (Douka et al., 2013; Bergman, 1987) and Üçagizli (Khun et al., 2009) in the mediterranean zone. Despite regional differences, the Early Ahamarian industries share an emphasis on bladelets production, straight and slightly curve, parallel or with convergent edges. Bladelets are modified into retouched (with fines and semi-steep or steep retouches) and backed bladelets as well as into points including El Wad point types. If the core reduction srategies can be focus on a bi-directional blade/bladelet knapping method to a single plateform core or on an opposed platform, mainly for the northern assemblages (Goring-Morris, Davidzon, 2006), the bladelet production is, for almost all Early Ahmarian assemblages, based on an unidirectionnal knapping method to a single palteform from the narrow face of a core (Belfer-Cohen, Goring-Morris, 2014) such as, for example, in Nahal Nizza III, industry from which the concept of "*narrow fronted core with tyical Y-shaped configuration"* was proposed (Davidzon, Goring-Morris, 2003). In almost assemblages, a single core strategy contiuously produces blades and bladelets (Kadowaki et al., 2015). Based on these typo-technological elements, the Garm Roud 2 assemblage can be compared to some Early Ahmarian assemblages, such as that of Umm el Tlel area 2 (I4'c'). Similarities relate to some reduction scheme (unidirectionnal knapping method from a narrow face of a core) as well as the tool kit based in both cases on lightly retouched bladelets (broken for many of them) and charactrized by the absence of El Wad types points (Ploux, Soriano, 2003). However, the Garm Roud 2 blade/bladelet production remain quite different and a link with the Early Ahmarian industries seem unlikely. The reduction schemes are various and autonomous from cores and flakes and a high number of baldelets have a twist profile. Based on the bladelets technological characteristics and despite important typological differences, the assemblage from Garm Roud 2 share some similarities with the early facies of the Levantine Aurignacian formerly called "A" (Copeland, 1975; Goring-Morris, Belfer-Cohen, 2006) as represented by the industries of Ksar-Akil XI-XIII (Bergman, 1987; Williams, Bergman, 2010), likely Kebara I-II (Bar-Yosef et al., 1996) and Umm el Tlel area 5 (Ploux, Soriano, 2003). The Ksar Akil XI-XIII assemblage, dated for the XII level around 40-39 ka cal BP (Douka et al., 2013) and the Umm el Tlel area 5 industry are based on blades and bladelets production with a high number of twisted bladelets modified into retouched bladelets. The bladelets production modalities are autonomous and diverse – carinated pieces, cores on flakes, unidirectionnal primatic cores including the *lateral carinated scraper* (Bergman, 1987). These assemblages are typologically characterized by a high number of burins and then by end-scrpers, notches and retouched bladelets including, except for the Umm el Tlel tool kit, El Wad points. Nevertheless and despite some technological similarities between the assemblage from Gram Roud 2 and the Early Ahmarian and the Levantine Aurignacian "A" technocomplexes, the differences do not allow to group this industry within the Early Upper Paleolithic traditions of the Levant.

To the east, in Central Asia, the recently studies and discoveries of the Upper Paleolithic sites of Kulbulak, Dodekatym-2 and Shugnou (Kolobova et al., 2011, 2013 ; Ranov et al., 2012)

allowed to highlight a new cultural-technlogical tradition called Kulbulakian which share meany features in common with the Baradostian / Zagros Aurignacian and the Rostamian technocompelxes (Kolobova, Krivoshapkin, 2014) as well as some typo-technological similarities with the lithic assemblage of Garm Roud 2. The early/middle stage complexes of the Kulbulak tradition, estimated possibly around 35-25 ka BP, is characterized by the development of flakes, straight small blades and bladelets from prismatic and narrow-face cores and by non-straight bladelets mainly knapped from carinated cores (Kolobova et al., 2014 ; Kolobova, Krivoshapkin, 2014). The tool kits is composed of many common tools on flakes, numerous retouched blades and bladelets including Dufour bladelets as well as some backed bladelets (Kolobova, Krivoshapkin, 2014). Although the lithic assemblage from Garm Roud 2 share many technological attributes with the early and middle Kulbulakian technocomplex, the significant typological differences prevent us from fully affiliating the assemblage of Garm Roud 2 within this techno-cultural tradition.
Finally, it maybe with some Early Upper Paleolithic assemblages from the northern region of the Caucasus that the techno-typological similarities seem most obvious. In 2012, Y.E. Demidenko have proposed connections between "Southern Caucasus Early Upper Paleolithic" industries and some assemblages of the Southern Zagros (e.g. Garh-e-Bof Cave AH IV-III) and of the Alborz region such as Garm Roud 2 (Demidenko, 2014). The majority of the "southern Caucasus EUP" assemblages including those of Dzudzuana cave Units D (35-32 ka cal BP) and Ortval Klde rock-shleter layers 4d-4c (40-26 ka cal BP) in the southern as well as Mezmaiskaya cave (35-34 ka BP) in the northern, share similar technical traits based on fine or narrow bladelet and microbladelet production mainly from unidirectionnal – prismatic or pyramidal – cores and narrow-flakes bladelet cores on flakes (e.g. Meshvilani et al., 2004; Bar-Yosef et al., 2006; Alder et al., 2008; Golovanova, Doronichev, 2012; Demidenko, 2014). In all these assemblages, the most distinctive tools types are small (or microliths) finely retouched bladelets (around 2-4 mm wide), fine backed bladelets and light points with bilateral fines retouches. In the eastern part of the southern Caucasus , the assemblage of Aghitu 3 cave AH VI-III (36-24 ka cal BP) (Kandel et al., 2014, 2017) share also close typo-technological affinities with assemblages mentionned above (e.g. Dzudzuana cave) and offer perhaps the best comparison to Garm Roud 2. Througouht the sequence, the industry show an emphasis on small or narrow bladelet production mainly from unidirectionnal palteform cores. The tools types are mainly represented by laterally finelly retouched bladelets (or one or both edges) while other tools types including a variety of backed bladelets, burins and carinated scrapers are rare as are cores. Additionnally, we can highlight here the presence of narrow bladelets often twisted (Kandel et al., 2014).

6. CONCLUSION

The technological analysis of the artefacts collected at Garm Roud 2 presented here has produced a dynamic view of the site's productions and toolkit. Distinctive Upper Palaeolithic features have been identified: straight and twisted bladelets, bladelet cores, retouched bladelets, laminar blanks and some common tools such as burins and endscrapers. If the assemblage of Garm Roud 2 appear to be different from the Zagros Aurignacian, it share common features with some Upper Paleolithic or Early Upper Paleolithic assemblages from peripheral regions : the diversity of knapping patterns and bladelet production, the balanced combination of straight and twisted bladelets, the debitage of numerous flake blanks and the high percentage of bladelets with direct, short, semi-abrupt or even abrupt retouches. Its likely function as a hunting camp (Berillon, Asgari Khanegah, 2016) necessarily influenced the components of the industry and the proportions of cores and tools, but the differences remain significant. One would be tempted to consider Garm Roud 2 as one site within a local techno-

complex, which may be peculiar to the Caspian region and later than the Zagros Aurignacian and the Rostamian. However, although a techno-cultural mosaic is usually obvious, it seems premature to define such a complex when few Upper Palaeolithic sites have been surveyed or excavated in the area. A major challenge must now be to find new stratigraphically well-located sites in northern Iran that could yield reliable dates to further our understanding of cultural relationships between Upper Palaeolithic groups in Central Asia.
Although the Garm Roud 2 settlement, given its late chronology, does not provide new information about the emergence of bladelet debitage, this study has produced new data about the development of these industries and the Upper Palaeolithic groups concerned. Thanks to its precise stratigraphic framework, the Garm Roud 2 site has to be considered as a key site for defining and understanding the evolution of Upper Paleolithic cultural complexes in the Central Iranian Plateau and neighbouring areas and more widely in Central Asia.

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