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The Shouldered Pieces from the Santa Maria di Agnano Cave (SMA-Extern). Their Chrono-cultural Positioning During the Upper Paleolithic in Southern Italy

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ABSTRACT
The Santa Maria di Agnano cave (Puglia, Italy) shows a long human occupation that began in the Gravettian and went on in the Epigravettian periods. Among the lithic pieces discovered, many are so-called shouldered objects. This article intends to present and study them, but also to discuss the relevance of the diagnosis about shouldered points and shouldered bladelets. More broadly, the issue of the association of the shouldered point with ancient Epigravettian is discussed and questioned. On the basis of observations made in the Santa Maria di Agnano cave, the duration of existence of shouldered points and bladelets is discussed, which leads s to questioning the status of thes pieces as a key fossil.

KEYWORDS
Upper Paleolihic; Apulia; Gravettian; Epigravettian; shouldered pieces

Introduction

The Santa Maria di Agnano cave opens in the Northern zone of the Salento region. This territory covers the Southern end of the province of Apulia (Italy). The cave belongs to a group formed by the numerous prehistoric sites in the most Southern part of the Italian peninsula.

The site appears like a vast 40 meters wide and 20 meters deep shelter. It results from a collapsed sink hole. Its porch opens at 175 meters above sea level at the foot of the Rissieddi plateau belonging to the last Southern Murge hills. The site overlooks the present Adriatic coastal plain whose shore is 6.2 km away (Figure 1).

The archeo-stratigraphic sequence of the SMA-Extern zone shows a long human occupation, covering a time span of about 14.000 years (Figure 2A). On the lower level, Gravettian occupations (SU9-SU6) are found, covered, without any hiatus period, by Epigravettian occupations (SU6A-SU4/upper). Paleo-environmental studies restored the natural biotopes of the original flora and fauna (Baills et al, in press).

For the SU4C to SU4A, they revealed the existence of an open landscape in keeping with a dry cold climate throughout the Epigravettian sequence (Renault-Miskovsky et al., 2011, 2015). So far, only the fauna related to the Epigravettian sequence (SU6-SU9) is known. The horse-aurochs group is largely prevalent over rarer species such as deer, ibex, wild boar, leopard and hare.

The sedimentological report indicates that the SMA-Extern zone did not undergo major taphonomic overhauls which might have disturbed the organization of the different layers (Chakroun et al., 2020).

In 1991, the grave of a pregnant woman, Ostuni, was discovered under the present porch of the cavity. It dates back to 23.446 ± 107 years BP and was attributed to Gravettian (Baills, 2012; Coppola, 2012). The fact she was laid in a grave and her funeral procession, particularly her headdress with seashells and deer spits, show obvious similarities with the grave the Cavillon woman (Liguria, Italy) over 800 km away in the North-West (Lumley de, 2016 et Tozzi, 2016). Since 2007, constant archaeological research of an 18 sqm. area located in the immediate front over the present porch called "SMA-Extern" has enabled researchers to reveal and study the occupation of the site for quite a long period between 25.000- and 10.000-years BP, as indicated by C14 datings (Figure 2 B, C).

This article studies the 37 shouldered pieces discovered, so far, in the filling of SMA-Extern. These items come from the late Gravettian layers (SU8-SU6) and Epigravettian (SU6A-SU4) (Baills, 2015b).

The word "shouldered" appeared early in prehistoric literature. In such a situation, the appareance of a widely shared consensus concerning its definition might have been expected. It is not so and it can be noticed that authors have used the word "shouldered" with often different meanings. This descriptive

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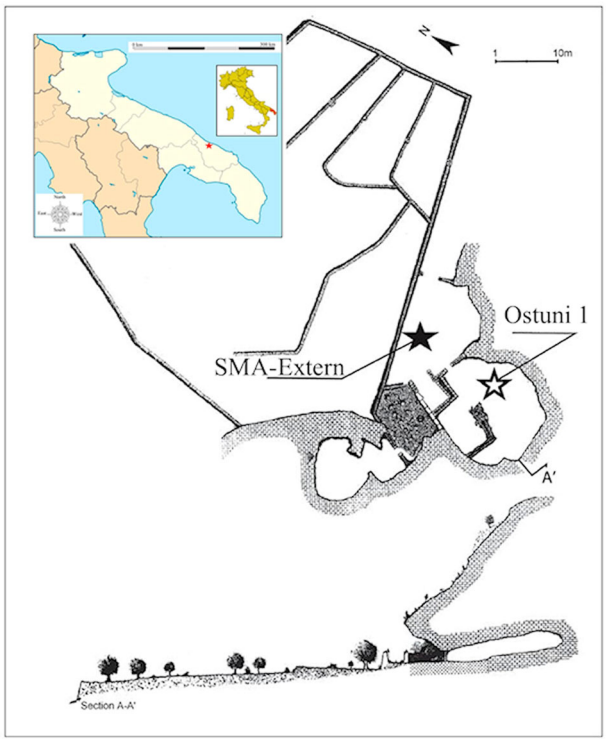


Figure 1. General planimetry of the Santa Maria di Agnano site (the white star indicates the burial of Ostuni 1, the white one positions the SMA-External zone)(from Coppola). In medallion the region of Apulia in Italy (the red star indicates the SMA cave).

characterization does not consider the functional aspect of the piece. It does not define the item functionally allowing the alternative of a distal notch, i.e. a piece that is not a "projectile point".

On the other hand, it is clear that considering the shoulder as an element of a fitting system generated the sometimes-improper equalization of shouldered pieces with projectile fittings.

This attribution is too restrictive concerning the family of shouldered items, which reveals strong morphological as well as functional polymorphism.

In the first place, the taxonomic problems raised by the morphological heterogeneity of these shouldered pieces have to be discussed.

Thus, the question is raised about distinguishing, within this corpus of authentic armatures (real shouldered points), pieces that are just tools inserted in a shoulder (shouldered scrapers, for instance) and also pieces which are nothing but scraps marking particular operative chains (accidents during the making of bladelets or backed points, failed microburins …)

Referring to previous typologies and adapting them to our corpus, shouldered points considered as arrowheads could be differenciated from the other shouldered blades not considered as being used as weapons.

Placed in the local stratigraphic context of SMA-Extern, a chrono-cultural positioning of the various shouldered pieces is proposed. It is then discussed on the scale of the Italian territory and more widely in the North-Western part of the Mediterranean.

Materials Et Method

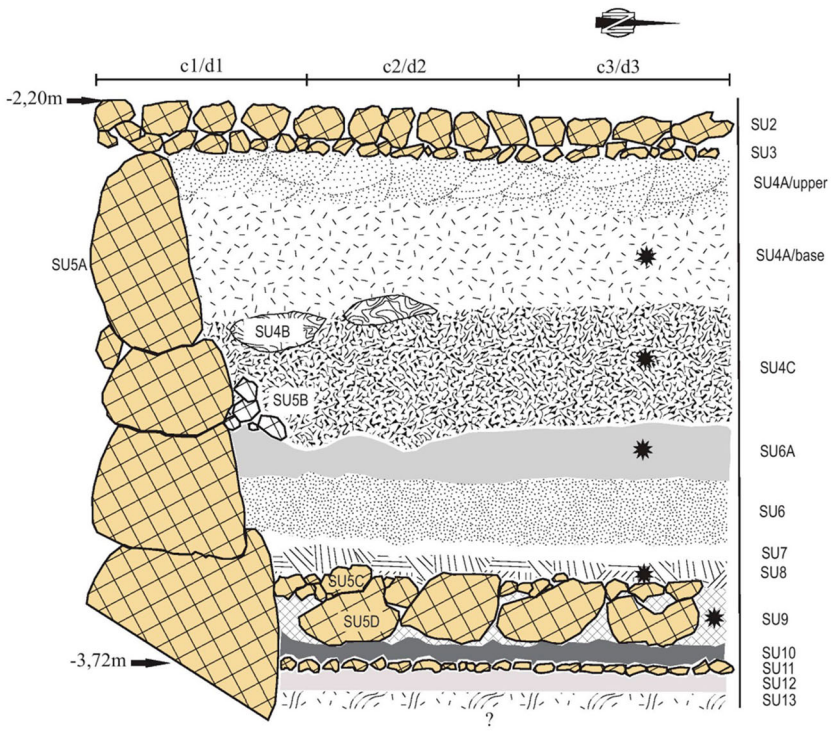
The corpus of shouldered pieces in the SMA-Extern zone of the Santa Maria di Agnano cave consists of 37 whole or fractured shouldered pieces. As said above, all these items come from the late Gravettian (SU8-SU6) and Epigravettian (SU6A-SU4) layers (Table 1)

The 37 shouldered pieces were extracted from a global corpus of 7468 lithic artifacts that make up the database of Santa Maria di Agnano. They form an original group among other more common objects such as burins or end scrapers. For the relative frequencies of the different families of lithic tools on the site, see their exhaustive presentation (Baills, 2015a). The corpus under study offers a small number of items. However, the fact that it comes from a single place and that shouldered pieces are present in the whole filling gives us the opportunity to estimate the existence of a positive dynamics concerning both their frequence and typology.

Our systematic approach of shouldered pieces cross-checks data from a database built with Microsoft Office Pro Access 2016, brings together quantitative metric data of the object and qualitatitave information about its support as well as the visible scars caused by the knapping economy.

The taxonomic frame of reference used also enabled us to code specific observations of shouldered pieces, such as the position of the shoulder, as well as its lateralization, the direction of its retouch and its association with a back. (Figure 3 n°6). Thus, a few general aspects result from this initial observation. It is the case of the hardly visible marks from the knapping (bulb, wave, bulb scars) which tend to indicate a technique of direct percussion with a soft hammer. On the other hand, some items show that the sharp end of the piece was set in the thick proximal part of the lamellar support (Figure 3 n°1–3). In this case, the debitage axis is opposed to the morphological one. This detail can be explained, perhaps, by the desire to reinforce the tip of the point. It is well known that the tip is the fragile part of the point. The latter often breaks during impact against the bones of the prey or on hard ground, in case of a clumsy throw.

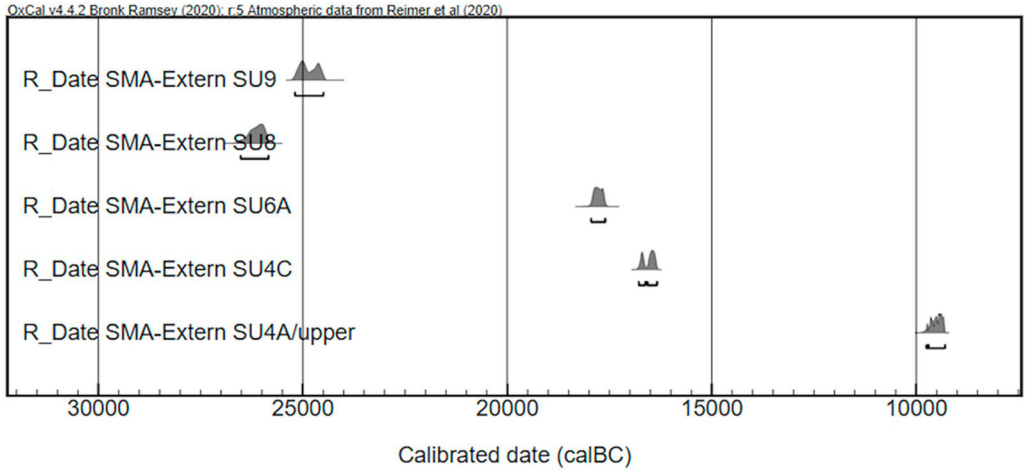
The diacritical reading of the nuclei discovered during the excavation shows a volumetric (3D) management of the pebbles of raw material. Blade detachment began with the removal of a crested blade. Some bladelets with a rectilinear profile and regular parallel edges are



A

Stratigraphic Units	Material and sampling date	Datation reference	Datation type	BP. Ages	Calibrated Ages CalBC*	Laboratory reference	Cultural Age
SU4A/upper	charcoal - 2007	LTL 2514A	AMS	9973±55	9752-9298	CEDAD Mesagne Italy	Final Epigravettian
SU4C	charcoal - 2008	LTL 2786A	AMS	15255±65	16745-16401	CEDAD Mesagne Italy	Early Epigravettian
SU6A	charcoal - 2007	LTL 2513A	AMS	16347±65	18013-17587	CEDAD Mesagne Italy	Earliest Epigravettian
SU8	charcoal - 2007	LTL 1811A	AMS	23945±110	26339-25779	CEDAD Mesagne Italy	Middle Gravettian
SU9	charcoal - 2017	LTL 16798A	AMS	22515±100	25221-24549	CEDAD Mesagne Italy	Middle Gravettian

B



C

Figure 2. A- Chronostratigraphy of the SMA-Extern zone. B- Table of the C14 radiometric datings in SMA-Extern. C- Radiometric dates on the SMA-Extern's treated using OxCal 4.2.4 (Bronk Ramsey, 2009; Reimer et al., 2014).

Table 1. Frequences of the shouldered points and shouldered pieces in the levels of SMA-extern.

	Shoudered points	Shouldered pieces
SU4A/upper	3	3
SU4A/base	10	5
US4B		1
US4C	1	3
US6A	4	1
US6-US8	2	2
US9	1	1

the result of bi-directional blade detachment (Figure 3 n°4). In this particular case, the knappers opened a second striking platform opposite to the first. Finally, the largest number of shouldered pieces results from unidirectional knapping (Figure 3 n°1–3), more rarely from bidirectional knapping (Figure 3 n°4–5)

Results

The basis of these data enabled us to structure the corpus of the 37 items into two groups of shouldered pieces:

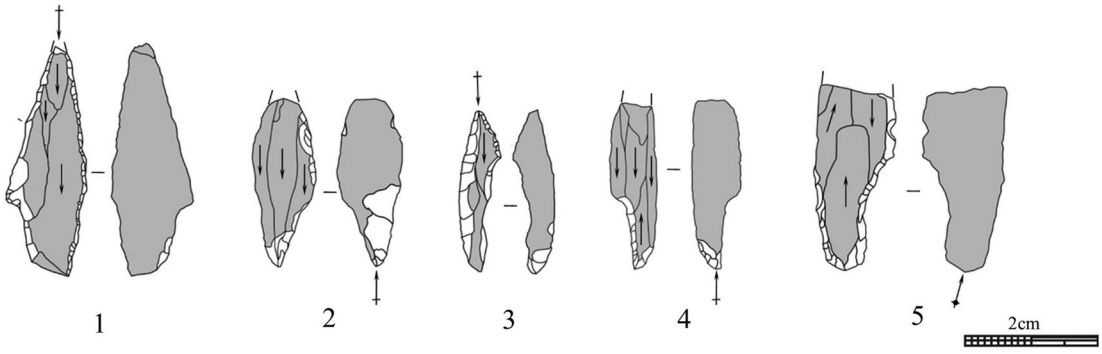
- The first group corresponds to pieces that can be identified as shouldered points, therefore functionally comparable to projectile armatures (Figure 4). Their lamellar lithic support, when the piece is intact, presents a sharp tip, opposite a constant proximal shoulder. The edges show an either natural or retouched convergence. When the inclination of the retouch is abrupt, it forms a back. Thanks to the combination of these various criteria, this group of shouldered points can be individualized. In the case of incomplete specimens, particularly when the apex is missing, the diagnosis of shouldered points was determined by taking into account the presence of a proximal shoulder combined with the initial section of an even partial retouched convergent edge. Thus the corpus under study consists of 21 shouldered points.
- The second group contains pieces that can be qualified as "shouldered blades" (Figure 5). Their shoulder can be proximal or distal but they don't possess a piercing tip. In this case, their distal tip may correspond to the reflected part of a lamellar support (Figure 5 n°4, 9), or even to a zone devoted to a kind of tool different from a point, like a borer (Figure 5 n°11), or an end scraper … (Figure 5 n°8, 16). There also exist shouldered pieces which obviously are unfinished objects. They mark out some stages of various operating chains aiming at producing specific pieces such as straight backed or gibbous bladelets (Figure 5 n°1, 3, 6, 7, 10, 14, 15). They may also be by-products connected with the manufacturing of microliths, such as microburins (Figure 5 n°2, 5, 12, 13). 16 pieces could be included in this category. In that respect, let us mention Broglio's cautionary remark, "shouldered points, which require a precise manufacturing process, are not to be confused with shouldered blades with obtuse distal ends and even less with shouldered fragments, which derive from the manufacture of backed bladelets" (Broglio, 1997) as well as Bietti's "shouldered blades and shouldered points … tools which, in my opinion, are almost always rough drafts for backed points" (Bietti, 1997).

If we only take the whole specimens into account, there does not seem to be a clear size difference between the first and second groups (Figure 5). It is to be noticed, quite obviously, that SMA-Extern shouldered points and blades are pieces of small length and width, the average sizes being around 23–26 mm for lengths and 8–9 mm for widths. The small Standard Deviations (StDev) indicate rather standardized pieces. However, it can be noticed that the shouldered blades present a slightly larger heterogeneity in lengths than the shouldered points.

Typomorphologically, in the first group, the shoulder appears to be systematically in a proximal position, which is, as said above, the main characteristic of this group (Table 2).

There does not seem to be any preferential laterality, dexter and sinister points being equally frequent (10/10). The shoulders are more often shaped by direct rather than inverse retouch (18/3). If we observe the character of adjacency/opposition of the shoulder and the back, adjacency is the more frequent (8/21), even though opposition is not rare (6/21). There are also a few exceptional cases of double-backed (2/21), or double-shouldered points forming a peduncle (1/21). Within the corpus under study, some shouldered points do not present any associated back (4/16). In this specific case, identification is based on the presence of naturally convergent edges.

The shouldered blades constituting the second group do not present any picture similar to the one of the shouldered points in the first group (Table 3). Admittedly the shoulders are more often in a proximal (10/16) than distal (6/16) position. As far as laterality is concerned, dexter shoulders are the more numerous (11/16). The shoulder/back association, whether in adjacency or opposition, is rather rare (6/16) and without any indication of preference. On the other hand we notice that shouldered points have more standardized dimensions (lengths and widths) than shouldered pieces (Figure 6).



shoulder location	proximal	distal	
			
lateralization of the shoulder	right	left	
			
direction of the retouch of the shoulder	direct	inverse	
			
association of the shoulder and the back edge	no backed edge associated	opposed shoulder and backed edge	adjacent shoulder and backed edge
			

6

Figure 3. Figure 3: n°1–6: Diacritical diagrams of a few shouldered points, n°7: Taxonomy of the shouldered pieces.

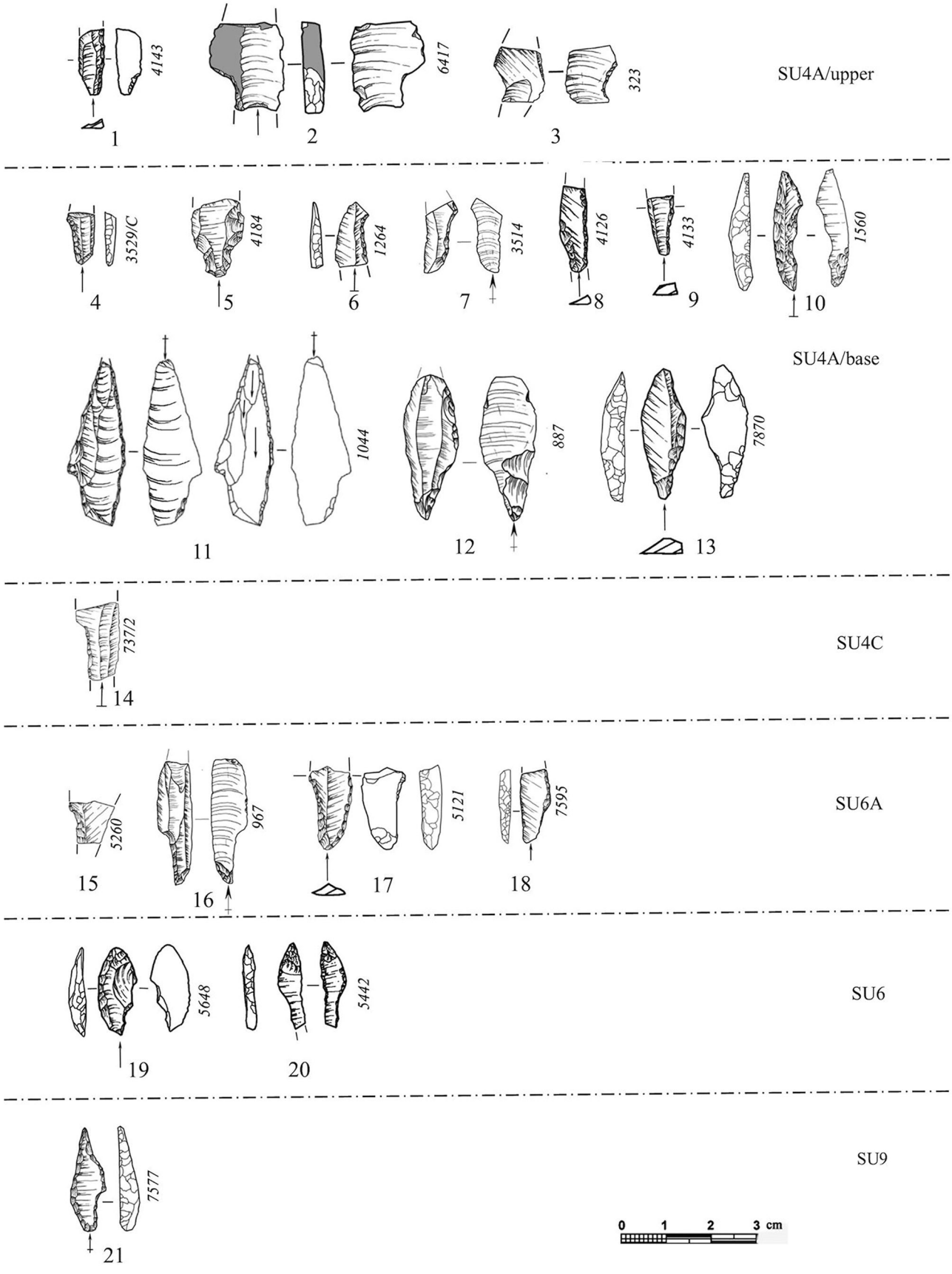


Figure 4. Drawings of the shouldered points according to the SMA-Extern levels.

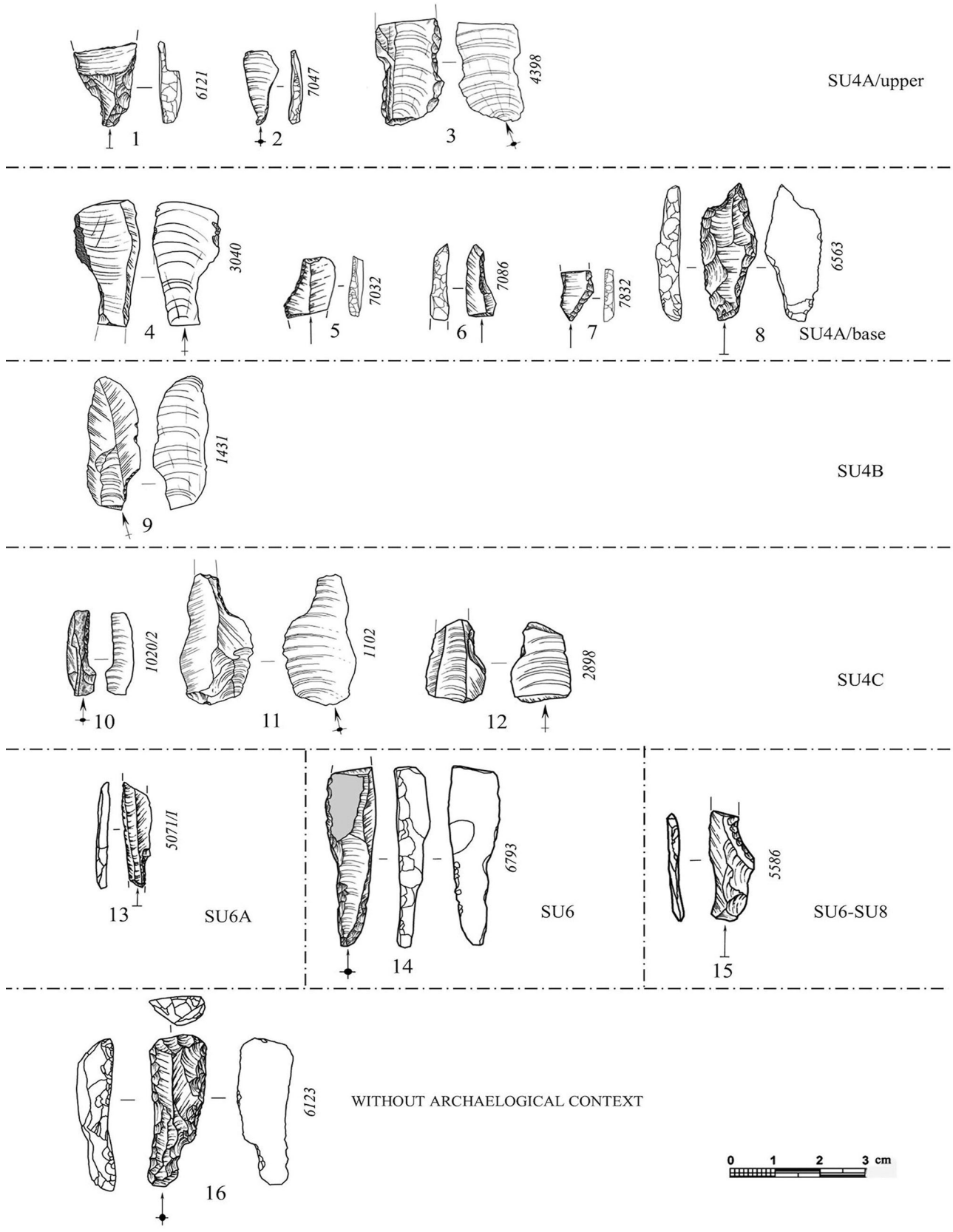


Figure 5. Drawings of the shouldered bladelets according to the SMA-Extern levels.

Table 2. Typometry and frequence of the shouldered points in SMA-Extern.

proximal shoulder	right shoulder	10	direct retouch	9	no backed edge associated	1
					adjacent shoulder and backed edge	4
					opposed shoulder and backed edge	2
					shoulder associated with 2 backed egdes	2
			inverse retouch	1	no backed edge associated	–
					adjacent shoulder and backed edge	–
					opposed shoulder and backed edge	1
	right and left	1	direct retouch	1	2 shoulders associated with 2 backed edges	1
	left soulder	10	direct retouch	8	no backed edge associated	3
					adjacent shoulder and backed edge	3
					opposed shoulder and backed edge	2
			inverse retouch	2	no backed edge associated	–
					adjacent shoulder and backed edge	1
					opposed shoulder and backed edge	1
	total	21		21		21

Table 3. Typometry and frequence of the shouldered bladelets in SMA-Extern.

proximal shoulder	right edge shouldered blade	6	direct retouch	5	no backed edge associated	2
					adjacent shoulder and backed edge	1
					opposed shoulder and backed edge	–
					cran associé à deux dos	2
			inverse retouch	1	no backed edge associated	1
					adjacent shoulder and backed edge	–
					opposed shoulder and backed edge	–
	left edge shouldered blade	4	direct retouch	4	no backed edge associated	1
					adjacent shoulder and backed edge	1
					opposed shoulder and backed edge	1
					shoulders associated with 2 backed edges	1
distal shoulder	right edge shouldered blade	5	direct retouch	5	no backed edge associated	5
					adjacent shoulder and backed edge	–
					opposed shoulder and backed edge	–
			inverse retouch		no backed edge associated	–
					adjacent shoulder and backed edge	–
					opposed shoulder and backed edge	–
	left edge shouldered blade	1	direct retouch inverse retouch	1	no backed edge associated	1
		16		16		16

Discussion

The origin and the spreading of shouldered points in the Adriatic zone of Europe are at the heart of a lot of questioning (Borić & Cristiani, 2016). The ancient presence of these pieces was recorded on the Southern side of the West Carpathians from the recent Gravettian towards 24000 BP- 23000 BP and might be due to temporary occupations by hunters coming from the Danube basin. (Kozlowski, 2007). During the latest glaciary maximum (LGM), the lower sea level opened vast exposed spaces corresponding to the Great Adriatic-Po rift (GAPR) (Peresani et al., 2020). This configuration probably helped contacts between cultural groups gravitating around the Adriatic Gulf, i.e coastal areas of the Italian and Balkan peninsulas (Djindjian et al., 1999). The spreading of shouldered items may be the result of such a scenario. Relay sites might have played the part of bridgeheads. Such could be the case of occupations producing shouldered points: in Šandalja II cave in Croatia (layer C/s - 25470–24500 CalBP) or in Ovčja Jama Cave in Slovenia (layer 4 - 24120–22930 CalBP) (Vukosavljević & Karavanić, 2017). Other sitesalso show ancient dates for lithic assemblages with shouldered points: in Šalitrena Cave in Serbia (25000–24000 Cal BP) (Mihailović et al., 2011), in Vrbička Cave in Montenegro (−28000–27000 CalBP) (Cristiani, 2013) or in Kastritsa cave in Greece (−26730–26150 CalBP) (Bailey & Gamble, 1990).

In Italy, it is worth noticing that the items with shouldered points appeared earlier in the North than in the South of the Peninsula. Such is the case of Liguria in the Arene Candide Cave where the earliest presence of shoulders dates back to 20470 ± 320 BP and 18560 ± 210 BP (layers P9 and P6) (Bietti & Molari, 1995). On the other hand, in Apulia, shouldered complexes appeared later as can be ascertained in layers 16 and 15 of the Paglicci Cave 17200 ± 300 BP and 17100 ± 300 BP (Palma di Cesnola, 1993). In Calabria, in the Romito Shelter, shoulders are ascertained towards 18750 ± 350 BP (Martini & Lo Vetro, 2005). In view of thes dates, A. Broglio suggested the hypothesis of a latitudinal gradient to explain the emergence pattern of shouldered items in Italy (Broglio, 1997).

In the filling of SMA-Extern, the shouldered pieces appear as early as middle Gravettian (SU9) and are also found in late Gravettian (SU8-SU6). With only 3 pieces, shouldered points are few in those deeper layers of the filling (Figure 4 n°19–21). They are characterized by small dimensions as shown by their average length of about 20 mm, and also by a certain morphological polymorphism.

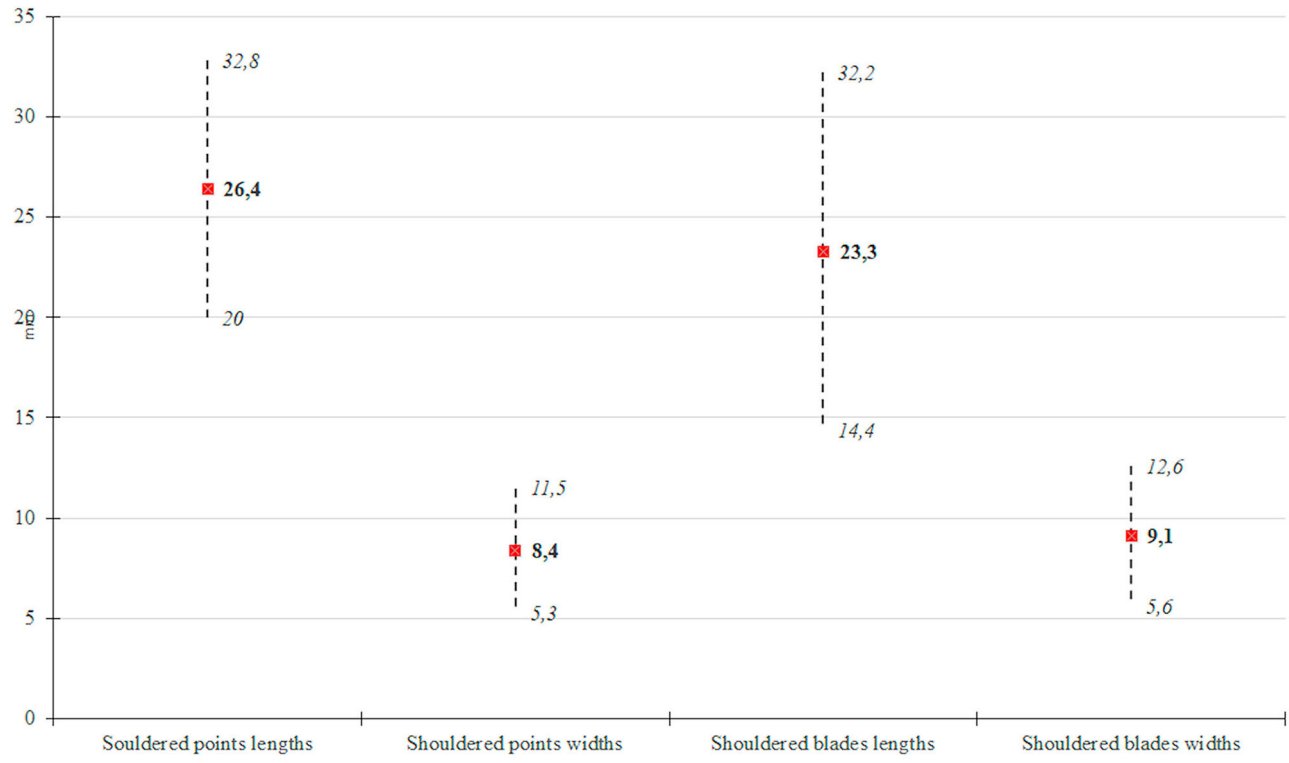


Figure 6. Standard Deviations (StDev) of lengths and widths of the shouldered pieces in SMA-Extern.

On these few items, the concavity of the shoulder seems to be an accurate criterion to characterize the shoulders from Late Gravettian (Figure 4 n°19).

In the same Gravettian layers of the site, there also exist fragments of shouldered blades which due to their fracturation, do not allow us to identify them as points (Figure 5 n°14–15).

They are undoubtedly Gravette points, the non rectilinear backs of which are slightly concave (Figure 5 n°14). In this case, they might be elements resulting from unfinished manufacturing (Figure 5 n°15). The presence of shouldered elements, particularly points, in a Gravettian context, was confirmed in several ancient Upper Paleolithic sites in the South of the Italian peninsula.

Table 4. Distribution of the shouldered points and shouldered blades in the chrono-sequence of SMA-Extern.

SU	Levels	Chronocultures	Shouldered points	Shouldered blades
SU4A/ upper	1–2	*Final Epigravettian Romanellian*	3	3
SU4A/ base	3–6	*Final Epigravettian*	10	5
SU4B	7–8			1
SU4C	9–12	*Early Epigravettian*	1	3
SU6A	13–15F	*Early Epigravettian*	4	1
SU6	17	*Final Gravettian*	2	2
SU7	18			
SU8	19			
SU9	20–20/ base	*Middle Gravettian*	1	1
SU10	21	*Middle Gravettian*		
SU11	22			
SU12	23			
SU13	24	*Sterile level*		

As a comparison, at least two specimens are known to have been found in the La Cala cave (Salerno, Campania). One comes from an ancient Gravettian level (GB layer level 1) and the other from the Q layer which corresponds to Gravettian with Noailles burins (Boscato et al., 1997).

The site of the Paglicci cave (Foggia, Apulia), closer to the Santa Maria di Agnano cave, also provided a few shouldered points from Gravettian layers 23–22 (Palma di Cesnola, 2006). They can also be noticed in layers 20 and 21 belonging to middle Gravettian in Apulia (Palma di Cesnola, 1975). All these specimens are between 15 and 20 mm long, thus sharing their rather small sizes with the specimens from SMA-Extern, which seems to be the rule of shouldered points in Southern Italy Gravettian. The ancient Epigravettian layers (SU6A-SU4C) can be found right over the Gravettian occupations (Table 1). Shouldered points are clearly present in 5 specimens (Table 4). The prototypes of these layers were manufactured on bladelets with a rectilinear profile, longer than their Gravettian counterparts (Figure 4 n°14–18). The concavity of the shoulder is clearly marked and the back is carefully shaped. As far as the shouldered blades in these ancient Epigravettian layers are concerned, some of them, because of the

partly distal position of the shoulder, may have been borers (Figure 5 n°11). Others are waste material from the manufacturing of segmented backed bladelets (Figure 5 n° 10, 12) (Bricker, 1995).

In Apulia, shouldered points are frequent in ancient Epigravettian horizons where they are by the way considered as a relevant chrono-cultural marker. Without pretending to give an exhaustive list of them, they were found in layers 16–12 of the Paglicci cave (Foggia) (Palma di Cesnola, 1983), c23-c6 of the Taurisano site (Lecce) (Bietti, 1979), c4 of shelter C of Cipolliane (Gambassini, 1971) and SU62-64 et SU142–144 of the Delle Mura cave (Bari) (Calattini et al., 2017).

They can also be found in layer 4 in the Romito Cave (Calabria) (Martini & Lo Vetro, 2005) as well as in the C level of the Roccia San Sebastiano (Campania) dated 19570 ± 210 BP (Collina et al., 2008)

At SMA-Extern, it is in the upper layers of the filling (SU4B-SU4A/base) chronologically attributed to late Gravettian, that the largest number of shouldered points were discovered, 10 specimens to be precise (Table 4). Taxonomically, 2 morphotypes of armatures can be identified.

The first one corresponds to small specimens manufactured on rectilinear lamellar supports. Therefore, they are completely similar to those found in the underlying layers of ancient Epigravettian (Figure 4 n°4 et 5). The second one consists of thick armatures of large dimensions on lamellar supports (Figure 4 n°10–13). Some display long shoulders (Figure 4 n°10), others present shapes reminding us of the morphotypes in the foliate family (Figure 4 n°12, 13). An original specimen has an incipient senester barb at the junction of the shoulder and the back (Figure 4 n°11). Some shouldered blades present a reflection phenomenon in their distal part (Figure 5 n°4, 9). This characteristic excludes them *de facto* from the group of points unless they are assimilated to pieces in the making! Other shouldered points are scraps from operating chains for the production of the backed bladelets (Figure 5 n°5–7). One piece presents a shoulder at one end and a robust point at the other end (Figure 5 n°8). It can be considered as a borer.

The presence of shouldered points is not exceptional in the late Epigravettian of Apulia. They are known, *inter alia*, in layers 9–8 of the Paglicci cave (Palma di Cesnola, 1983) and in layer 3 of the Delle Mura cave (Calattini, 2005).

It is certainly not useless to recall that in this site, ancient Epigravettian layer 4 provided only 4 shouldered points as opposed to 2 in late Epigravettian layer 3! It can be noted that, although they are less frequent than in the ancient Epigravettian contexts, shouldered points are attested in the more recent horizons of late Epigravettian in that region.

In the SMA-Extern zone, the archeo-stratigraphic SU4A/upper unit caps the sedimentary sequence. It corresponds to late Epigravettian in its Romanellian facies (Table 4). Shouldered points are only represented by 3 specimens, the diagnosis of which remains hypothetical (Figure 4 n° 1–3). Shouldered blades are in the same situation and, like the ones of the underlying occupations, they are directly linked to the manufacturing chain of backed bladelets.

Conclusions

The Santa Maria di Agnano SMA-Extern site (Brindisi, Italy) delivered a long archeo-stratigraphic sequence covering, about 14.000 years.

The fauna study leads to a model corresponding to numerous seasonal occupations, possibly in Autumn.

In this context, the presence of shouldered pieces, either points or blades, provided a relevant chronocultural indicator. Like in a certain number of Southern Italy Gravettian sites, shouldered points make a timid appearance as small atypical morphotypes. Ancient Epigravettian following that period knew a development of more standardized points with deep shoulders on rectilinear supports (Baills, 2015a). This situation carried on in the recent phases of late Epigravettian. It is to be noted that this continuation is not in keeping with the generally accepted scenario for the lithic assemblage of the end of Pleistocene in Italy. Could this be a regional particularity proper to Apulia? A region about which Bietti already said in 1997 that it was

> the only geographical area where the ancient Epigravettian can be observed with a "real" quite recent phase of shouldered pieces … especially with the Paglicci and Taurisano sites, which besides are rather more recent than the corresponding sites in the rest of Italy.

At the end of this presentation, we can reasonably ascertain that the chronocultural positioning of shouldered elements in SMA-Extern matches the heuristic models of the spreading networks of these pieces proposed between the Balkans and Italy.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributor

Henry Baills began his career by studying the Neolithic of the East Pyrenean zone, which led to a thesis under the direction of Jean Guilaine. In the early 1990s, he oriented his research towards the Upper Paleolithic, first in the South of France, then in Italy, Tuscany and especially Puglia. For the last few years, he has been collaborating in the research programs of the UMR 7194 of the MNHM (Paris). It is in this capacity that he participates in the work of the Franco-Cambodian and Franco-Thai teams and the French mission in Papua New Guinea.

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