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Lithic landscapes and taskscapes: obsidian procurement, production and use in west central Sardinia, Italy

Volume 2

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Chapter Six

Riu Mannu lithic practices: secondary technology

This chapter presents information on the character of retouched and probably retouched pieces. It firstly focusses on spatial data, and secondly, applying the framework outlined in chapter three, presents and discusses secondary technology in terms of traditions, strategies and variations, comparing and contrasting these results with primary technology data, presented in the previous chapter.

6.1. Classification and terminology

As outlined earlier, my understanding of 'use' changed when the theoretical focus of this thesis shifted (Section 2.6). In earlier stages of methodology formulation, use was solely equated with retouched artefacts (*i.e.* tools), and again following common perceptions in traditional technology studies, it was believed that social information predominantly resided in finished – retouched – artefacts. My earlier aims therefore included setting up a tool typology, which could also be contrasted to the more restricted existing LaPlace and arrowhead typologies used in Sardinian lithic studies (Section 1.3; Table 1.5). Thus, rather than using a tool type based classification that implied function, I chose an attribute-based system to describe the static end-result of all retouched pieces. For example, rather than classifying something as a knife or scraper it is described in terms of retouch types, edge morphology, retouch angle, etc (Tables 3.24-3.25; Appendix 3.3).

The new conceptual framework, however, reduced the 'importance' of retouched artefacts as sole indicators for use, which in turn diminished the need for detailed construction of tool typologies. To adjust for a social framework cores were restudied, but time constraints have prevented restudy of retouched artefacts (see Introduction). The applied attribute system and terminology, however, can be loosely correlated to basic tools types commonly seen in lithic studies (Table 6.1). This chapter concentrates on outlining the general characteristics of retouched pieces and focusses on their relationship

to primary technology, and the extent to which their distribution patterns reveal information on procurement, production, use and discard strategies.

Basic *Riu Mannu* classification		*Riu Mannu* retouch types / pattern	*Riu Mannu* edge shapes / work angles	Normative tool types
Unifacial retouch	Intentional retouch	Feathered/ stepped/ scalar retouch; marginal to extensive continuous patterns	Straight/ convex/ concave/ convergent/ pointed edges; obtuse to very obtuse angles	End-, side-, convergent scrapers
			Pointed/convergent edges; steep to very steep angles	Awls, gravers, borers, points,
			Straight / convex edges; very steep –to steep angles	Knives
		Notches/denticulates; marginal to extensive isolated patterns	Concave / wavy edges; steep to very obtuse angles	Notches/denticulates
		Burins		Burins
		Feathered/stepped/ scalar retouch; extensive patterns; alternating / non invasive bifacial	Convergent edges; obtuse to very obtuse	Strike-a-lights / fabricators
			Straight to convex edges; steep to very steep	Bifacial knives
	Probable retouch	Probable / fresh/ use wear/ irregular 'retouch' (edge damage); marginal isolated to continuous patterns	All of above/ plus irregular and/or indeterminate edges and angles	Edge damaged pieces; miscellaneous retouched pieces; utilised pieces
Bifacial retouch	Hafted/ tanged pieces	Extensive feathered thin or stepped deep retouch	Smooth/ regular edges; very steep to steep angles	Tanged arrowheads
	Non-hafted pieces		Steep to very obtuse angles; irregular edges; stepped/ hinged plateaus	Fragments of or abandoned/failed arrowheads; bifacial knives; miscellaneous bifacial pieces

Table 6.1. Proposed correlation between basic normative tool typologies common in lithic studies and terminology of attribute based *Riu Mannu* classification system used in studied dataset.

Before presenting the characteristics of retouched pieces, it is important to define the main terms used. My attribute-based classification system makes two basic distinctions between 1) intentional and probable retouch, and 2) unifacially and bifacially retouched artefacts.

Intentional retouch is defined as retouch by human agency, while probable retouch includes modification that may be intentional but could also be the result post depositional processes (a.k.a. spontaneous edge damage or pseudo 'retouch'), or use wear traces. It has proven difficult not only to

distinguish clearly between these probable retouch categories, but also between intentional and probable retouch (see Section 6.2.2. below). This is a common problem for surface material and for obsidian (Section 3.1.2.3; Mallouf 1982; McBrearty *et al.* 1998). Unifacial retouch refers to modification of one surface of the artefact and to non-invasive bifacial and/or alternating modification of dorsal and ventral surfaces. Bifacial retouch is the extensive modification of both surfaces. These are further subdivided into those with a visible haft element, which are in traditional terminology called tanged arrowheads, and those without hafts.

6.2. Secondary flaking locations

Please note that the discussion below on the distribution of retouched and probably retouched pieces is based on initial classification and not on detailed attribute based descriptions. As will be outlined below (Section 6.3.2.1), there is a considerable discrepancy between my initial classification and the detailed study of artefacts, which has affected these basic distribution patterns. I have intentionally decided not to 'correct' the following section, but discuss the implications in more detail below.

6.2.1. Riu Mannu retouched pieces distribution and density patterns

Unifacially and bifacially retouched pieces form a small percentage of the total quantitative *Riu Mannu* collection, 3.1% and 0.8% respectively (Table 6.2-6.3). Individual transect percentages for unifacial retouched pieces are uniform and range from 1.9% for transect 07 to 3.8% for transect 14. The bulk of finds (81.3%) is concentrated in the wider Mògoro area, in transect 04 and 14, with an additional 12.1% in transects 10 and 23.

	Campidano				Marmilla		
	04	07	09	23	10	14	Total
Percentage of total assemblage	*3.7*	*1.9*	*3.3*	*2.5*	*2.5*	*3.8*	*3.1*
Sites	25	1	4	1	6	42	79
Haloes	3	1	-	1	1	1	7
Isolated	2	-	-	1	1	1	5
Total	30	2	4	3	8	44	91

Table 6.2. Distribution and density of unifacial retouched pieces, subdivided into finds context (sites, site haloes and isolated finds). Quantitative data.

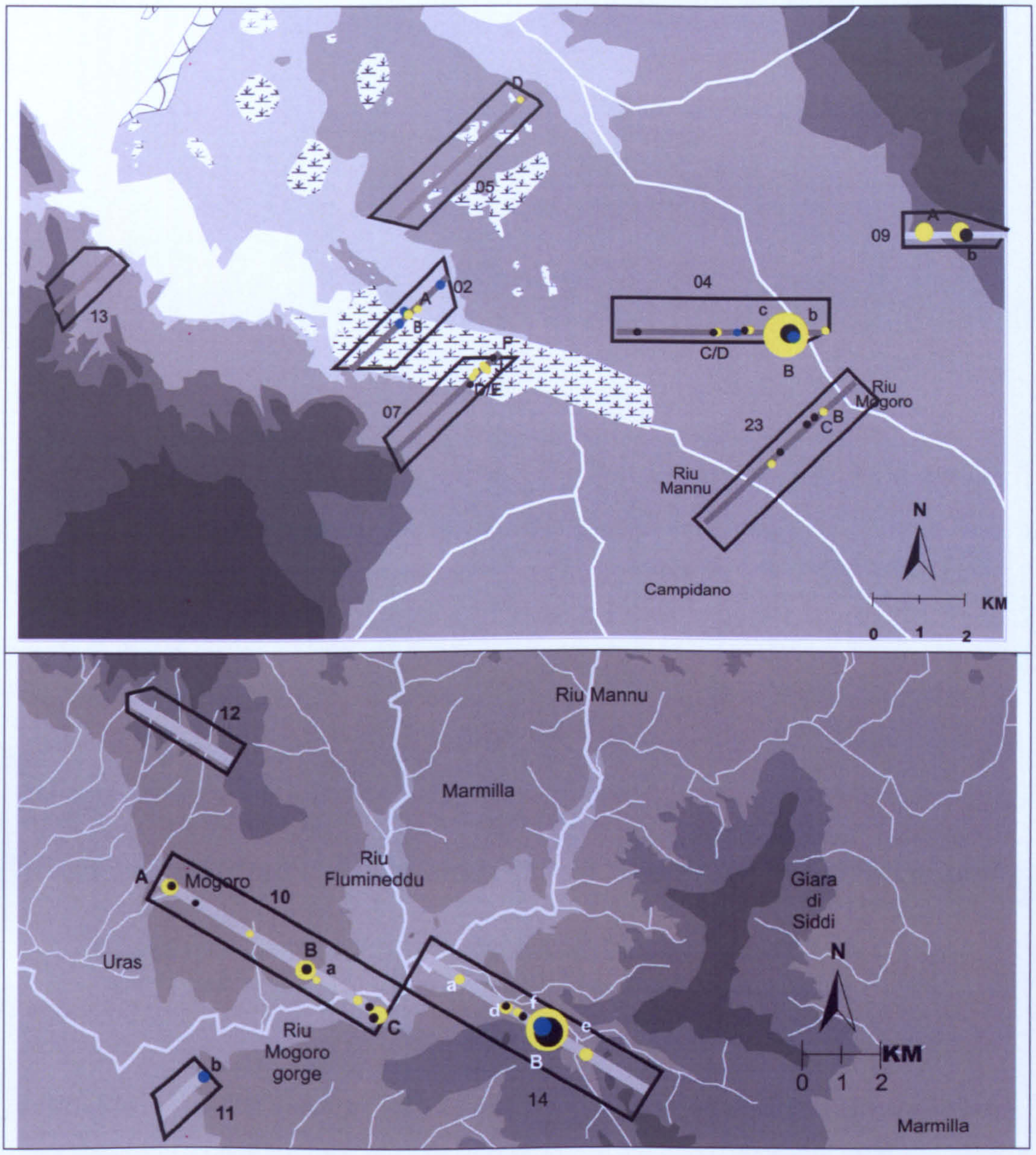

Figure 6.1. Retouched and probably retouched pieces distribution and density in Arborèa and Campidano (above) and Marmilla (below). Quantitative finds (n= 297)

Key to Map:
Black bullets (graduating in size with increased densities) = unifacial retouched pieces
Blue bullets (graduating in size with increased densities) = bifacial retouched pieces
Yellow bullets (graduating in size with increased densities)= probably retouched pieces
Note: small and capitals letters indicate 'site' assemblages

Most finds (94.5%) are place-specific, of which 75.8% are concentrated in two special interest areas, 04-B and 14-B (Figure 6.1: black bullets; Appendix 6.1). Density and distribution patterns are very uneven for bifacially retouched material. The overall *Riu Mannu* percentage is low (0.8%), while individual transect percentages vary from 0.6% to 2.5% (Table 6.3). Finds are restricted

to four transects across all three landscapes with the bulk (62.5%) coming from one single location, 14-B. Two other smaller concentrations exist, one (16.7%) from the single location 04-B, and the other (12.5%) are the finds from Arborèa transect 02 (Figure 6.2: blue bullets). All but two quantitative bifacial pieces are non-hafted, although four may be fragments of tanged arrowheads or unfinished examples that may have been abandoned due to technical mistakes (see below 6.3.2.5). All of these are found at site 14-B. Isolated finds are rare. It should be recalled, however, that the 'site' in transect 11 is a low-density stretch of finds rather than an actual concentration, and that contemporaneity between lithics and pottery is ambiguous in transect 02 (Section 3.2.1).

	Arborèa	Campidano	Marmilla		Total
	02	04	11	14	
Percentage of total assemblage	*2.5*	*0.6*	*0.6*	*1.3*	*0.8*
Sites	1	4	1	15	21
Haloes	1	-	-	-	1
Isolated	1	1	-	-	2
Total	3	5	1	15	24

Table 6.3. Distribution and density of bifacial retouched pieces, subdivided into finds context (sites, site haloes and isolated finds). Quantitative data.

Qualitative finds provide additional information. Unifacial material is now also present in the Arborèa (Table 6.4; Appendix 6.1). Given the nature of the collection, neither the higher overall *Riu Mannu* percentage (5.9%) nor percentages for individual transect assemblages, are surprising. For the most part, distribution and density patterns mirror those based on quantitative finds. The bulk of finds (86.6%) come from the wider Mògoro area in transects 04, 10, and 14. Again, finds are mostly place-specific with special interest areas 04-B, 10-B and 14-B containing the bulk of finds (Figure 6.2: black bullets).

	Arborèa	Campidano				Marmilla		Total
	02	04*	07#	09	23	10	14*#	
Percentage of total assemblage	*2.3*	*6.4*	*1.4*	*6.5*	*3.2*	*4.4*	*11.8*	*5.9*
Sites	3	50	2	8	1	15	54	133
Haloes	-	7	1	-	2	5	2	17
Isolated	1	2	-	1	2	1	-	7
Total	4	59	3	9	5	21	56	157

Table 6.4. Distribution and density of unifacial retouched pieces, subdivided into finds context (sites, site haloes and isolated finds). Qualitative data. * Excluding revisits. # Excluding sites outside main grid areas.

Qualitative figures for bifacially retouched material add substantial extra information (Table 6.5; Figure 6.2: blue bullets). The bulk of finds (62.2%) are concentrated in 14-B, with another 20% in transects 02 and 04. An additional 17.8%, a small quantity of finds, comes from four new transects (05, 07, 10 and 23). The majority of finds are non-hafted bifacial pieces, of which five may be fragments of tanged arrowheads. Most of these are again found at 14-B, but two finds come from sites 10-B and 13-d. The bulk of the six tanged arrowheads are from site 14-B, with single finds at 10-B and 05-A.

	Arborèa		Campidano			Marmilla		Total
	02	05	04*	07	23	10	14	
Percentage of total assemblage	*0.6*	*4.1*	*0.9*	*0.9*	*0.6*	*0.8*	*5.9*	*1.7*
Sites	-	1	5	1	-	2	28	37
Haloes	1	-	-	1	-	2	-	4
Isolated	-	-	3	-	1		-	4
Total	1	1	8	2	1	4	28	45

Table 6.5. Distribution and density of bifacial retouched pieces, subdivided into finds context (sites, site haloes and isolated finds). Qualitative data.

Some sites (07-J, 13-C and 14-b) outside the gridded areas were also qualitatively sampled and yielded additional unifacially retouched artefacts. Of these, only 13-C demonstrates the presence of retouched material in an area previously devoid of finds. Revisits to sites 14-B and 04-B also yielded additional finds (Appendix 6.1). Non-hafted bifacially retouched pieces from sites outside the gridded areas come from transect 13 (13-a and 13-C) and a revisit to transect 04.

In sum, retouched material primarily consists of unifacial retouch and is found in small quantities and percentages throughout the research area. Distribution and density patterns are very uneven and show that most finds are concentrated in two specific special interest areas, one in the Mògoro valley (04-B) and one on the Mògoro terraces (14-B). Smaller clusters and a more dispersed pattern occur throughout the Campidano-Arborèa transitional areas (transects 02 and 07) and again in the wider Mògoro area (transects 10 and 23). Bifacial retouch is rare and for the most part restricted to four areas, of which three are the special interest areas 04-B, 10-B and 14-B, and one more dispersed distribution in transect 02.

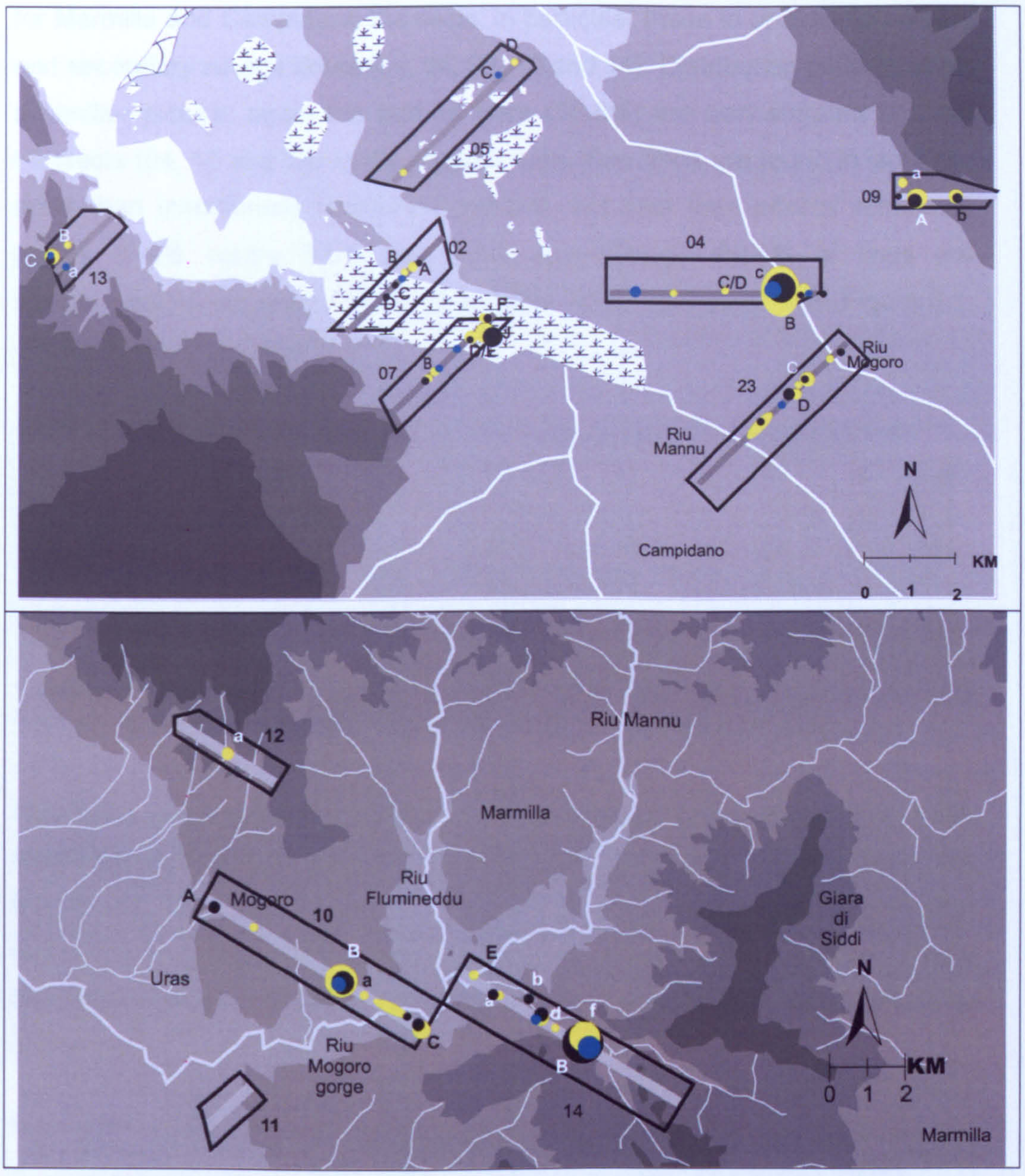

Figure 6.2. Retouched and probably retouched pieces distribution and density in Arborèa and Campidano (above) and Marmilla (below). Qualitative finds (n= 504).

Key to Map:
Black bullets (graduating in size with increased densities) = unifacial retouch
Blue bullets (graduating in size with increased densities) = bifacial retouch
Yellow bullets (graduating in size with increased densities) = probable retouch
Note: small and capitals letters indicate 'site' assemblages

6.2.2. Riu Mannu probably retouched pieces distribution and density patterns

The last category, probably retouched pieces (all with unifacial retouch) is the largest (6.3%) and most widespread of all *Riu Mannu* quantitative data (Table 6.6). Individual transect assemblage percentages vary with the highest figures

for Marmilla and Campidano transects, in particular those in or close to primary and secondary source areas (*i.e.* 04, 09, 10 and 14). Distribution patterns show a familiar picture; again the bulk of finds (86.8%) are concentrated in three transects (04, 10 and 14) in the Mògoro area. Few finds are found in isolation, more than intentionally retouched material, but less than bifacial retouched pieces (6.6% contra 5.5% and 8.3% respectively). 80.1% of finds are concentrated in six areas: 04-B, 09-A, 09-b, 10-B, 10-C and 14-B (Figure 6.1: yellow bullets; Appendix 6.1).

	Arborèa		Campidano				Marmilla		
	02	05	04	07	09	23	10	14	Total
Percentage of total assemblage	*2.5*	*5.3*	*9.0*	*4.7*	*11.5*	*1.2*	*5.3*	*6.0*	*6.3*
Sites	1	1	60	1	14	1	14	63	155
Haloes	1	-	8	4	-	-	-	2	15
Isolated	-	-	4	-	-	1	3	4	12
Total	2	1	72	5	14	2	17	69	182

Table 6.6. Distribution and density of probably retouched pieces, subdivided into finds context (sites, site haloes and isolated finds). Quantitative data.

Qualitative distribution and density data show similar figures (Table 6.7). High individual transect percentages exist in Campidano and Marmilla transects (04, 09, 10 and 14), with the bulk of finds (81.5%) concentrated in the Mògoro region. Most artefacts are clustered, but 8.8% were found in isolation. These isolated pieces are mostly located in the Mògoro valley and on its terraces (*e.g.* transects 04, 10 and 23).

	Arborèa		Campidano				Marmilla			Total
	02	05	04*	07#	09	23	10	12	14*#	
Percentage of total assemblage	*2.3*	*8.3*	*9.6*	*3.2*	*10.1*	*7.7*	*9.5*	*2.1*	*9.1*	*8.1*
Sites	1	1	71	6	14	3	34	1	42	173
Haloes	2	-	13	1	-	3	5	-	-	24
Isolated	1	1	4	-	-	6	6	-	1	19
Total	4	2	88	7	14	12	45	1	43	216

Table 6.7. Distribution and density of probably retouched pieces, subdivided into finds context (sites, site haloes and isolated finds). Qualitative data. * Excluding revisits. # Excluding sites outside main grid areas.

Additionally, a small percentage of qualitative finds (1.5%) is from sites outside the main grids and revisited areas, whereby only those from transect 13 add

new information to the general trends (09-a, 10-a, 13-B, 13-C, 07-J; revisit at 04-B).

6.2.3. Discussion and conclusion: secondary technology distribution

Distribution and density patterns are clearly uneven. Most finds are concentrated in two areas and match patterns noted for primary material: 1) in the wider area along the river Mògoro in the Campidano plain and 2) on Mògoro terraces in the Marmilla. The third concentration observed for primary technology, in the inland Arborèa-Campidano transition, is not reflected by secondary material. Within these areas further clustering exists, which again mirrors primary technology data. The densest area in the Mògoro-Campidano is special interest area 04-B and its surrounding smaller concentrations 04-b and 04-c. In the Mògoro-Marmilla region three clusters can be discerned: sites 10-B, 10-C, and special interest area 14-B, and nearby localised concentrations 14-e and 14-f. Two additional and much smaller clusters are observed in transitional areas, one special interest area in Arborèa-Campidano transect 07 (sites D-J), and one in the Monte Arci transect 09.

Quantitative regional distribution patterns for secondary flaking artefact classes show some interesting differences. In the Arborèa half of retouched material consists of bifacial retouch, while unifacial material is absent. Data for the Marmilla and Campidano are more alike, although subtle intra-regional differences exist. Intentionally retouched material occurs more frequently in the Marmilla. This may be partially explained by post depositional processes that have affected the condition and distribution of artefacts in both these areas (Section 3.1.2.2). It is, however, also worthwhile exploring the extent to which procurement and use/discard patterns have contributed to these differences. Data analysis of primary technology, for instance, has suggested a larger component of non-local source use for the Marmilla despite the wide occurrence of secondary sources. Likewise, physical landscape features for this area, in particular for special interest area 14-B, suggest non-settlement related activities (see also Chapter 7).

Distribution and density patterns of the three secondary technology artefact categories also show some interesting patterns (Table 6.8). Unifacial material

is absent in the Arborèa, and percentages of probably retouched material are equally low. The bulk of bifacially retouched artefacts clearly lie in the Marmilla where they are exclusive to site 14-B. Inter-regional differences between retouched and probably retouched artefacts for the Campidano and the Marmilla are small.

	Arborèa			Campidano			Marmilla			Total
	N	*Region*	*Class*	*N*	*Region*	*Class*	*N*	*Region*	*Class*	
Unifacial retouch	-	-	-	39	28.5%	42.9%	52	33.8%	57.1%	**91**
Bifacial retouch	3	50%	12.5%	5	3.6%	20.8%	16	10.4%	66.7%	**24**
Probable retouch	3	50%	1.6%	93	67.95	51.1%	86	55.8%	47.35	**182**
Total	**6**			**137**			**154**			**297**

Table 6.8. Regional distribution comparisons for all secondary technology. Arborèa transects: 02, 05. Campidano transects: 04, 07 09, 13, 23. Marmilla transects: 10-12,14. Quantitative data.

Unifacially retouched material for the most part is strongly associated with site contexts (Table 6.9). Bifacial material occurs more often in isolation, with 8.3% contra 5.5% for unifacial and 6.6% for probably retouched finds. Contrasts are more marked rising to 20.8% for bifacial and 8.3% for probably retouched pieces, when taking into account that the association with site assemblages is tenuous at best for transect 02 and 11 (see Section 3.2). The implications are interesting given that distribution patterns reflect not just locations where retouching took place, but may also indicate use and discard patterns (see below and Chapter 7.2).

		Arborèa			Campidano			Marmilla			Total
		N	*Region*	*Class*	*N*	*Region*	*Class*	*N*	*Region*	*Class*	
Unifacial Retouch	*Sites**	-	-	-	36	26.3%	40.9%	50	32.5%	56.8%	**88**
	Isolated finds	-	-	-	3	2.2%	60%	2	1.3%	40%	**5**
Bifacial retouch	*Sites**	2	33.3%	9.5%	4	2.9%	19%	15	9.7%	71.4%	**21**
	Isolated finds	1	16.7%	33.3%	1	0.7%	33.3%	1	0.6%	33.3%	**3**
Probable retouch	*Sites**	3	50%	1.8%	88	64.3%	51.7%	79	51.3%	46.5%	**170**
	Isolated finds	-	-	-	5	3.6%	41.7%	7	4.5%	58.3%	**12**
Total		6			137			154			**297**

Table 6.9. Regional comparisons of find distribution across context and artefact class. Arborèa transects: 02, 05. Campidano transects: 04, 07 09, 13, 23. Marmilla transects: 10-12,14. Quantitative data. *Including site haloes.

Qualitative data largely correspond to quantitative data, but have provided additional information for the Arborèa (transect 07) and the Iglesiente-Campidano (transect 13).

6.3. Secondary flaking practice: strategies, traditions and variations

All modified artefacts (quantitative and qualitative) have provided information on secondary flaking practices through the analysis of a wide variety of variables and attributes (see Section 3.4.2.3; Tables 3.24-3.25). Just over half of these (56.5%) are artefacts with a unifacial single-work edge with another 34.7% consisting of two or more work edges, and a small percentage of invasive bifacially retouched material. Those with a haft element (*i.e.* tanged arrowheads) are almost exclusive to a single location (14-B). Non-hafted bifacial pieces, which include a variety of types, are more numerous and widespread with the bulk (79.7%) concentrated in two locations – 04-B and again 14-B (Table 6.10).

Due to low sample sizes, no distinction is made between quantitative and qualitative data in the following presentation and discussion (see Section 3.1.2.1).

	Arborèa		Campidano					Marmilla				Total	
	02	05	04	07	09	13	23	10	11	12	14		
Single unifacial work edge	6	3	199	17	24	5	16	62	-	1	122	455	56.5%
Multi unifacial work edges	4	-	101	17	19	4	6	32	-	-	95	278	34.5%
Bifacial hafted	-	1	-	-	-	-	-	1	-	-	6	8	1.0%
Bifacial non-hafted	4	-	15	2	-	2	1	3	1	-	36	64	8.0%
Total	14	4	315	36	43	11	23	98	1	1	259	805	

Table 6.10. Numbers and percentages for all unifacially retouched pieces with single- and multi-work edges and for all bifacial pieces per transect.

6.3.1. Blank selection

Analysis of blank selection (*i.e.* the primary technology artefacts selected for secondary modification) for all modified pieces shows a clear predominance (80.4%) of flakes and blades, with an additional 13.9% on flake fragments (Table 6.11). When using the blade index for retouched and probably retouched *Riu Mannu* material – where they are a percentage of all retouched

material – figures only partially compare to those noted for unretouched data (Figure 6.3. see Chapter 5.1.3; Figure 5.5). Three locations show corresponding high indices for unretouched and retouched blade material: 1) site 05-D in the Arborèa, 2) site 04-B, situated close to the Mògoro river, and 3) in closely associated sites 23-C and 23-D, also situated along the Mògoro river. In contrast, site 12-a, which contained a high index for unretouched material, does not have any retouched pieces. Likewise, in transects 07 and 13 low blade indices for unretouched material contrast with higher figures for retouched pieces, perhaps suggesting that procurement and/or discard strategies differed from the production strategies discussed previously (see also Chapter 7).

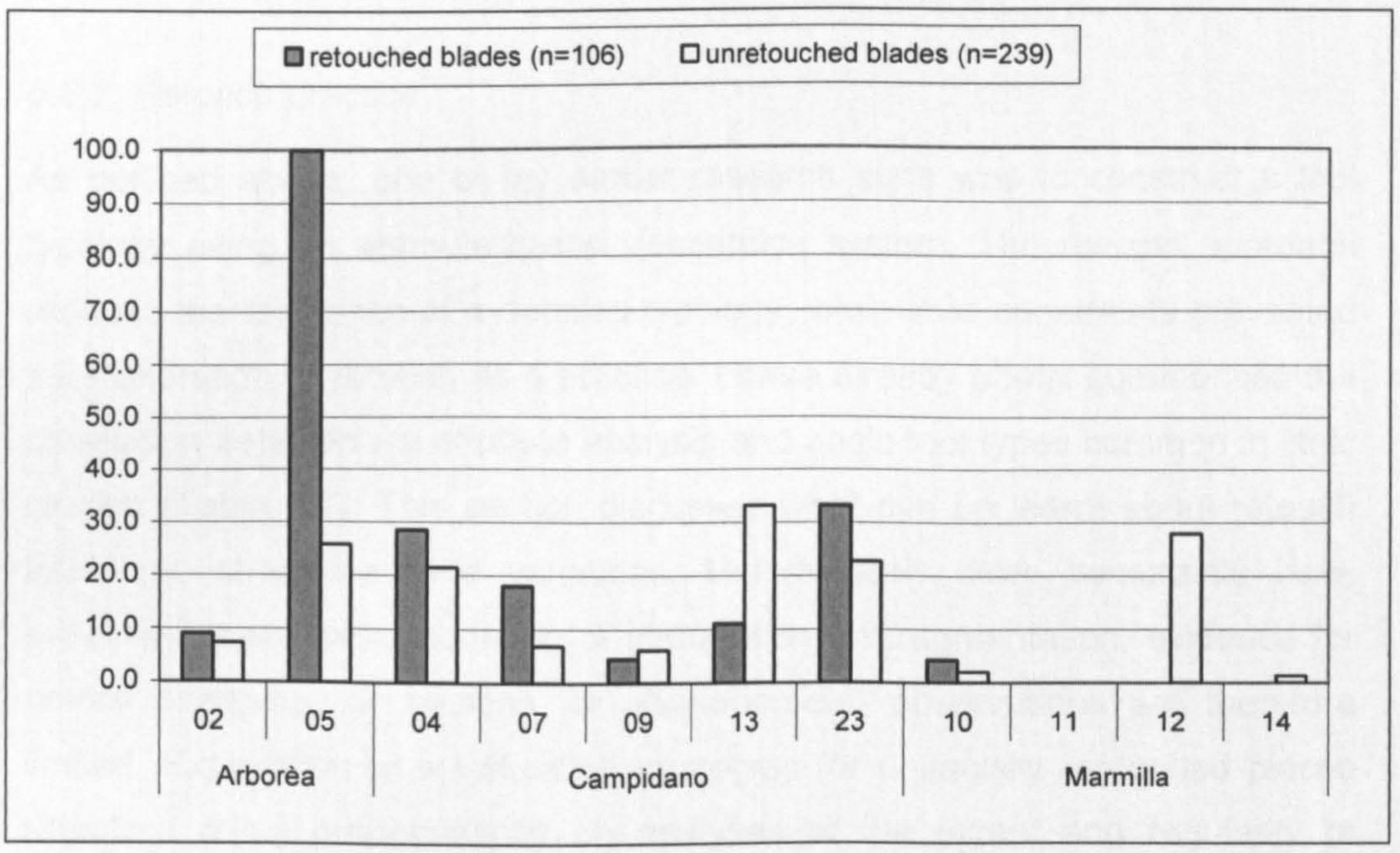

Figure 6.3. Blade indices expressed as percentage (y-axis) for all retouched (grey bars) and unretouched (white bars) blade material.

Two other interesting regional patterns are visible (Table 6.11). Firstly, the use of core rejuvenation flakes, overshot flakes and side-struck platform removals, as blanks is virtually exclusive to special interest area 04-B. Secondly, cores used as blanks are exclusive to three locations. Bipolar cores served as blanks are found at 04-B and 14-B, while a (fragmented) platform core with flake reduction from 14-D also appears to have been modified.

Blank type	Arborèa		Campidano					Marmilla				N
	02	05	04	07	09	13	23	10	11	12	14*	
Unifacial modification												
Flake	7	-	148	20	34	7	13	71	-	1	3	304
Blade	1	3	79	6	2	1	7	4	-	-	-	103
Overshot flake	-	-	3	1	-	-	-	-	-	-	-	4
Side-struck core platform removal	-	-	3	-	-	-	-	-	-	-	-	3
Chunk	-	-	4	-	2	-	-	1	-	-	7	14
Core / core fragment	-	-	5	-	-	-	-	-	-	-	4	9
Fragment	2	-	37	6	5	1	3	15	-	-	3	72
(Invasive) bifacial retouch												
Flake	1	-	3	-	-	-	-	-	1	-	3	8
Blade	-	-	2	-	-	-	1	-	-	-	-	3
Total	11	3	284	33	43	9	24	91	2	1	20	520

Table 6.11. Blank types for all modified material. *Data incomplete.

6.3.2. Retouch practice

As outlined above, one of my earlier research aims was to construct a tool typology using an attribute-based description system. The revised approach reduced the relevance of a detailed typology, while time constraints prevented full exploration of retouch as a practice. I have already briefly summarised the correlation between my attribute analysis and basic tool types common in lithic studies (Table 6.1). This section discusses what can be learnt about retouch traditions, strategies, and variations. Unfortunately, time constraints have prevented systematic recording of information on fragmentation, evidence for novice knapping, or reasons for abandonment; observations are therefore limited. Exploration of modification strategies for unifacially retouched pieces therefore relies predominantly on analyses of the extent and regularity of modification (Section 3.4.2.4; Table 3.24). It is concentrated on flake and blade blanks. These constitute the bulk of the dataset and have clearly defined surfaces and sides, in contrast to other debitage and debris blanks. Note that blank data were not recorded for transect 14, so discussion of its trends remain general. Exploration of retouch strategies for bifacially retouched artefacts is more detailed and allows for a more systematic examination of abandonment, fragmentation, artefact condition and evidence for novice knapping (Table 3.25).

First, however, it is necessary to address the earlier mentioned inconsistencies among initial classifications of artefacts as retouched or probably retouched and their detailed descriptions (Section 6.1)

6.3.2.1. Problematic classifications: retouched and probably retouched

It is generally recognised that a variety of cultural and natural post depositional processes will modify artefact shapes in a manner that resembles intentional retouch (Section 3.1.2.3). To acknowledge this and to investigate if and to what extent *Riu Mannu* pieces were affected, an initial subjective distinction between intentionally and probably retouched pieces was made in the first stages of description. Three trends in the analysis of retouch types and their patterning, however, indicate that the boundary in this distinction is more fluid than originally thought, and emphasise the subjective nature of the classification system. Firstly, 15-20% of the four retouch types associated with probable retouch (irregular/edge damage, probable retouch, probable usewear and fresh retouch on patinated artefacts), irrespective of retouch patterning, were initially classified as retouched rather than probably retouched pieces (Appendix 6.2: Table 1 in blue). Secondly, much larger percentages (30-40%) of intentional retouch types (*i.e.* stepped, feathered and scalar retouch) and patterning (*i.e.* marginal continuous and isolated, as well as extensive continuous and isolated) were initially classified in the probable retouch category (Appendix 6.2: Table 1 in red). Lastly, most burins, denticulates and notches were first classified as probable retouch because I found these to be (too) easily confused with edge damage.

To avoid further confusion, from this point onwards 'probably retouched' refers to artefacts with retouch types described as irregular, probable, fresh retouch and usewear in the below data presentation (see also Chapter 7).

6.3.2.2. Unifacial retouch: location and position

Retouch location indicates the surface where retouch is located, distinguishing between dorsal, ventral, non-invasive bifacial and alternating between dorsal and ventral sides (Figure 6.4). Retouch position refers to where on that surface

retouch is situated: proximal, medial, distal and lateral (respectively: the top, middle, bottom and along the entire side(s) of artefacts).

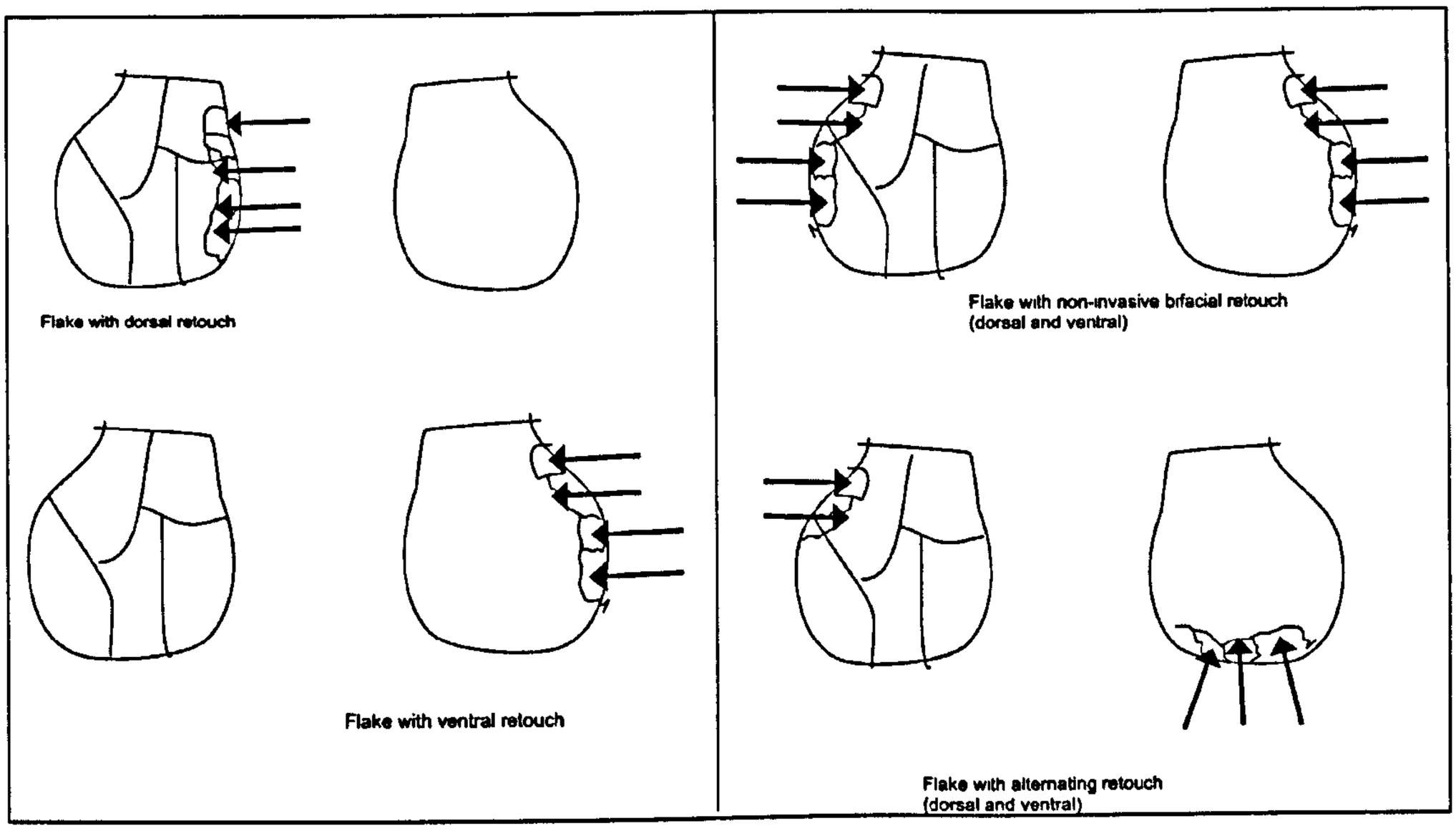

Figure 6.4. Schematic examples of the location of retouch: dorsal or ventral side only (four drawings on left hand side) and non-invasive bifacial and alternating retouch (four drawings on right hand side). Arrows indicate the direction from which retouch was removed.

Flake blanks with single-work edges are predominantly (56.9%) retouched on the dorsal side, with 34.9% ventral retouch and 6.3% of non-invasive bifacial and alternating retouch. Blade blanks with single-work edges have equal percentages of dorsal or ventral retouch (48.5% / 47.1%), with only a few bifacial/alternating retouched pieces. There is a clear difference between the position of retouch on flake and blade blanks, which is unrelated to the location of retouch. Flakes mostly are retouched on lateral (with no clear preference for either left or right) and distal sides. Blade blanks on the other hand, are mostly retouched on both lateral sides. Non-invasive bifacial and alternating retouch on flakes occurs on proximal, lateral and distal sides, while that on blades prevails on distal sides (Table 6.12-6.13; Appendix 6.3).

Location	Position	Arborèa	Campidano					Marmilla		Total
		02	04	07	09	13	23	10	12	
Dorsal	Proximal	-	9	1	1	1	-	4	-	16
	Medial	-	1	-	1	-	-	-	-	2
	Lateral left	-	8	1	2	-	1	8	-	20
	Lateral right	-	15	-	5	-	-	9	-	29
	Distal	2	19	2	6	1	2	13	-	45
Ventral	Proximal	-	2	1	1	-	2	2	-	8
	Medial	-	1	-	-	-	-	-	-	1
	Lateral left	1	8	-	1	1	2	3	-	16
	Lateral right	1	8	3	-	-	-	3	1	16
	Distal	1	16	6	1	-	-	2	-	26
Bifacial / Alternating	Proximal	-	2	-	-	-	-	1	-	3
	Lateral right	-	2	-	-	-	-	-	-	2
	Lateral left	-	-	-	-	-	-	3	-	3
	Distal	-	2	-	2	-	-	-	-	4
Other	Proximal	-	-	-	-	-	-	-	-	0
	Lateral right	-	1	-	-	-	-	-	-	1
	Distal	-	-	-	-	-	-	-	-	0
Total		5	94	14	20	3	7	48	1	192

Table 6.12. Retouch location and position for flake blanks with a single-work edge.

Some local variation occurs, although in certain cases artefact numbers are so low that it is impossible to talk about trends (*i.e.* for flakes: transects 05, 12 and 13; for blades: transects 05, 07, 09, 13). Flakes with ventral retouch predominate in transects 07 and 23, while dorsal retouch is more common in transects 04 (59.8%), 10 (77.3%) and especially 09 (83.3%). Modified blades are rare, the only sizeable collection is transect 04 where there is an even distribution of dorsal and ventral retouch. Bifacial and/or alternating retouch on flakes is limited to transects 04, 09 and 10, while that found on blades is restricted to transect 04. Out of the four transects containing more than ten modified flakes (*i.e.* 04, 07, 09, 10), only one transect (07) shows a different pattern for retouch position, with a higher tendency for distal retouch. Blade blanks are predominantly retouched on lateral sides, in fact, those with distal retouch are virtually exclusive to transect 04. In transect 14, dorsal retouch is more common than ventral retouch, irrespective of blank type (50.9% *contra* 32.5%), with a more substantial bifacial/alternating retouch component (12.3%). The latter corresponds to the distribution of invasive bifacial retouch, which is largely restricted to transect 14 (Table 6.9). Modification, for all pieces, occurs mostly on lateral and distal sides.

Location	Position	Arborèa	Campidano					Marmilla		Marmilla
		05	04	07	09	13	23	10	Total	14*
Dorsal	Proximal	-	1	-	-	-	-	-	1	6
	Medial	-	3	-	-	-	1	-	4	2
	Lateral left	1	7	-	-	1	-	-	9	13
	Lateral right	1	10	2	-	-	2	-	15	11
	Distal	-	3	-	1	-	-	-	4	17
Ventral	Proximal	-	1	-	-	-	-	-	1	3
	Medial	-	5	-	-	-	2	-	7	2
	Lateral left	-	6	1	-	-	1	1	9	9
	Lateral right	1	7	1	-	-	-	-	9	10
	Distal	-	6	-	-	-	-	-	6	8
Bifacial / Alternating	Proximal	-	1	-	-	-	-	-	1	3
	Lateral right	-	2	-	-	-	-	-	2	2
	Lateral left	-	-	-	-	-	-	-	-	-
	Distal	-	-	-	-	-	-	-	-	6
Other	Proximal	-	-	-	-	-	-	-	-	1
	Lateral right	-	-	-	-	-	-	-	-	-
	Distal	-	-	-	-	-	-	-	0	4
Total		3	52	4	1	1	6	1	68	97

Table 6.13. Retouch location and position for blade blanks with a single-work edge.

Artefacts with double and multi-work edges can be subdivided into three main traditions (Tables 6.14-6.16):

1) Modification on one surface but in two different locations, *e.g.* dorsal on the proximal and distal side. Note that this differs from non-invasive bifacial and alternating since the latter are retouched on both sides in the same location.
2) Modification on two surfaces and in two or more different locations, *e.g.* on the dorsal surface at the proximal side and on the ventral surface at the distal end (in tables below: dorsal / ventral – proximal / distal)
3) Modification on one side and in combination with bifacial and/or alternating retouch, *e.g.* on the ventral surface at the proximal end and bifacial or alternating at the distal side (in tables below: ventral / bifacial/alternating – proximal / distal).

Flake blanks with two work edges predominantly consist of strategy 1 and 2, with retouch on the dorsal and the ventral/dorsal surface (Table 6.14). Only four transects contain five or more modified flakes (04, 07, 09 and 10), and

some spatial differences exist. In transect 07 most modification consists of type 2, while in transects 09 and 10 type 1 is most common.

Location	Position	Arb.	Campidano					Marmilla	N	Mar.
		2	4	7	9	13	23	10		14*
Dorsal	Lateral left & right	-	5	1	1	1	-	8	16	8
	Proximal & distal	-	4	-	2	1	1	1	9	1
	Lateral left & proximal	-	-	-	-	-	-	-	-	1
	Distal & lateral left	-	1	-	1	-	-	1	3	1
	Distal & lateral right	-	1	-	1	-	-	1	3	1
	Distal & medial	-	-	-	-	-	-	-	-	2
Ventral	Lateral left & right	-	1	-	-	1	-	1	3	5
	Medial & distal	-	1	-	-	-	-	-	1	-
	Lateral left & proximal	-	2	-	1	-	1	-	4	1
	Lateral right & distal	-	2	-	-	-	-	1	3	1
	Distal & proximal	-	-	-	1	-	-	-	1	-
Ventral / Dorsal	Proximal / distal	-	1	2	1	-	-	-	4	3
	Proximal / lateral right	-	-	-	-	1	-	-	1	-
	Proximal / lateral left	-	-	-	-	-	-	-	-	1
	Lateral right/ lateral left	-	3	1	-	-	-	1	5	2
	Lateral left / lateral right	-	2	1	-	-	1	-	4	2
	Lateral right / distal	-	1	-	-	-	-	-	1	1
	Distal / lateral right	-	2	-	-	-	-	1	3	1
	Distal / lateral left	-	-	-	-	-	-	1	1	2
	Distal / medial	-	-	-	-	-	-	-	-	1
	Distal / proximal	-	-	-	-	-	-	-	-	2
Dorsal / Bifacial	Lateral left / proximal	-	1	-	-	-	-	-	1	-
	Lateral left / distal	-	1	-	-	-	-	-	1	-
	Lateral right / lateral left	-	-	-	-	-	-	-	-	2
	Distal / medial	-	-	-	-	-	-	-	-	1
Ventral / Bifacial	Lateral left / distal	1	-	-	-	-	-	-	1	1
	Medial / proximal	-	-	-	-	-	-	-	-	1
Dorsal / Alternating	Lateral left / lateral right	-	-	-	-	-	-	-	-	1
Bifacial / Alternating	Lateral left & right	-	-	-	-	-	-	-	-	1
Ventral / Other	Proximal / proximal	-	-	-	-	-	-	-	-	1
Total		1	28	5	8	4	3	16	68	44

Table 6.14. Retouch location and position for double-work flake blanks. *Blank type not recorded.

Retouch positions show three strategies that are to some extent spatially distinct:

1) On the dorsal surface parallel modification (*e.g.* on both lateral sides or on proximal and distal sides) is most common in transects 04 and 10.

2) On the ventral surface modification at a '90-degree turn', *i.e.* on one lateral side and/or proximal or distal sides, is prevalent in transect 04.
3) Parallel modification on the dorsal and ventral side is exclusive to flakes in transect 07 and 10, whereas there is more 90° modification in transect 04.

Data from transect 14, irrespective of blank type also show some interesting patterns (Table 6.14). It contains the bulk of type 3 – one surface in combination with bifacial/alternating – modifications. Most retouch is parallel positioned with a clear preference for lateral sides, which contrasts the distal predominance noted for single-work edges. The only sizeable collection of blades with two work edges comes from transect 04. Modification types 1 and 2 are most frequent, and there is a clear predominance of parallel modification (Table 6.15).

Location	Position	Arborèa	Campidano				Marmilla	
		02	04	07	09	23	10	Total
Dorsal	Lateral left & right	-	8	1	-	-	1	10
	Proximal & distal	-	2	-	-	1	-	3
	Distal & lateral left	-	1	-	-	-	-	1
	Distal & lateral right	-	-	-	-	-	1	1
Ventral	Lateral left & right	-	3	-	-	-	-	3
Ventral / Dorsal	Lateral right/ lateral left	1	4	-	-	-	-	5
	Lateral left / lateral right	-	1	-	-	-	-	1
Bifacial / Alternating	Lateral left & right	-	-	2	-	-	1	3
Dorsal / Bifacial	Lateral right / lateral left	-	-	-	1	-	-	1
Total		1	19	3	1	1	3	28

Table 6.15. Retouch location and position for blade blanks with a double-work edge.

Multi-work edges occur almost exclusively on flakes, and consist mainly of a single surface with continuous modification around three or all sides of the artefact (Table 6.16). Interestingly, ventral and bifacial/alternating modification are virtually exclusive to transect 04. Modified blades with multiple work edges are also exclusive to transect 04. Mirroring figures from double-work edges, virtually all type 3 modifications are again located in transect 14, which reiterates the overall predominance of a bifacial (invasive and non-invasive) component in this transect. There is no patterning between retouch type and retouch position (Table 6.17).

Location	Position	02	04	07	09	23	10	N	04#	14*
Dorsal	Continuous 3-4 edges	1	10	3	6	1	7	28	3	23
	Distal, lateral left & right	-	-	-	-	-	-	-	-	2
Ventral	Continuous 3-4 edges	-	3	3	-	-	1	7	-	6
Bifacial /Alternating	Continuous 3-4 edges	-	5	-	-	-	-	5	2	2
Ventral / Dorsal	Lateral right & proximal / lateral left	-	-	-	-	-	-	-	-	1
	Continuous 3-4 edges / lateral left & right	-	-	-	-	1	-	1	-	-
	Distal & proximal / distal	-	-	-	-	-	-	-	-	1
	Lateral left & proximal / lateral right	-	-	-	-	-	-	-	-	1
	Proximal / distal & medial	-	-	-	-	-	-	-	-	1
Dorsal / Bifacial	Continuous 3-4 edges / proximal	-	-	-	-	-	-	-	-	1
Dorsal / Alternating	Distal / continuous 3-4 edges	-	-	-	-	-	-	-	1	
Ventral / Dorsal / Other	Lateral right & proximal / lateral left / proximal	-	-	-	-	-	-	-	-	1
Total		1	18	6	6	2	8	41	6	39

Table 6.16. Retouch location and position for multi-work edge flake blanks. *Blank type not recorded. #Blade blanks only.

Retouch type	Position	Single-work edges			Multi-work edges		
		Blade	*Flake*	*Total*	*Blade*	*Flake*	*Total*
Feathered	Distal	3	18	21	2	7	9
	Lateral left	4	11	15	1	12	13
	Lateral right	5	5	10	1	7	8
	Medial	1	-	1	-	-	-
	Proximal	-	13	13	-	5	5
	Lateral left & right	-	-	-	-	3	3
	Continuous 3-4 edges	-	-	-	3	9	12
Total		*13*	*47*	*60*	*7*	*43*	*50*
Stepped	Distal	3	25	28	1	9	10
	Lateral left	10	10	20	9	7	16
	Lateral right	7	13	20	5	4	9
	Medial	2	-	2	2	1	3
	Proximal	1	4	5	1	3	4
	Lateral left & right	-	-	-	1	2	3
	Continuous 3-4 edges	-	-	-	-	7	7
Total		*23*	*52*	*75*	*19*	*33*	*52*
Scalar	Distal	-	4	4	-	2	2
	Lateral right	1	2	3	-	1	1
	Medial	2	-	2	-	-	-
	Proximal	-	1	1	-	1	1
	Continuous 3-4 edges	-	-	-	-	2	2
Total		*3*	*7*	*10*	-	*6*	*6*
Notch	Distal	3	3	6	2	5	7
	Lateral left	-	5	5	1	2	3
	Lateral right	4	6	10	-	4	4
	Medial	1	1	2	-	-	-
	Proximal	1	3	4	3	2	5
	Lateral left & right	-	-	-	2	2	4

	Continuous 3-4 edges	-	-	-	-	2	2
Total		*9*	*18*	*27*	*8*	*17*	*25*
Denticulate	Distal	-	1	1	-	-	-
	Lateral left	-	2	2	-	1	1
Total		-	*3*	*3*	-	*1*	*1*
Burin	Lateral right	-	1	1	-	-	-
	Proximal	-	-	-	-	1	1
	Lateral left & right	-	-	-	-	1	1
Total		-	*1*	*1*	-	*2*	*2*
Fresh	Distal	-	5	5	-	8	8
	Lateral left	1	3	4	-	1	1
	Lateral right	3	4	7	3	6	9
	Medial	2		2	-	-	-
	Proximal	-	2	2	-	4	4
	Continuous 3-4 edges	-	-	-	2	4	6
Total		*6*	*14*	*20*	*6*	*22*	*28*
Probable	Distal	1	-	1	-	2	2
	Lateral left	-	2	2	-	-	-
	Lateral right	-	1	1	-	-	-
	Proximal	1	-	1	-	3	3
	Continuous 3-4 edges	-	-	-	1	4	5
Total		*2*	*3*	*5*	*1*	*7*	*8*
Usewear	Distal	1	1	2	-	1	1
	Lateral left	2	5	7	2	1	3
	Lateral right	4	4	8	4	2	6
	Medial	1	1	2	-	-	-
	Proximal	-	2	2	-	-	-
	Lateral left & right	-	-	-	3	2	5
Total		*8*	*13*	*21*	*10*	*6*	*16*
Irregular	Distal	-	10	10	-	5	5
	Lateral left	1	2	3	1	6	7
	Lateral right	2	12	14	2	4	6
	Medial	-	1	1	-	-	-
	Proximal	-	3	3	-	1	1
	Lateral left & right	-	-	-	3	1	*4*
	Continuous 3-4 edges	-	-	-	-	13	13
Total		*3*	*28*	*31*	*6*	*30*	*36*
Grand Total		**67**	**186**	**253**	**57**	**171**	**228**

Table 6.17. Retouch type and retouch position for all flake and blade blanks.

6.3.2.3. Work edge angle and shape

Work edge angles are consistent across the study area (Table 6.18; Appendix 6.4). Very steep angles (1-30°) are rare, but occur most frequently on blade blanks. Obtuse angles (60-80° and over 80°) are most common on core and chunk blanks. Angles on flake blanks with single-work edges range from 30-80 degrees (62.4%) with another substantial portion (37.1%) over 80 degrees.

Similarly, two-thirds (65.6%) of angles on single-work edge blade blanks range between 30-80 degrees, although a smaller percentage (25.3%) of angles over 80 degrees are present. There is a broad relationship between retouch location and retouch angle for flake blanks. Most (75%) angles on distal and proximal sides are more obtuse (*e.g.* falling in 60-80 and >80 categories), compared to angles on lateral and medial sides (43.2%). Irrespective of blank types, figures for transect 14 are similar to the general trends. Few angles are very steep, and there is a basic correspondence between location and angle of retouch. There is no spatial patterning visible.

		Arborèa	Campidano					Marmilla			Marmilla
Position	**Angle**	**02**	**04**	**07**	**09**	**13**	**23**	**10**	**12**	**Total**	**14***
Distal	30-60	-	10	2	-	1	-	1	-	14	6
	60-80	-	11	2	4	-	2	5	-	24	8
	>80	2	14	-	2	-	-	8	-	26	12
Total		*2*	*35*	*4*	*6*	*1*	*2*	*14*	-	*64*	*26*
Lateral left	30-60	1	3	1	-	-	1	4	-	10	10
	60-80	-	6	-	2	-	1	6	-	15	5
	>80	-	7	-	1	1	-	3	-	12	6
Total		*1*	*16*	*1*	*3*	*1*	*2*	*13*	-	*37*	*21*
Lateral right	0-30	-	-	-	-	-	-	-	-	-	1
	30-60	1	7	1	1	-	-	2	1	13	12
	60-80	-	9	2	1	-	-	4	-	16	2
	>80	-	8	-	1	-	-	2	-	11	4
Total		*1*	*24*	*3*	*3*	-	-	*8*	*1*	*40*	*19*
Medial	30-60	-	1	-	-	-	-	-	-	1	2
	60-80	-	1	-	-	-	-	-	-	1	1
	>80	-	-	-	1	-	-	-	-	1	1
Total		-	*2*	-	*1*	-	-	-	-	*3*	*4*
Proximal	0-30	-	-	1	-	-	-	-	-	1	-
	30-60	-	5	1	-	-	-	2	-	8	3
	60-80	-	2	-	1	-	1	-	-	4	2
	>80	-	6	-	-	1	1	2	-	10	5
Total		-	*13*	*2*	*1*	*1*	*2*	*4*	-	*23*	*10*
Indeterminate	30-60	-	1	-	-	-	-	-	-	1	7
	60-80	-	3	-	-	-	-	1	-	4	10
	>80	1	4	-	-	-	-	1	-	6	5
Total		*1*	*8*	-	-	-	-	*2*	-	*11*	*22*
Total		**5**	**98**	**10**	**14**	**3**	**6**	**41**	**1**	**178**	**102**

Table 6.18. Retouch angle and work edge shape for flake blanks with a single-work edges. *Blank type not recorded.

Angles on multi-work edges, irrespective of blank type, are generally (78.6%) obtuse. The noted correspondence between position and angle of retouch for single-work edges is not present on artefacts with multi-work edges; modification on lateral sides is not steeper than those on distal/proximal ends (Appendix 6.4: Table 2).

Single-work edge morphology largely follows blank morphology (Table 6.19-6.20; Appendix 6.4: Table 3-4). Edges on blade blanks are mostly straight (52.2%), concave (22.1%) or convex (11.6%). Work edges on flake blanks are predominantly concave (43.4%), convex (16.8%) or straight (21.9%). Spatial distinctions are visible. Straight and concave work edges on flake and blade blanks are concentrated in Mògoro transects 04, 10, and 14. Convex edges are similarly abundant in these transects, but also constitute a majority in transects 09 and 23 (Table 6.19). Denticulated and edges shaped into converging points are rare; on blades they are virtually exclusive to transect 04, and on flakes they are found in transects 04, 09 and 10 (and irrespective of blank type they also occur in transect 14).

Blank type	Work edge shape	02	05	04	07	09	13	23	12	10	Total	14*
Blade	Straight	-	2	27	2	1	-	3	-	1	36	33
	Concave	-	-	12	1	-	-	2	-	-	15	27
	Convex	-	1	5	1	-	1	-	-	-	8	44
	Convergent/pointed	-	-	4	-	-	-	-	-	-	4	8
	Irregular	-	-	1	-	-	-	-	-	-	1	4
	Denticulated	-	-	4	-	-	-	1	-	-	5	8
Total		-	*3*	*53*	*4*	*1*	*1*	*6*	-	*1*	*69*	*121*
Flake	Straight	1	-	25	4	1	-	1	-	10	42	
	Concave	2	-	17	2	2	-	1	1	8	33	
	Convex	2	-	41	3	11	2	5	-	21	85	
	Convergent/pointed	-	-	7	-	2	-	-	-	4	14	
	Irregular	-	-	4	-	-	-	-	-	2	6	
	Denticulated	-	-	7	1	3	1	-	-	4	16	
Total		*5*	-	*101*	*10*	*19*	*3*	*7*	*1*	*49*	*196*	
Grand Total		**5**	**3**	**154**	**14**	**20**	**4**	**13**	**1**	**50**	**264**	

Table 6.19. Work edge morphology for single-work edges on all flake and blade blanks. * Blank data not recorded.

Multi-work edge morphology partially compares and contrasts with these patterns. Blade blank edges are again predominantly straight (50.9%) or convex (23.6%). Flake blank edges are more diverse and are straight (29.5%),

concave (29.5%) and convex (12.2%) with an additional portion (17.9%) of blanks shaped into convergent/pointed edges (Table 6.20). Spatial distribution patterns are less concentrated than single-work edges, although some again may hint at temporally and spatially distinct use activities. Equal numbers of straight, convex, concave and/or convergent edges are found in transects 07 and 09, in the latter case contrasting with single-work edge data. Straight, convex and convergent work edges constitute the bulk of transects 04 and 10, while concave and convex work edges predominate in transect 13, and straight and convergent edges are most frequent in transect 23 (Table 6.20).

Blank type	Work edge shape	02	04	07	09	13	23	10	Total	14*
Blade	Straight	1	21	2	-	-	2	2	28	54
	Concave	1	9	1	2	-	-	-	13	55
	Convex	-	6	1	-	-	-	-	7	41
	Convergent/pointed	-	2	-	-	-	-	1	3	19
	Irregular	-	2	-	-	-	-	-	2	7
	Denticulated	-	1	-	-	-	-	1	2	8
Total		*2*	*41*	*4*	*2*	-	*2*	*4*	*55*	*185*
Flake	Straight	2	18	5	6	1	4	10	46	
	Concave	-	6	4	5	3	-	1	19	
	Convex	-	24	5	5	2	1	9	46	
	Convergent/pointed	1	10	3	3	1	3	7	28	
	Irregular	-	6	-	-	-	-	1	7	
	Denticulated	-	5	2	-	1	1	1	10	
Total		*3*	*69*	*19*	*19*	*8*	*9*	*29*	*156*	
Grand Total		**5**	**110**	**23**	**21**	**8**	**11**	**33**	**211**	

Table 6.20. Work edge morphology for multi-work edges on all flake and blade blanks (n=127). * Blank data not recorded.

Examination of a correspondence between work edge morphology and retouch type only show a very generic connection (Figures 6.5-6.6; Appendix 6.4: Tables 3-4). Notches and denticulates result in concave and/or wavy edges, while feathered and stepped retouch are used to created straight, convergent and convex edges. Probably retouched artefacts (*i.e.* retouch types: fresh, probable, usewear and irregular) have resulted in a mixture of edge shapes, particularly straight and convex ones.

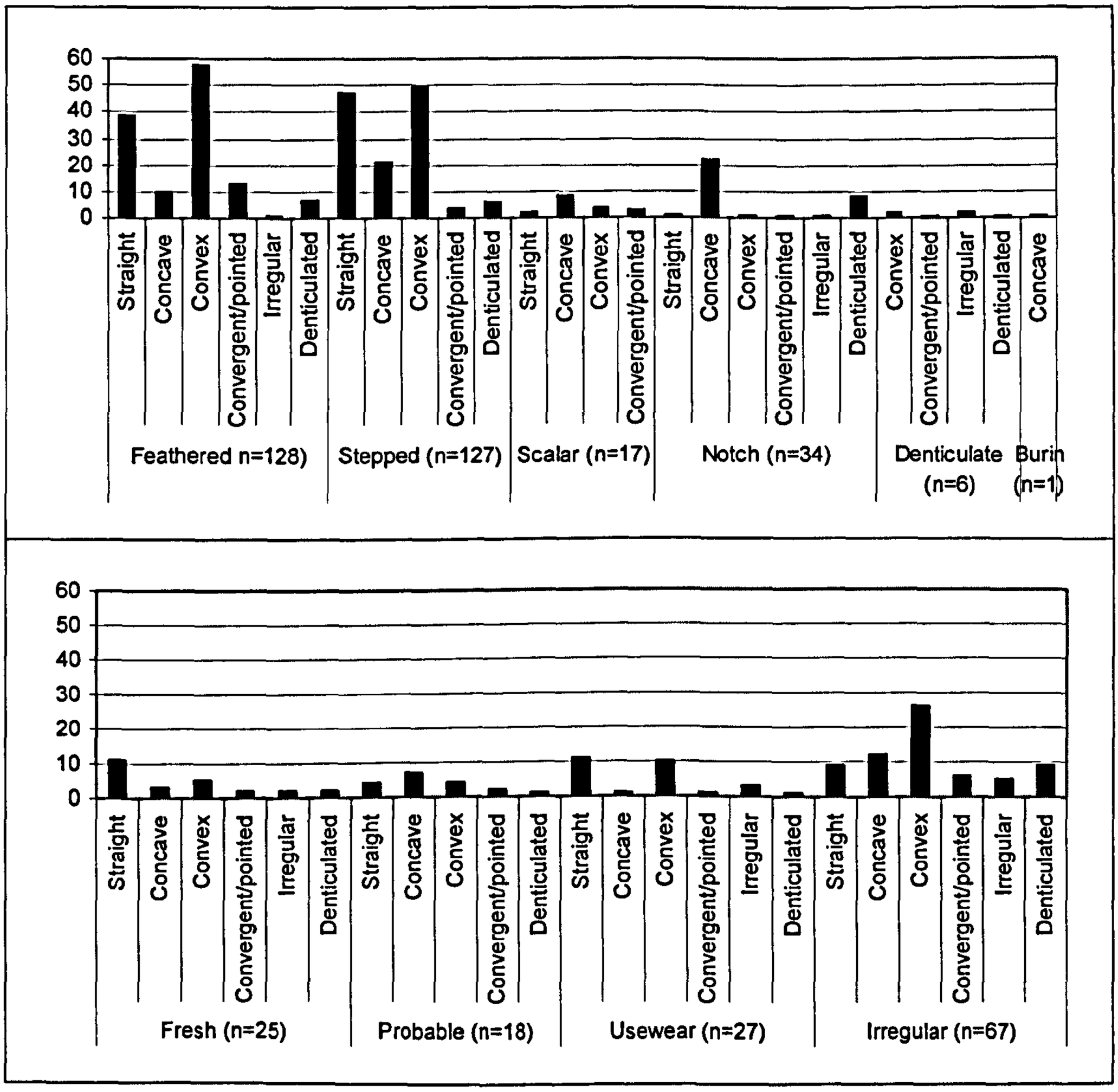

Figure 6.5. Work edge morphology and retouch types for retouched (above) and probably retouched (below) single-work edges, all blanks (n=450).

In summary, it is clear that it has proven difficult to identify clear patterned retouch strategies for unifacial modification from retouch type, location, position, angle and work edge shape. Some very generic trends may be discerned:

- Positioning of retouch largely follows blank morphology and shows greater variation among flake blanks. Blade blanks are predominantly modified along the lateral sides, while flake blanks are modified laterally as well as at proximal and distal ends.
- Three main types of modification exist for artefacts with double and multi-work edges. Type 3 modification (retouch on one surface in combination with non-invasive bifacial and/or alternating modification) is concentrated in transects 04 and, especially 14.

- Double and multi-work edges on blade blanks are rare and virtually exclusive to transect 04.
- Most modification is obtuse to very obtuse (60-80° and over 80°), very steep retouch is rare, and predominantly occurs on blades.
- Extensive modification, even on artefacts with multi-work edges, appears to be rare.

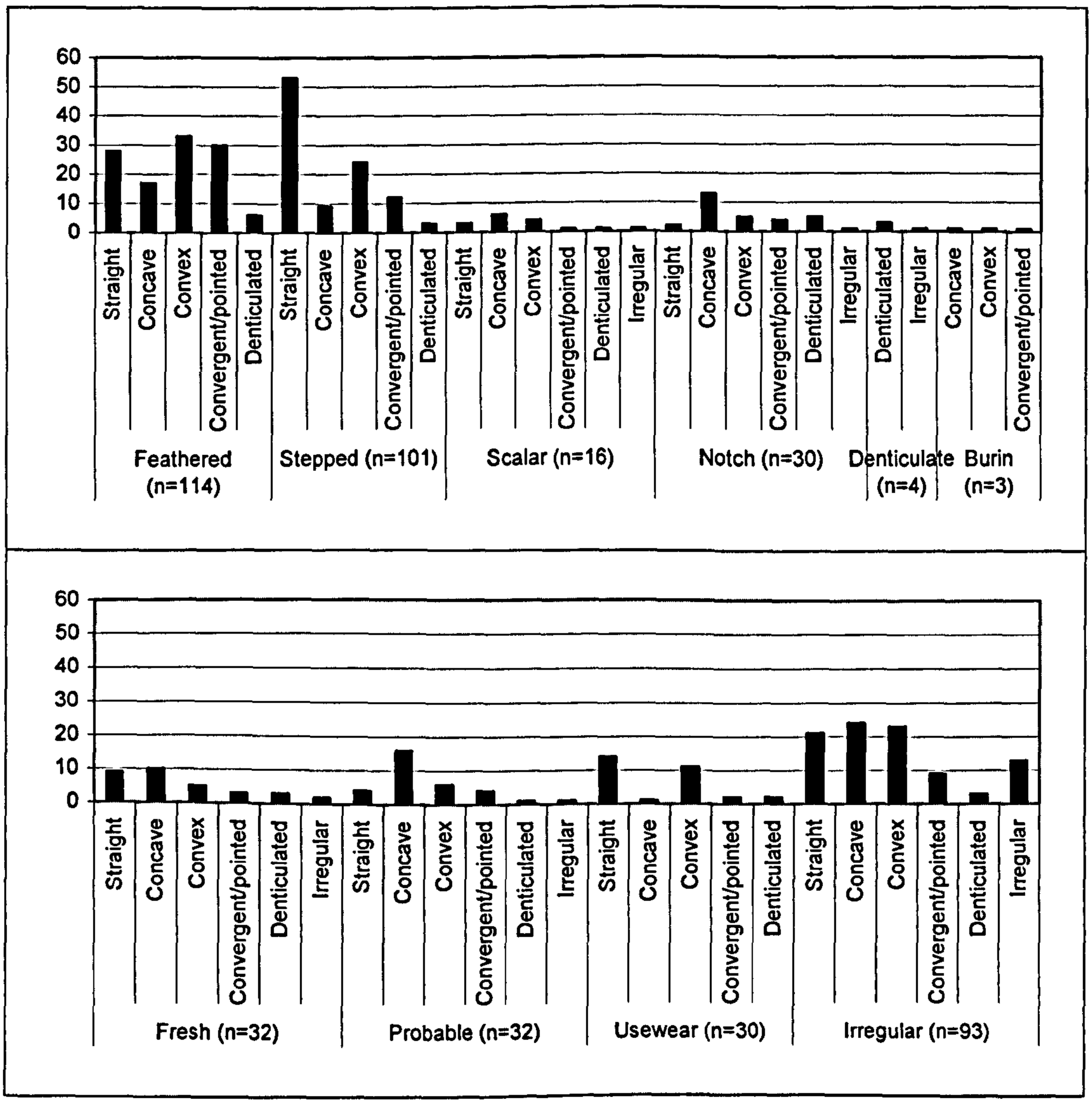

Figure 6.6. Work edge morphology and retouch types for retouched (above) and probably retouched (below) multi-work edges, all blanks (n=259).

6.3.2.4. Unifacial retouch: intensity and consistency of modification

It is also worthwhile to examine the extent of retouch intensity and consistency through a closer look at the length and depth of retouch types and patterns. Each retouch type and retouch pattern is meant to convey the extent and continuity of modification. Feathered marginal retouch for instance is considered to be less invasive than feathered extensive or scalar retouch. Likewise, a marginal continuous patterning denotes that retouch is continuous but blank modification is slight, while extensive isolated retouch implies that part of the blank was significantly altered. Comparisons of average retouch lengths and depths for all retouch types distributed over the five retouch patterns, both compare and contrast to these subjective classes (Figures 6.7-6.8):

- Marginal continuous and isolated retouch (all types) largely conform to expected patterns. Blank modification (as indicated by retouch depth) is slight and in both categories most retouch types have an average below 5mm, except notches. As indicated by the terminology, marginal isolated retouch is less continuous but more extensive, with average depths over 5mm.
- Comparisons between retouch types in all categories except irregular retouch follow expected patterns and show internal consistency. Feathered retouch, for instance, is more invasive than stepped retouch, but scalar retouch is less invasive than the term implies.
- Extensive continuous and isolated retouch patterns generally indicate more invasive retouch with average retouch depths around 5-12mm, but there is less contrast with figures for marginal retouch patterns than implied by the terms. Retouch lengths too, indicate slightly more invasive retouch but not by a great measure (*e.g.* average lengths of 22-25mm contra 20-22mm).
- Marginal and extensive isolated retouch both are clearly associated with two retouch types: notches and denticulates.
- Irregular retouch, unsurprisingly, is mostly non-invasive but quite variable and contains some of the lowest average depths. Interestingly, retouch lengths are comparable to those for marginal continuous retouch.

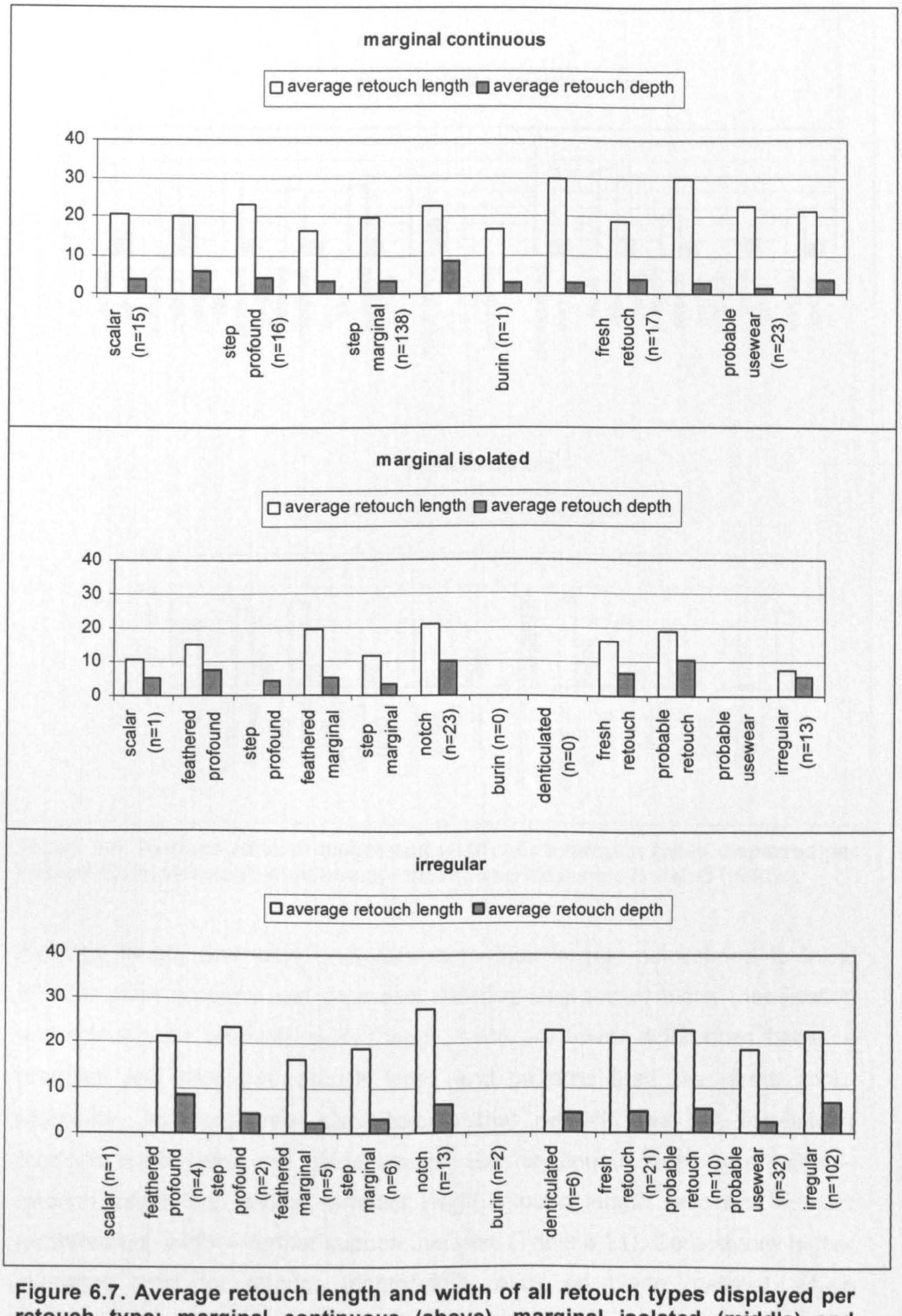

Figure 6.7. Average retouch length and width of all retouch types displayed per retouch type: marginal continuous (above), marginal isolated (middle) and irregular (below).

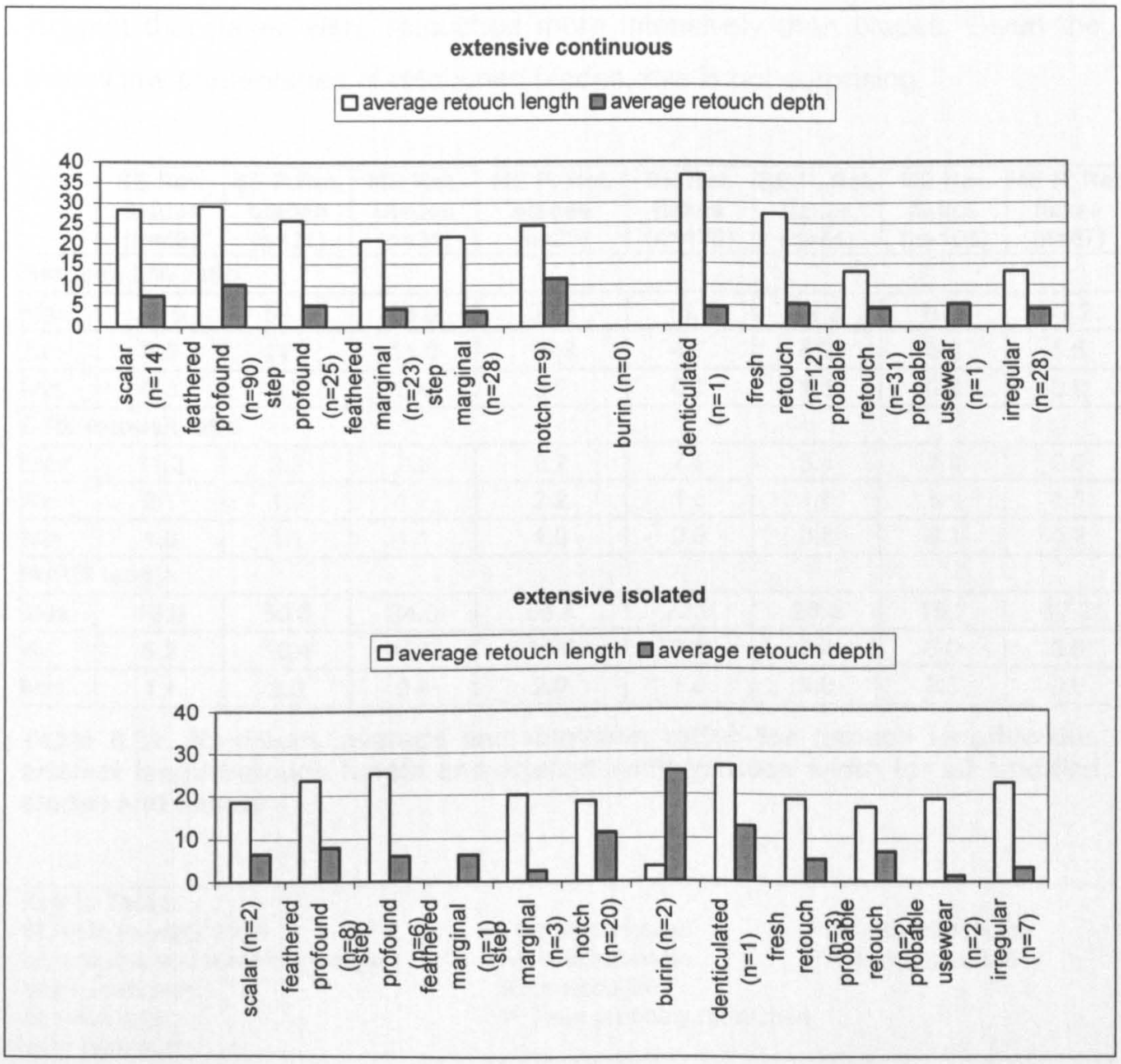

Figure 6.8. Average retouch length and width of all retouch types displayed per retouch type: extensive continuous (above), and extensive isolated (below).

Average length and width measurements thus largely correspond to initial intuitive classifications and represent differing degrees of blank modification and retouch/use intensity even though there are fewer differences between marginal and profound retouch types and patterns than the terms imply. Moreover, measurements also indicate that retouch has not extensively modified most flake and blade blanks. Examination of three size ratios – retouch length and widths, artefact length/retouch length ratio and artefact width/retouch width – further support this view (Table 6.21). Consistently higher averages exist for retouch length/width ratios on blade material, which correspond to earlier observations that modification predominantly occurs on the lateral sides of blades. Comparisons of artefact length/retouch length ratios and artefact width/retouch width show higher average ratios for blade than flake material, in particular for artefacts with multi-work edges. This may

suggest that flakes were retouched more intensively than blades. Given the overall low percentages of retouched blades, this is not surprising.

	SE Ret. Blades (n=49)	SE P.Ret. blades (n=21)	ME Ret. Blades (n=34)	ME P. Ret. blades (n=23)	SE Ret. flakes (n=135)	SE P. Ret. flakes (n=64)	ME Ret. flakes (n=104)	ME P. Ret. flakes (n=67)
Retouch L/W ratio								
Max	38.5	56.0	34.0	66.5	16.9	21.3	16.2	17.2
Av	6.5	11.3	11.0	14.9	4.7	6.2	5.0	5.6
Min	0.3	3.7	0.4	2.9	0.1	1.5	0.3	0.9
L/RL retouch ratio								
Max	11.2	3.2	2.8	6.2	7.8	3.1	3.3	2.6
Av	2.1	1.9	1.7	2.2	1.5	1.6	1.6	1.5
Min	1.0	1.1	1.1	1.0	0.6	0.8	0.3	0.2
W/RW length								
Max	18.0	50.6	34.0	66.5	22.9	26.4	16.2	17.2
Av	6.2	10.4	11.0	14.9	6.1	7.7	5.0	5.6
Min	1.1	3.3	0.4	2.9	1.0	2.0	0.3	0.9

Table 6.21. Maximum, average and minimum ratios for retouch length/width, artefact length/retouch length and artefact width/retouch width for all modified blades and flakes.

Key to Table:
SE= single-work edge
ME- double and multi-work edge
Max= maximum
Av= Average
Min= minimum
L= artefact length
W= artefact width
Ret= retouched
P. Ret= probably retouched
RL= retouch length
RW= retouch width

A last exploration that contrasts blank fragmentation with the position of modification shows two main patterns (Table 6.22). Firstly, there is a strong correlation between fragmentation and blank type, perhaps suggesting differing degrees of retouch/use intensity. Virtually all blade blanks are incomplete with extensive fragmentation; either all sides are missing or only one part is clearly recognisable. Likewise, most blanks used in transect 14 appear to be complete, suggesting limited modification irrespective of blank type. Secondly, there is only a partial correlation between retouch position and fragmentation. A missing proximal part for instance, does not automatically indicate a retouched proximal side. A certain degree of correlation does exist. For example, absent lateral sides do partially (43.8%) correspond with lateral retouch, likewise absent distal and lateral sides are often accompanied by distal and lateral retouch (64.7%). Thus, comparison of fragmentation with retouch position suggests a more extensive blade than flake modification, despite the lack of multi-work edges for the former, and in direct contrast with

conclusions drawn from size ratio comparisons. Four explanations may be offered that are not mutually exclusive, but presumably complement each other: 1) selection of large complete blade blanks for use, 2) a high fragmentation degree for blades as a result of use, 3) purposeful breakage and selection of blade fragments prior to modification, 4) post depositional breakage. Unfortunately, I was unable to distinguish between the latter three types of breakage.

Blank fragmentation	Retouch position	Blade		Flake		N/R		Other	Total
		N	%	N	%	N	%	N	
Complete	Proximal	-	-	-	-	29	14.0	-	29
	Lateral	-	-	-	-	89	43.0	-	89
	Laterals	-	-	-	-	1	0.5	-	1
	Medial	-	-	-	-	10	4.8	-	10
	Distal	-	-	-	-	65	31.4	-	65
	3-4 edges	-	-	-	-	10	4.8	-	10
	Irregular	-	-	-	-	3	1.4	-	3
Total		-	-	-	-	*207*	*100*	-	*207*
Proximal missing	Proximal	-	-	2	4.9	4	-	-	6
	Lateral	-	-	20	48.8	20	-	-	40
	Laterals	-	-	1	2.4	-	-	-	1
	Medial	-	-	1	2.4	-	-	-	1
	Distal	-	-	11	26.8	6	-	-	17
	3-4 edges	-	-	6	14.6	6	-	-	12
	Irregular	-	-	-	-	1	-	-	1
Total		-	-	*41*	*100*	*37*	-	-	*78*
Lateral missing	Proximal	-	-	6	18.8	-	-	-	6
	Lateral	-	-	14	43.8	-	-	-	14
	Distal	-	-	12	37.5	-	-	-	12
Total		-	-	*32*	*100*	-	-	-	*32*
Distal missing	Proximal	-	-	19	13.8	-	-	-	19
	Lateral	-	-	59	42.8	-	-	-	59
	Laterals	-	-	3	2.2	-	-	-	3
	Medial	-	-	3	2.2	-	-	-	3
	Distal	-	-	41	29.7	-	-	-	41
	3-4 edges	-	-	13	9.4	-	-	-	13
Total		-	-	*138*	*100*	-	-	-	*138*
Proximal & Lateral missing	Proximal	-	-	1	3.8	-	-	-	1
	Lateral	-	-	13	50.0	-	-	-	13
	Laterals	-	-	2	7.7	-	-	-	2
	Distal	-	-	8	30.8	-	-	-	8
	3-4 edges	-	-	2	7.7	-	-	-	2
Total		-	-	*26*	*100*	-	-	-	*26*
Lateral & Distal missing	Proximal	-	-	6	17.6	-	-	-	6
	Lateral	-	-	14	41.2	-	-	-	14
	Laterals	-	-	1	2.9	-	-	-	1

	Medial	-	-	1	2.9	-	-	-	1
	Distal	-	-	8	23.5	-	-	-	8
	3-4 edges	-	-	4	11.8	-	-	-	4
Total		-	-	*34*	*100*	-	-	-	*34*
Proximal and Distal missing	Proximal	-	-	10	15.9	-	-	-	10
	Lateral	-	-	20	31.7	-	-	-	20
	Laterals	-	-	2	3.2	-	-	-	2
	Distal	-	-	23	36.5	-	-	-	23
	3-4 edges	-	-	8	12.7	-	-	-	8
Total		-	-	*63*	*100*	-	-	-	*63*
Proximal remaining	Proximal	1	2.9	-	-	-	-	-	1
	Lateral	27	79.4	-	-	-	-	-	27
	Laterals	2	5.9	-	-	-	-	-	2
	Distal	4	11.8	-	-	-	-	-	4
Total		*34*	-	-	-	-	-	-	*34*
Lateral remaining	Proximal	-	-	3	-	-	-	-	3
	Lateral	2	-	-	-	-	-	-	2
	Distal	-	-	1		-	-	-	1
	3-4 edges	1	-	3		-	-	-	4
Total		*3*	-	*7*		-	-	-	*10*
Distal remaining	Proximal	-	-	2	16.7	-	-	-	2
	Lateral	-	-	5	41.7	-	-	-	5
	Distal	-	-	4	33.3	-	-	-	4
	3-4 edges	-	-	1	8.3	-	-	-	1
Total		-	-	*12*	-	-	-	-	*12*
3-4 sides missing	Proximal	6	6.7	-	-	-	-	3	9
	Lateral	46	51.7	-	-	-	-	6	52
	Laterals	7	7.9	-	-	-	-	-	7
	Medial	11	12.4	-	-	-	-	-	11
	Distal	13	14.6	-	-	-	-	5	18
	3-4 edges	6	6.7	-	-	-	-	2	8
Total		*89*	*100*	-	-	-	-	*16*	*105*
Grand Total		**126**	-	**353**	-	**244**	-	**16**	**739**

Table 6.22. Retouch location expressed in blank fragmentation for all blank types. N/R unrecorded blanks types in transect 14. Represented in work edges not artefact numbers.

6.3.2.5. Bifacial retouch

Extensive bifacially retouched artefacts are rare, and found strongly concentrated in transects 04 and 14. An initial division was made between those with a visible haft element at the base of the artefact (*i.e.* tanged) and those without. Please note that these are descriptive terms and are not meant to suggest that actual hafting took place. Comments additionally classify half of the 'non-hafted bifacially retouched pieces'. A third of these are broken fragments of tanged arrowheads (Table 6.23). Fragmentation analysis for all

bifacial pieces further shows that just over half (54.2%) appear to be incomplete. Unfortunately, while fragmentation can generally be recognised, in most cases the 'missing' part could not be recognised, excluding the pieces already recognised as fragmented arrowheads (Tables 6.23-6.24).

	Arborèa	Campidano			Marmilla			
	02	04	07	13	10	14		Total
						NH	H	
Arrowhead fragment (base/ tip)	-	1	-	-	1	1	2	5
Probable (fragment of) tanged arrowhead	-	-	-	1	-	5	-	6
Novice attempt?	-	1	-	-	-	1	-	2
Abandoned during flaking?	2	1	1	-	-	6	-	10
Overshot features in edge/base	-	1	-	-	-	3	1	5
Probable steps/hinges plateau / hinged on cortex	-	1	-	-	-	4	-	5
Total	**2**	**5**	**1**	**1**	**1**	**20**	**3**	**33**

Table 6.23. Comments made during recording on hafted (H) and non-hafted bifacial (NH) pieces.

Length/width ratios for hafted and non-hafted bifacial pieces underscore the internal cohesion of the two basic categories. Tanged arrowheads fall in a much tighter range than non-hafted ones, although its small sample size makes it difficult to attribute any significant conclusions to this (Figure 6.9).

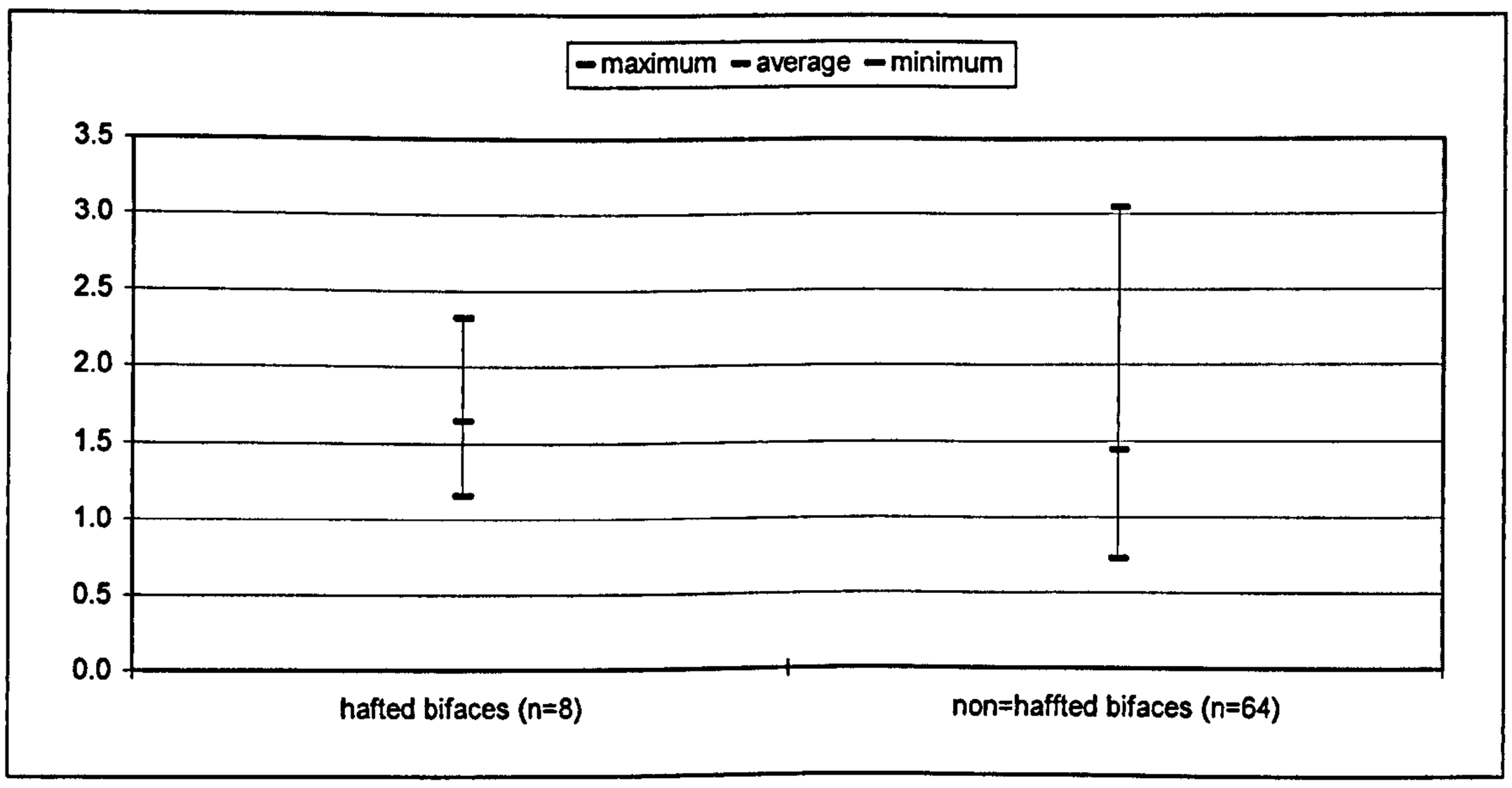

Figure 6.9. Maximum, average and minimum length/thickness ratios for bodies of hafted and non-hafted bifacial pieces.

Variables	Attributes	NON-HAFTED BIFACIAL									HAFTED BIFACIAL			
		Arb.	Campidano				Marmilla			*N*	Arb.	Marmilla		*N*
		02	04	07	13	23	10	11	14		05	10	14	
Retouch / edge angle	0-30	-	1	-	-	-	-	-	1	*2*	-	-	-	-
	30-60	3	6	1	1	1	2	-	14	*28*	1	1	4	*6*
	60-80	1	6	-	1	-	1	1	18	*28*	-	-	2	*2*
	>80	-	1	1	-	-	-	-	1	*3*	-	-	-	-
	Total	*4*	*14*	*2*	*2*	*1*	*3*	*1*	*34*	*61*	*1*	*1*	*6*	*8*
Retouch Type	Thin, long feathered	2	4	1	1	-	-	-	14	*22*	1	-	2	*3*
	Deep, short stepped	1	9	1	1	1	-	-	16	*29*	-	-	4	*4*
	Scalar	-	1	-	-	-	2	-	-	*3*	-	-	-	-
	Irregular	-	1	-	-	-	-	-	6	*7*	-	-	-	-
	Total	*3*	*15*	*2*	*2*	*1*	*2*	-	*36*	*61*	*1*	-	*6*	*7*
Edge shape	Abraded	-	-	-	-	-	-	-	3	*3*	-	-	2	*2*
	Denticulated	1	-	-	-	-	-	-	-	*1*	1	-	-	*1*
	Smooth	3	10	-	1	-	2	1	19	*36*	-	-	2	*2*
	Irregular	-	4	2	1	1	1	-	13	*22*	-	1	3	*4*
	Total	*4*	*14*	*2*	*2*	*1*	*3*	*1*	*35*	*62*	*1*	*2*	*6*	*9*
Fragmentation	Complete	3	7	-	-	1	1	1	16	29	1	1	2	4
	Top missing	-	-	-	-	-		-	-	-	-	-	3	3
	Lateral side(s) missing	-	-	-	-	-	-	-	2	2	-	-	-	-
	Base/haft element missing	1	3	-	-	-	-	2	7	13	-	-	1	1
	Top & Base missing	-	-	-	-	-	-	-	1	1	-	-	-	-
	Fragment remaining	-	1	-	-	-	-	-	-	1	-	-	-	-
	Indeterminate	-	3	2	2	-	-	-	11	17	-	-	-	-
	Total	*4*	*14*	*2*	*2*	*1*	*1*	*3*	*36*	*63*	*1*	*1*	*6*	*8*
Break pattern	Lipped	1	5	1	-	-	1	-	3	11	-	-	1	1
	Straight	-	1	-	-	-	1	-	6	8	-	-	-	-
	Oblique	-	-	-	-	-	-	-	3	3	-	-	1	1
	Overshot	-	-	-	-	-	-	-	1	1	-	-	1	1
	Indeterminate	-	2	1	2	-	-	-	7	12	-	-	-	-
	Total	*1*	*8*	*2*	*2*	-	*2*	-	*20*	*35*	-	-	*3*	*3*
Artefact profile	Oval	2	2	1	1	-	1	-	15	22	1	3	1	5
	Triangular	-	1	1	-	-	-	-	-	2	-	-	1	1
	Step/hinge plateau	-	1	-	-	-	-	-	-	1	-	-	-	-
	Asymmetrical	2	10	-	1	1	2	1	15	32	-	-	3	3
	Irregular	-	-	-	-	-	-	-	4	4	-	-	-	-
	Total	*4*	*14*	*2*	*2*	*1*	*3*	*1*	*34*	*61*	*1*	*3*	*5*	*9*
Artefact shape	Oval/Rounded	3	5	1	-	-	1	-	17	27	-	-	-	-
	Triangular	1	4	-	-	1	2	3	-	11	-	-	-	-
	Square/Rectangular	-	3	-	-	-	-	1	2	6	-	-	-	-
	Semi-circular	-	3	2	-	-	-	-	10	15	-	-	-	-
	Irregular	-	-	-	1	-	-	-	3	4	-	-	-	-
	Total	*4*	*15*	*3*	*1*	*1*	*3*	*4*	*32*	*63*	-	-	-	-

Table 6.24. Summary of attribute data for extensively bifacially retouched artefacts.

Some information is also available on retouch practice. It should be recalled that these data were not recorded systematically. Thus, this exploration relies on both attribute analysis and comments made during recording (respectively Table 6.24 and 6.23). Abandonment as a result of (unspecified) technical mistakes is suggested for some pieces. Two types of technical mistakes are identified for some pieces: hinge/step plateaus in the middle of the artefact, and overshot edges – where retouch removal cut too deep into the artefact body creating irregular edges or failing to created a haft element (Table 6.23). Attribute analysis similarly shows a mixture of skilfully knapped and not-so-skilfully-knapped or ad hoc knapped bifacial pieces. The latter category may be recognised by obtuse angles (>80°), irregular retouch types and edge shapes, as well as irregular and asymmetrical artefact profiles (Table 6.24; Appendix 6.4: Tables 5-7). Spatial distribution is, as mentioned earlier, strongly concentrated in two areas, but it is worthwhile noting that these ad hoc pieces are virtually exclusive to transects 04 and 14.

6.3.3. Secondary flaking practice: conclusion

It may be concluded that a restrictive recording system has affected the full exploration of secondary flaking as a socially embedded practice. Nevertheless, the attribute-based analysis brought six noteworthy trends to the fore.

Firstly, unifacially modified artefacts are most common. Extensive bifacial retouch is rare and its distribution is strongly concentrated in three areas, the special interest areas 04-B and 14-B, and throughout transect 02.

Secondly, flakes and blades are most often used as blanks for unifacially retouched pieces and where recognisable, also for bifacially retouched pieces. Distribution of modified blades is strongly concentrated in special interest area 04-B. Likewise, the use of other blanks, especially overshot flakes and bipolar cores, is restricted to special interest area 04-B.

Thirdly, it has proven difficult to separate intentional from pseudo retouch analysis. Where initial classification suggested a distinction could be made, comparison with detailed description showed considerable overlap between

the pieces, particularly for those with marginal continuous stepped and feathered retouch.

Fourthly, detailed examination of the position of unifacial retouch, angle, and edge morphology, showed some broad retouch traditions. Descriptions for modified blades – with single- or double-work edge modification mostly along one or both lateral sides, very steep, steep or obtuse angles and straight or convex edge morphologies – correspond to what are commonly called 'knives' in traditional tool typologies. Modification of flakes is more varied, in particular among single-work edges. Some standardisation may be seen among double-work edge artefacts, which seems to have a spatial component. Parallel modification (*e.g.* on both lateral sides or at proximal and distal sides) and at a 90º-turn are found primarily in transect 04 and 10. Angles are mostly obtuse to very obtuse with convex, concave and straight angles, corresponding with descriptions of end, side and convergent scrapers.

Fifthly, examination of retouch intensity revealed an intriguing contrast. Analysis of retouch length and depth suggested flakes are more extensively modified than blades, while comparison of retouch position with blank fragmentation suggested the opposite. The majority of modified blades appear fragmented, but retouch position only partially explains this fragmentation because not all areas recorded as absent show evidence of modification. Unfortunately, it is unclear whether fragmentation is pre-modification as a result of use, or post depositional processes.

Lastly, extensively bifacially retouched pieces are rare and concentrated in only a few locations with almost a quarter of all bifacial pieces found in isolation or as part of 'site' assemblages where contemporaneity between lithics and pottery is contested. There is a strong concentration of tanged arrowheads, complete and fragmented, in site 14-B, which is echoed in the distribution of pieces with non-invasive bifacial and alternating retouch. Intermittent recording notwithstanding, it is intriguing that the few bifacial pieces for which unskilled knapping is (tentatively) suggested are exclusive to 04-B and 14-B.

6.4. Raw material selection

The previous chapter discussed artefact sizes, especially length and width range, to gain insight into raw material selection criteria by focussing on a comparison of average lengths of cores, complete unretouched flakes and blades, and previous removals on cores (see Section 5.3). This section compares and contrasts those figures with retouched and probably retouched material to gain a more comprehensive understanding of procurement strategies.

6.4.1. Size distribution

Length, width and thickness measurements for single and multi-work edge modified flakes and blades correspond with those recorded for primary technology figures (Figure 6.10; Appendix 6.5; see also Figure 5.17; Appendix 5.10):

- Single-work edge blade lengths range from 20-70mm, with an average of 37.8mm for retouched, and 43.6mm for probably retouched pieces. Widths range from 10-40mm, with averages of 23.8 (retouched) and 21.9mm (probably retouched). Blade length/width ratios echo primary technology data; retouched pieces 1:1.7 and 1:2 for probably retouched pieces. Blade thickness falls in the 4-20mm category, with averages of 8.5 for retouched, and 7.9 for probably retouched blades.
- Size measurements for flake blanks with single-work edges similarly mirror primary technology data, but show a tighter range. Lengths for retouched and probably retouched pieces range from 15-70mm, with an average of 32mm. Widths too, have a narrower range from 14-50mm, with averages of 27.9 and 26.9mm for retouched and probably retouched respectively. Length/width ratios (1:1.2 for both) closely mirror debitage and core data. Flake thickness ranges from 3-27mm, with an average of 9.5mm (retouched) and 9mm (probably retouched).

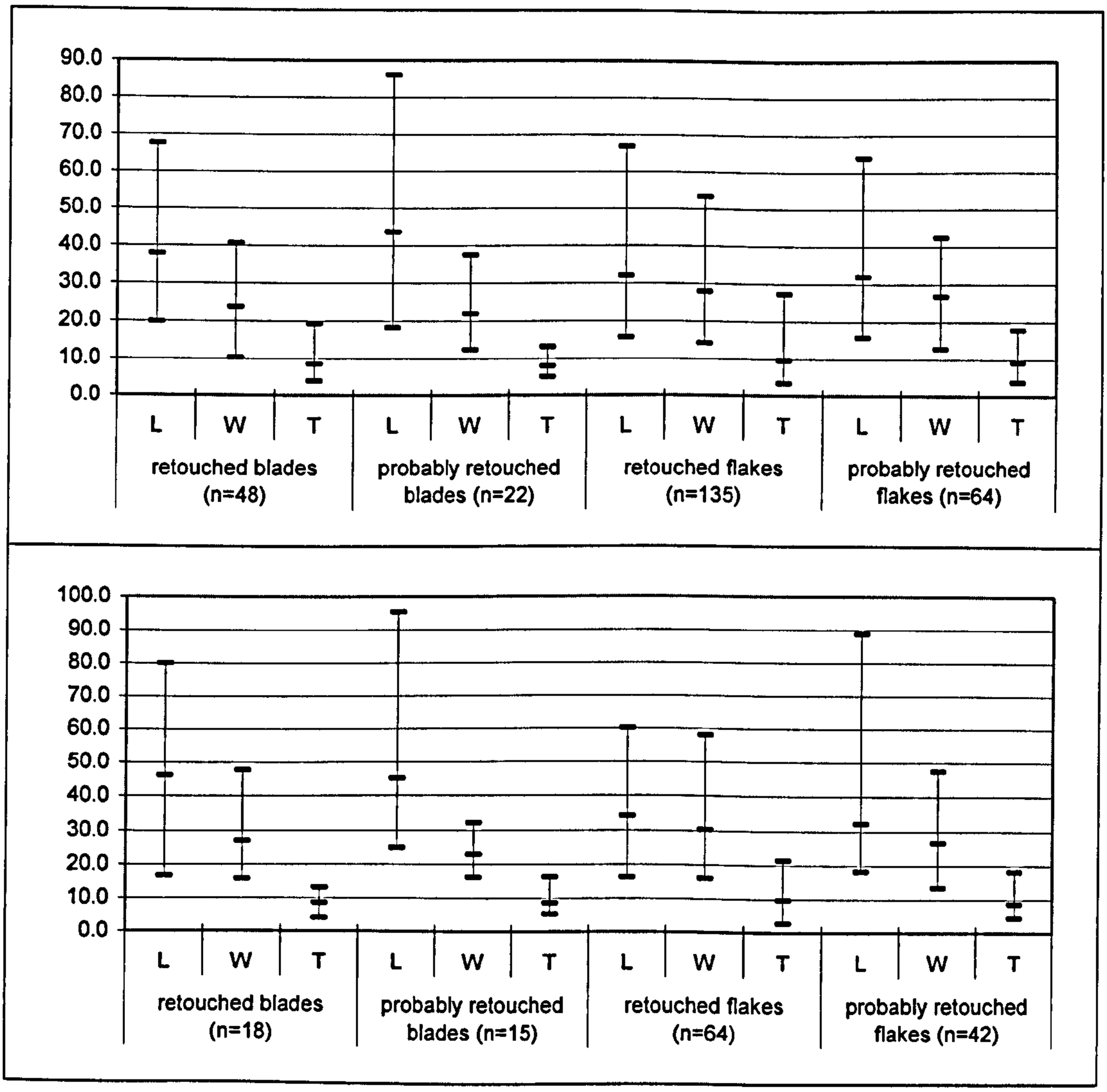

Figure 6.10. Maximum, average and minimum lengths (L), widths (W) and thicknesses (T) for single-work edge (above) and double/multi-work edges (below) retouched and probably retouched blades and flakes.

- Measurements for flake and blade blanks with multi-work edges fall in similar ranges, but have higher overall averages than their single-work edge counterparts (Figure 6.11). Length/width ratios closely mirror single-work edge and debitage core data, 1:1.7 and 1:1.9 for retouched and probably retouched respectively, and 1:1.2 for all modified flakes blanks.

Length/width ratios for retouched and probably retouched flakes and blades support these trends. They fall within the range of debitage and core data but show tighter ranges (Figure 6.11; see also Figure 5.17). Flake ratios in particular are internally cohesive both in ratio averages and ranges (range 0.5-

2.5; average 1.2), while blade ratios show more variation despite smaller sample sizes (range 0.7-3.3 average 1.7-2.0).

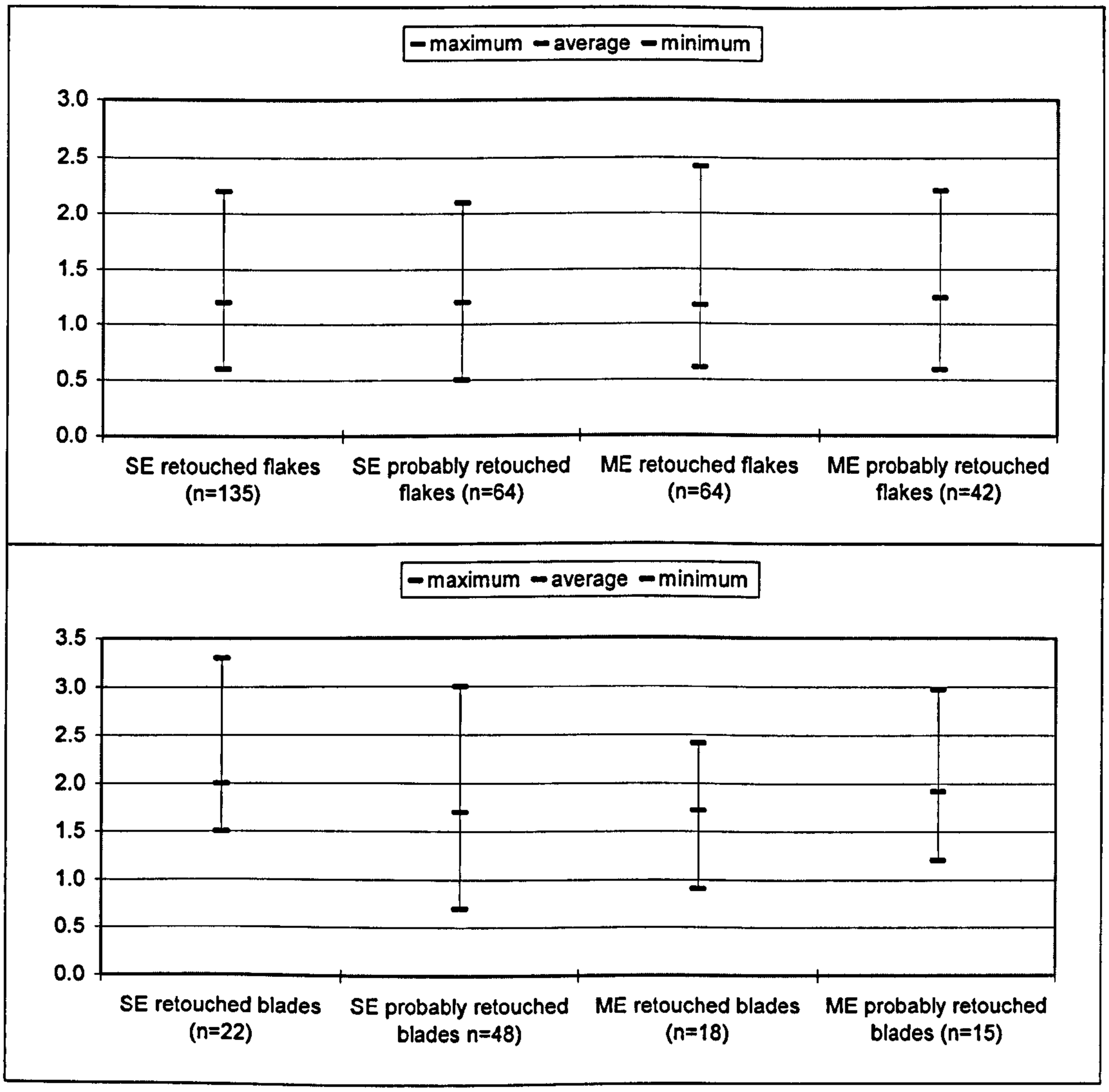

Figure 6.11. Maximum, average and minimum length/thickness ratios for single (SE) and double and multi edge (ME) retouched and probably retouched flakes (above) and blades (below).

Artefact size, standard deviation and co-efficient of variation also show a close correspondence between secondary and primary material. Variation is similar to, or slightly lower, than debitage and core data (see Section 5.4.1.1). Moreover, flake and blade co-efficients of variation are very similar (Table 6.25). Size measurements of all modified flakes and blades largely correspond to debitage and core data. Ranges are generally tighter, which is presumably a result of size reduction through retouch and/or use as well as selection based on size criteria (see also below). Modified material is larger than debitage, but

the size differences are not extremely unusual. It may be concluded that primary and secondary material suggest broadly similar parent material and production strategies. Interestingly, and countering intuitive expectations, flake and blade blanks with multi-work edges are not smaller than single-work edges.

Artefact class		Mode	St Dev	C/V
Probably retouched blades (n=37)	*L*	37.2	17.7	0.5
	W	22.8	5.8	0.3
	T	7.74	2.6	0.3
Probably retouched flakes (n=106)	*L*	25.7	10.9	0.4
	W	29.2	7.4	0.3
	T	6.9	3.1	0.4
Retouched Blades (n=66)	*L*	44.1	13.8	0.3
	W	21.9	7.8	0.4
	T	9.1	2.9	0.3
Retouched Flakes (n=199)	*L*	30.9	10.7	0.3
	W	26.5	8.5	0.3
	T	6.7	3.8	0.6

Table 6.25. Size comparisons (mode, standard deviation and co-efficient of variation) for length (L), width (W) and thickness (T) measurements for retouched and probably retouched flakes and blades.

Exploration of the spatial relationship between size distribution and distance to primary and secondary raw material sources for primary flake and blade technology has provided interesting insights into raw material use and procurement strategies (see Section 5.3.1.1; Figure 5.18). A similar examination for secondary flake and blade technology has revealed four interesting main trends (Figure 6.12; Appendix 5.11):

- There is a partial linear relationship between decreasing size distributions and increasing distance to raw material sources. Three transects close to or in primary and secondary raw material source zones (*e.g.* 04, 09, 23) contain the highest average lengths of modified flake blanks, while transect 13, which is furthest from primary and secondary sources, contains the lowest average. Other transects, however, do not conform to this trend. Transect 12, located close to the primary SA raw material source zone, does not contain large retouched artefacts, and neither do transect 14 data (note that this applies to flake and blade data, as blank types were not recorded).

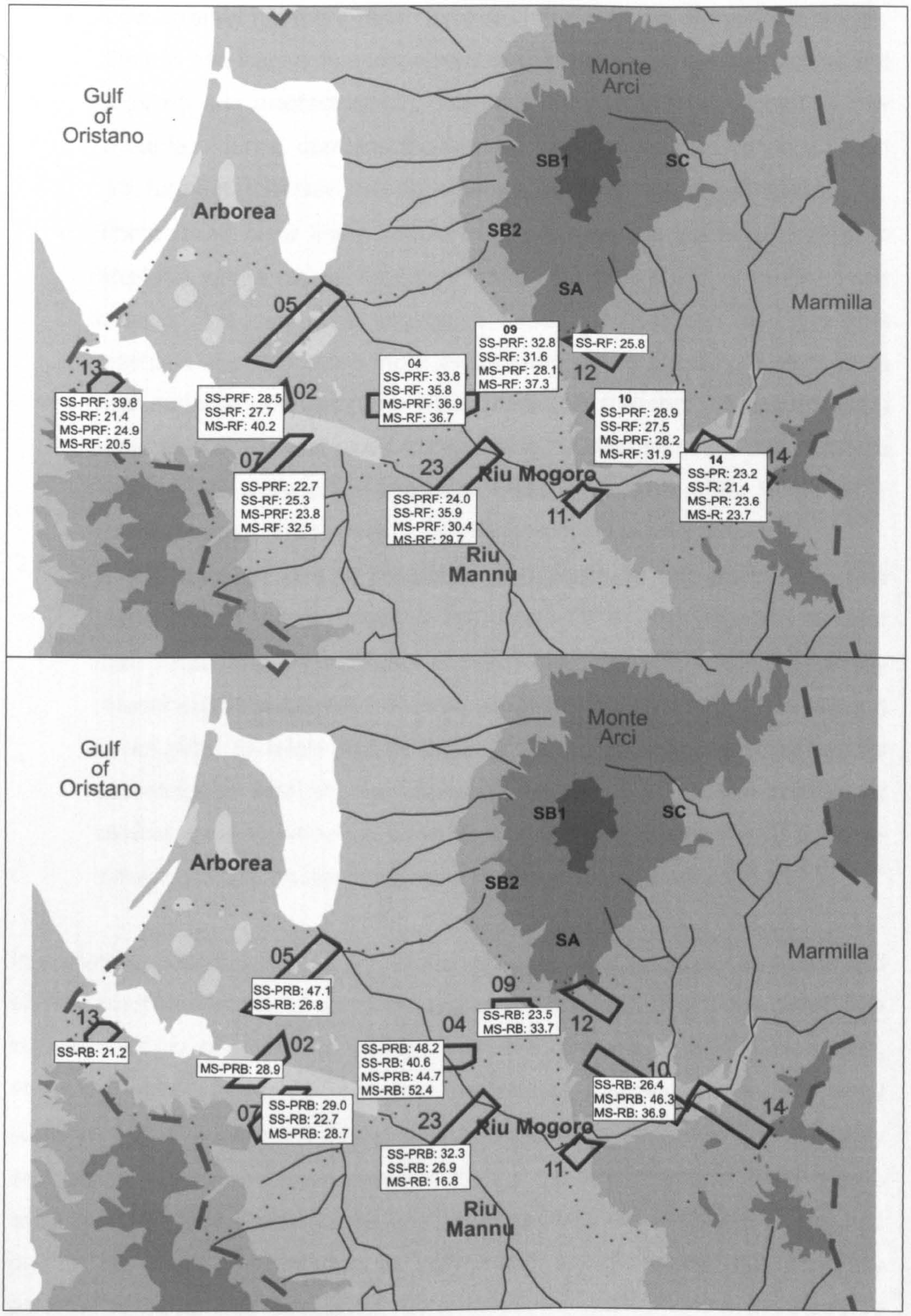

Figure 6.12. Average lengths in mm for (above) single stage and double/multi stage probably retouched (SS PRF / MS PRF) and retouched flakes (SS RF / MS-RF) and (below) single stage and double/multi stage probably retouched (SS PRB/ MS PRB) and retouched blades (SS RB / MS RB). Transect 14 all blanks.

- Low artefact numbers have hampered the analysis of modified blades. Only in two transects show a relationship between raw material source location and artefact length. Transect 04, on top of a secondary raw material source, contains the highest average lengths, while transect 13, furthest from raw material sources, contains the lowest figures.
- There is no clear linear relationship between the average lengths of artefacts with a single, double or multi-work edges and distance to raw material sources. This makes it difficult to support the idea that artefacts are retouched more extensively with increasing distances to raw material sources. Only flake blanks in transect 13 supports this idea, as it is furthest away from all raw material sources, and contains large single-work edge artefacts. Flake and blade data in all other transects have larger multi than single-work edge artefacts.
- A difference in size of retouched and probably retouched flake and blade blanks exists. Probably retouched flakes are generally smaller than retouched ones except in transects 13 and 14. Most probably retouched blade blanks, however, are larger than the retouched ones. It is tempting to relate this to different origins (*e.g.* usewear or natural spontaneous retouch) for probable retouch, but without microwear studies and extensive experiments this is sheer speculation. It does re-emphasise the ambiguous nature of retouch (also Section 3.1.2.3).

In summary, size distributions for retouched and probably retouched flakes and blades comfortably fall in existing ranges for debitage and core data. This supports earlier conclusions, derived from the analysis of flaking strategies, about the strong similarities between the primary and secondary technology (Section 5.2). Furthermore, based on size distribution and distance to primary and secondary raw material sources, it may be proposed that flake blanks were selected from local raw material sources. Analysis for blade blanks has proven more problematic due to very small sample sizes, but generally patterns are less clear and show more variation in size distribution to source distance, perhaps indicating a mixture of primary and secondary source use.

Bifacial pieces

Due to their extensive modification, size distribution for bifacially retouched pieces reveals little information on raw material selection criteria. Length, width and thickness measurements for all bifacial pieces fall in the same ranges as unifacially modified flakes and blades, debitage, and core data. Tanged arrowheads are small and fall within a tight range, non-hafted bifacial pieces are generally larger and fall in a wider range (Figure 6.13; Table 6.26; Appendix 6.5: Tables 5-6).

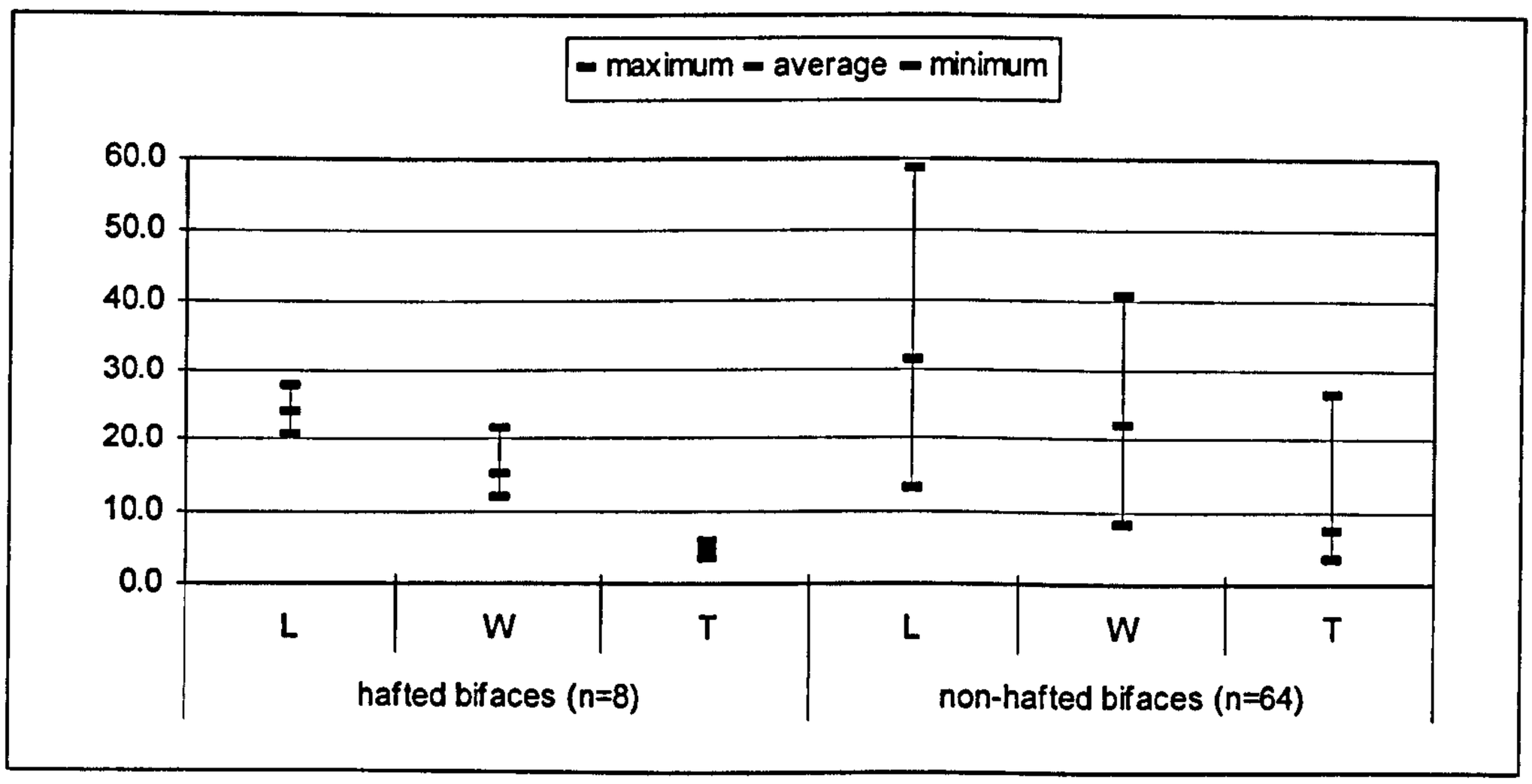

Figure 6.13. Maximum, average and minimum lengths (L), widths (W) and thicknesses (T) for hafted and non-hafted bifacial pieces.

Standard deviation and co-efficient of variation for length, width and thickness for non-hafted pieces show a range in variation similar to the unifacially modified pieces. Figures for tanged arrowheads indicate a smaller degree of variation. The tight spatial concentration and small sample size have presumably contributed to this homogeneity (Table 6.26).

Artefact class		Mode	St Dev	C/V
Hafted bifacial pieces (n=8)	*L*	25	2.4	0.10
	W	12	0.4	0.03
	T	4	3.3	0.8
Non-hafted bifacial pieces (n=64)	*L*	26	11.5	0.4
	W	19	6.9	0.4
	T	6	3.2	0.5

Table 6.26. Size comparisons (mode, standard deviation and co-efficient of variation) for length (L), width (W) and thickness (T) hafted and non-hafted bifacial pieces.

Exploration of the spatial relationship between size distribution and distance to raw material sources has again provided interesting insights (Figure 6.14; Appendix 6.5). There is a considerable difference between the average lengths of non-hafted pieces in transects 04 and 23, both near or on secondary raw material sources, and those in all other transects. Raw material availability, however, cannot be the only explanation since there is no clear linear relationship between artefact length and distance to raw material sources for the remaining transects. Use and discard patterns are also likely to have contributed to this difference, a quarter of all non-hafted pieces were found in isolation or as part of site assemblages (*e.g.* 02-B; 07- D/E; 13-d, 14-d) where contemporaneity is ambiguous. The bulk is concentrated in three sites (04-B, 10-B and 14-B) where contemporaneity is less ambiguous (for further discussion on chronology, see Section 7.2).

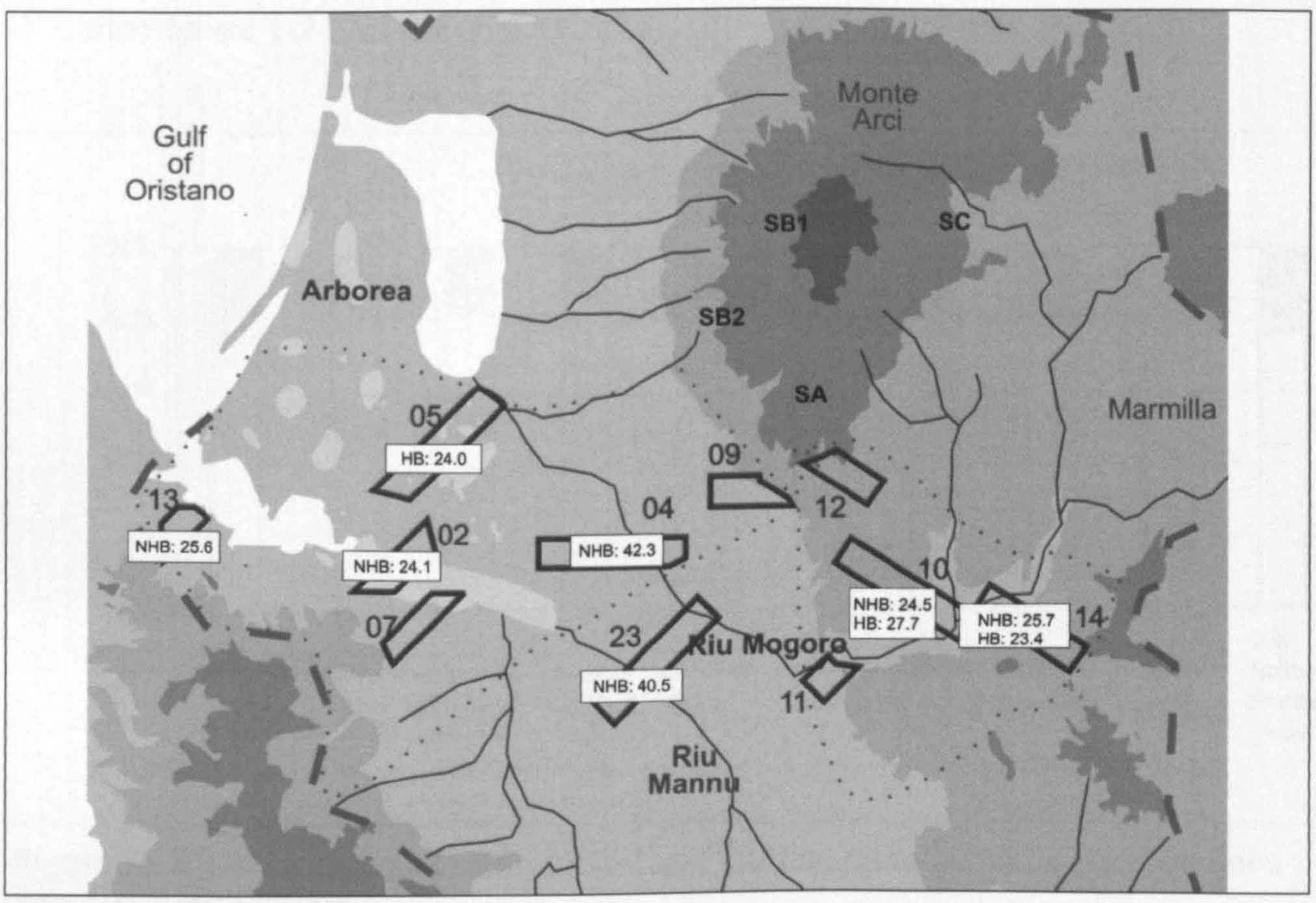

Figure 6.14. Average lengths in mm for hafted and non-hafted bifacial pieces.

6.4.2. Source data

Following on from the previous chapter, three types of source data have been examined in secondary technology to gain further insight into lithic procurement, production and use (see also Chapter 5.3.2).

6.4.2.1. Source locations: primary and secondary source use

A closer look at the different cortex types on all secondary technology flake and blade material shows two main trends. Firstly, cortical percentages for blade blanks are consistently lower than for flake blanks. Secondly, there is a clear association between blank type and cortex types. Types 1-2, associated with secondary raw material sources, are much more common on flake than blade blanks, while types 3-4, associated with primary raw material sources, are more frequent on blade blanks. Tanged arrowheads are all non-cortical, while a quarter of non-hafted bifacial pieces contain virtually equal percentages of cortex types 1-2 and 3-4 (Figure 6.15).

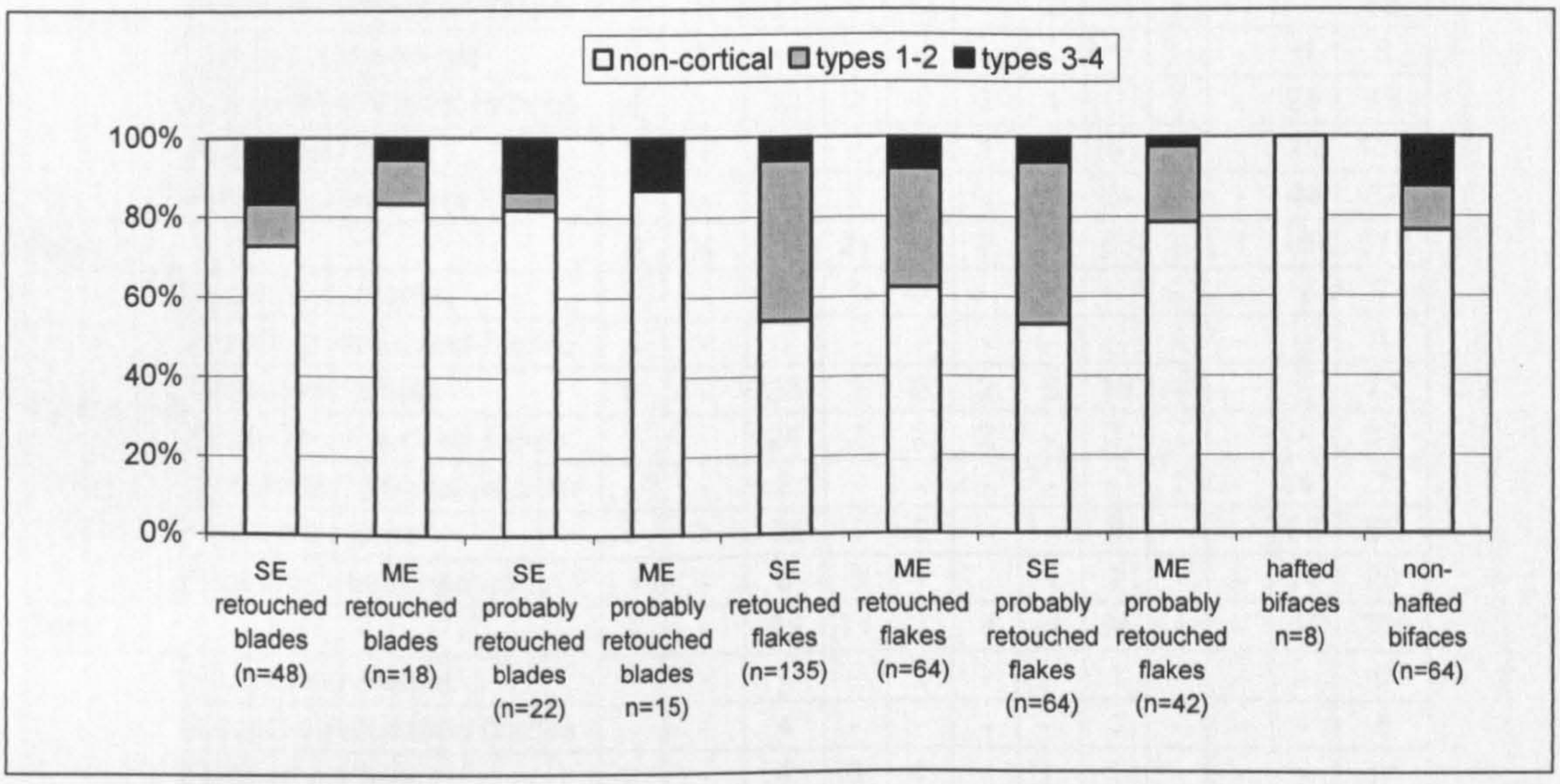

Figure 6.15. Percentages of non-cortical and cortical material for secondary flake and blade technology.

Exploration of regional patterns is more informative (Table 6.27), although it should be kept in mind that discussion of patterning remains fragmentary because artefact numbers are low in most transects. In the Arborèa, differences exist between modified blade and flake material. All blades are non-cortical, whereas cortical flakes predominate (77.8%) mostly with types 1-

2, which are associated with local secondary raw material sources (71.5%). Likewise, bifacially retouched material is all non-cortical. Blade material is just as scarce in the Marmilla, is either non-cortical, or contains types 3-4 associated with primary raw material sources. Non-cortical flake material predominates, but substantial percentages of cortical material is present in both transect 10 (32.4%) and transect 14 (43.6%). In transect 10 cortex types 1-2 constitute a majority (91.1%), while in transect 14 a much more significant portion of artefacts contain cortex types 3.4 (46.3%). Note, however, that transect 14 data are skewed because blank types were not systematically recorded. Non-cortical bifacial pieces are the most frequent. Again, when present, cortex types 3-4 predominate in transect 14, despite the proximity of secondary raw material sources.

		Arborèa		Campidano					Marmilla				
		02	05	04*	07	09	13	23	10	11	12	14*	Total
Non-cortical	*Retouched blades*	-	2	41	1	1	1	4	1	-	-	-	51
	Probably retouched blades	1	1	20	4	-	-	6	1	-	-	-	33
	Retouched flakes	1	-	52	5	11	2	4	37	-	1	-	113
	Probably retouched flakes	1	-	31	5	12	1	2	14	-	-	-	66
	Tanged arrowheads	-	1	-	-	-	-	-	1	-	-	6	8
	Non-hafted bifacial retouch	4	-	12	2	-	2	1	3	-	-	25	49
	Retouched other	2	-	28	7	4	1	2	8	-	-	79	130
	Probably retouched other	-	-	14	1	-	-	-	3	-	-	44	62
Total		*9*	*4*	*198*	*24*	*28*	*7*	*19*	*68*	-	*1*	*154*	*512*
Types 1-2	*Retouched blades*	-	-	6	1	-	-	-	-	-	-	-	7
	Probably retouched blades	-	-	1	-	-	-	-	-	-	-	-	1
	Retouched flakes	5	-	36	3	6	2	3	18	-	-	-	73
	Probably retouched flakes	-	-	24	2	2	2	-	3	-	-	-	33
	Non-hafted bifacial retouch	-	-	2	-	-	-	-	-	1	-	4	7
	Retouched other	-	-	16	1	2	-	-	4	-	-	37	60
	Probably retouched other	-	-	9	3	-	-	1	1	-	-	14	28
Total		*5*	-	*96*	*11*	*7*	*4*	*4*	*26*	*1*	-	*55*	*209*
Types 3-4	*Retouched blades*	-	-	7	-	1	-	-	1	-	-	-	9
	Probably retouched blades	-	-	4	-	-	-	-	1	-	-	-	5
	Retouched flakes	2	-	4	6	1	-	-	1	-	-	-	14
	Probably retouched flakes	-	-	2	-	1	-	-	1	-	-	-	4
	Non-hafted bifacial retouch	-	-	1	-	-	-	-	-	-	-	7	8
	Retouched other	-	-	2	-	-	-	-	-	-	-	25	27
	Probably retouched other	-	-	1	-	-	-	-	-	-	-	19	20
Total		*2*	-	*21*	*6*	*3*	-	-	*4*	-	-	*51*	*87*
Grand Total		**16**	**4**	**315**	**41**	**38**	**11**	**23**	**98**	**1**	**1**	**261**	**808**

Table 6.27. Regional distribution of non-cortical and cortical secondary technology. * Blank types not recorded.

As with the other regions, non-cortical percentages are high for all modified blades in the Campidano, with 70-80% for transects 04 and 07 and 100% for transect 23. Cortical modified flakes are more numerous (ranging from c. 35-55%) in all transects. Again cortex types and blank types are related. Cortex types 1-2 predominate on flake blanks in four Campidano transects (04, 09, 13, 23) at 80-100%, but considerably less so in transect 07 (45.5%), while types 3-4 are more common on blade blanks (61.1% for transect 04). Bifacial pieces are virtually all non cortical, except in transect 04 where types 1-2 predominate. Raw material availability, however, only partially explains the association between predominant cortex types and blank types. Transects 04 and 23 are located in the Mògoro secondary source zone, which corresponds with the predominance of cortex types 1-2 for flake material, but contrasts with the higher percentage of primary source cortex for blade material. Proximity of primary sources notwithstanding, cortical flake material in transect 09 suggest secondary source use. Likewise, despite the proximity to secondary sources cortical material in transect 07 contains more modified flakes with primary than secondary source cortex.

It may be concluded that cortical percentages are generally lower for blade than flake material, and that correlations between cortex type and blank type are stronger for modified material than for debitage and core data (Section 5.3.2.1). Most modified cortical flakes indicate local secondary source use, while when present, modified cortical blades suggest primary source use. Bifacially retouched pieces are mostly non-cortical and thus provide little indication for primary or secondary source use. Interestingly, in transect 14 primary is more frequent than secondary source cortex, proximity to the latter notwithstanding (for further discussion, see Section 7.1).

6.4.2.2. Visual source characterisation and aesthetic preferences

Visual source characterisation helps in understanding source distribution patterns (Section 4.4). Using the earlier established associations (Table 4.12), three basic patterns may be discerned (Table 6.28). Firstly, as with unretouched blades (Table 5.26), over half of blade blanks may be attributed to SA, SA/SB obsidian. Modified blade material, however, has lower SC but higher SC/SB percentages. Secondly, flake blanks also resemble unretouched

flake data, albeit with a slightly higher SA, SA/SB component. Lastly, non-hafted bifacial pieces deviate from both flake and blade trends and are for the most part (76%) attributed to SA or SA/SB obsidian.

Secondary technology*	SA	SA/SB	SC	SC/SB	Total
Retouched blades	16	24	18	3	61
Probably retouched blades	10	13	6	16	45
Percentage	*24.5*	*34.9*	*22.6*	*17.9*	
Retouched flakes	55	57	38	30	180
Probably retouched flakes	31	25	20	12	88
Percentage	*32.1*	*30.6*	*21.6*	*15.7*	
Tanged arrowheads	1	-	1	-	2
Non-hafted bifacial pieces	7	12	4	2	25
Retouched other	22	9	14	12	57
Probably retouched other	13	4	4	1	22
Percentage	*32.3*	*30.0*	*21.9*	*15.8*	
Total	**155**	**144**	**105**	**76**	**480**

Table 6.28. Source attributions based on material characteristics for secondary *Riu Mannu* technology. * Excluding data for transect 14.

Exploration of spatial distribution provides interesting information on source use. It is difficult to speak of trends since artefact frequencies are so low, in particular for modified blades and bifacial pieces (Figures 6.16-6.17; Appendix 6.6). For modified blades two points stand out:

- The 100% SA, SA/SB component in transect 05 and 09 compares with equally high percentages of SA obsidian for unretouched blade data (Figure 5.20). In transect 07, however, modified and unretouched blade data differ; the former consist predominantly of SA characteristics, while the latter mostly contain SC characteristics.
- Figures from transects 02, 04, 10 and 23 resemble those for unretouched blade material, with SA, SA/SB characteristics in the majority (50-60%), and a sizeable SC or SC/SB component.

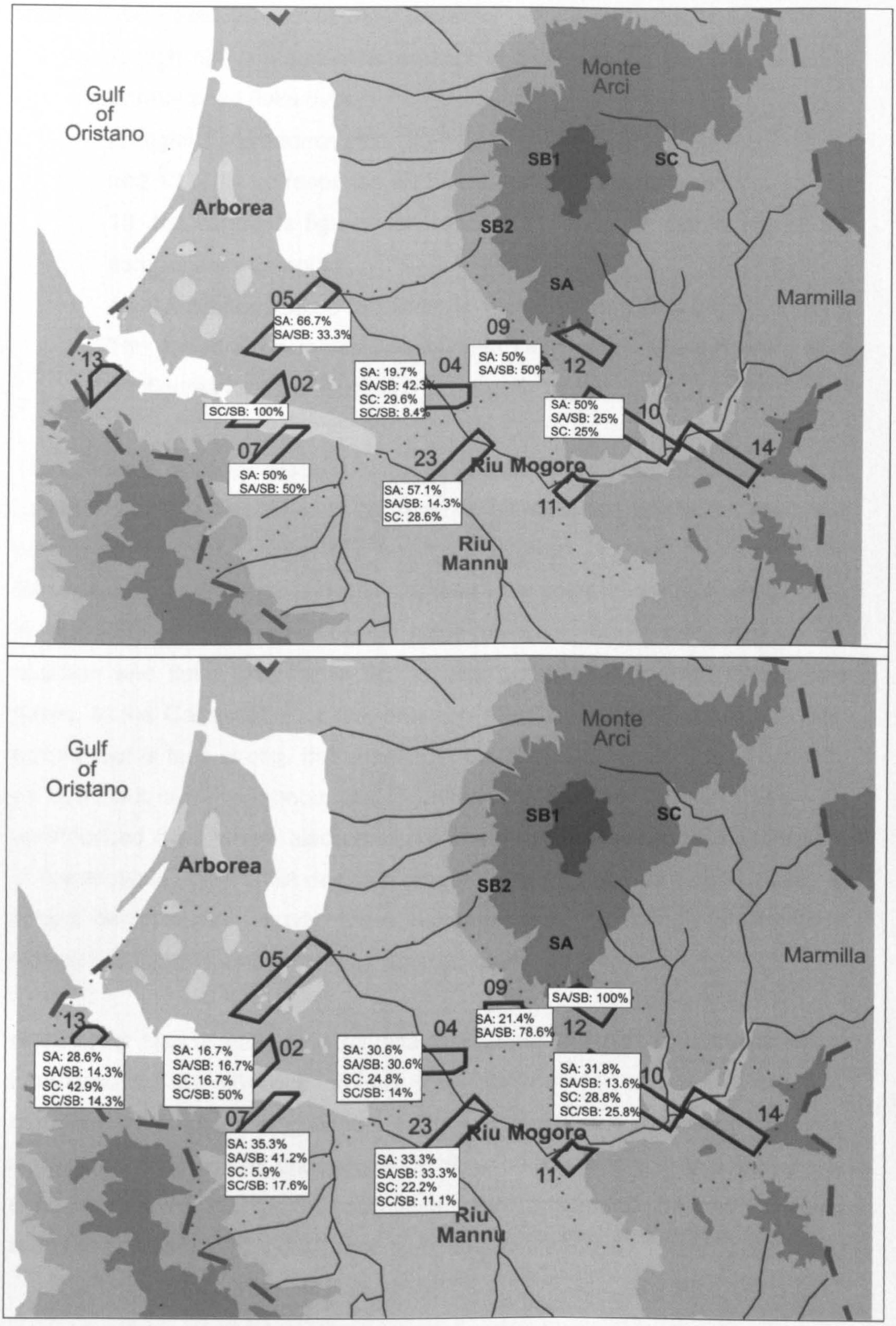

Figure 6.16. Source distribution (using visual characterisation) for unifacially retouched blades (above) and flakes (below). Excluding data for transect 14.

Modified flake data show three main patterns:

- A high SA component is present in transects 09 and 12, mirroring unretouched flake data.
- A slight SC predominance (50-60%) may be seen in transects 02, 10 and 13. This corresponds with unretouched data for transects 02 and 10, but contrasts figures for transect 13 where a slightly higher SC component was noted.
- An SA predominance (50-60%) is visible in transects 04, 07 and 23. This broadly resembles unretouched flake data, although in transect 04, figures for modified flakes are slightly higher.

Thus, source data for blade and flake material closely mirror each other in transect 09. This corresponds to data for unretouched artefacts. The clear predominance for SA obsidian is unsurprising given its close proximity to the SA source zone. The link between obsidian type and primary technology seen in the Arborèa, with unretouched blade material mostly attributed to SA obsidian and flake material to SC, is also present in modified blades and flakes. In the Campidano the link between obsidian type and blank type also occurs, but is less strong. In transect 07, SA obsidian occurs most frequently on both, but is more pronounced for blades than flakes. This contrasts with unretouched data, where blade material was mostly attributed to SC obsidian. In transects 04 and 23, SA obsidian predominate for both flakes and blades in similar percentages. Clearly, these patterns cannot be simply attributed to distance to primary and secondary source zones.

Analysis of spatial patterning for bifacially retouched pieces is considerably hampered by the absence of data from transect 14, and the overall low numbers of artefacts (Figure 6.17). It is nonetheless interesting that the distribution is not easily understood by distance to primary or secondary raw material sources - *e.g.* the SA predominance in transects 02, 04, and 07, which lie in the heartland of the (SC) secondary source zone.

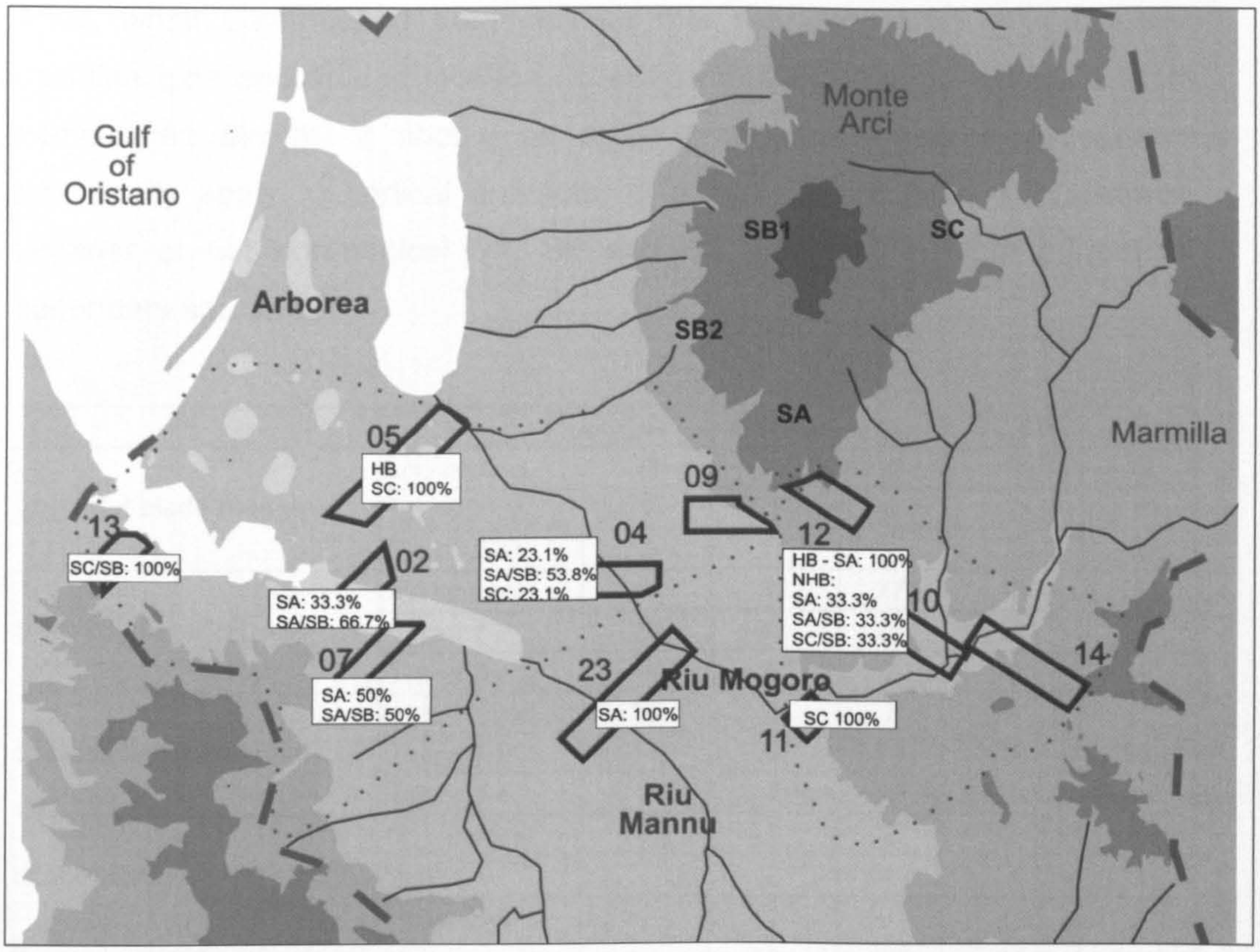

Figure 6.17. Source distribution (using visual characterisation) for bifacial retouched pieces (HB= hafted bifacial pieces; NHB= non-hafted bifacial pieces). Excluding data for transect 14.

Further to the exploration of associations between primary and secondary source zones and obsidian types carried out in the previous chapter, analysis here shows again that primary source cortex (types 3-4) predominantly (86.5%) occurs on SA obsidian (Table 6.29). There are two significant differences with unretouched data, however:

- Blade blanks show a strong link between cortex types and raw material source location. All primary source cortex occurs on SA, SA/SB obsidian and most (75%) secondary source cortex occurs on SC, SC/SB obsidian.
- Flakes and other blanks also show a strong correlation between SA, SA/SB obsidian and primary source cortex, but the connection between SC obsidian and secondary source cortex is weaker. Almost half (42.9%) of cortical flake blanks attributed to SA, SA/SB obsidian, contain secondary source cortex. Likewise, just over half (53.5%) of the other SA, SA/SB blanks contain secondary source cortex.

Thus, while unretouched data indicate that the suggested links between obsidian type and source location do exist, modified material shows a more complicated picture. It should be again emphasised that these patterns specifically apply to cortical artefacts. It is much more difficult to examine whether or not non-cortical SA, SB and SC artefacts indicate primary or secondary source use.

		SA	SA/SB	SC	SC/SB	Total
Unifacial blade blanks	*Non-cortical*	23	25	18	8	73
	Types 1-2	1	1	6	-	8
	Types 3-4	2	11	-	-	13
Unifacial flake blanks	*Non-cortical*	44	62	27	18	151
	Types 1-2	28	11	29	23	91
	Types 3-4	4	9	2	1	16
Unifacial other blanks	*Non-cortical*	20	9	7	9	45
	Types 1-2	14	1	10	3	28
	Types 3-4	1	3	1	1	6
Non-hafted bifacial pieces	*Non-cortical*	7	8	3	2	20
	Types 1-2	-	2	1	-	3
	Types 3-4	-	2	-	-	2
Total non-cortical		94	104	55	37	290
Total cortex types 1-2		43	15	46	26	130
Total cortex types 3-4		7	25	3	2	37

Table 6.29. Correlation between cortex types and visual source characterisation for all secondary technology.

Material characteristics: aesthetic preferences.

Exploration of selection criteria and potential aesthetic preferences based on visual characterisation of material characteristics showed that two-thirds of the *Riu Mannu* primary blade technology contained one or both of two diagnostic features: translucency and/or banding (see Section 5.3.2.2; Table 5.27). Analysis of secondary technology shows similar patterns (Table 6.30). Secondary flakes (and other blanks) have higher percentages (42.2% and 61% respectively) of non-diagnostic features than blades (24.8%) or non-hafted bifacial pieces (20%). Banding, both translucent and non-translucent, is again a predominant characteristic with translucent banding occurring slightly (56.3%) more often.

Material Characteristics	Flake (n=258)	Blade (n=101)	Non-hafted bifacial pieces (n=25)	Other (n=80)
Glossy Black/Grey	27.5	18.3	12.0	45
Completely Translucent	0.4	-	4.0	-
Completely Translucent + Internal Patterning	2.3	9.7	12.0	-
Marginally Translucent	9.3	1.1	12.0	2.5
Marginally Translucent + Internal Patterning	7.4	6.5	4.0	1.3
Translucent	0.4	1.1	-	-
Translucent + Internal Patterning	5.8	22.6	20.0	6.3
Glossy Black/Grey + Banding	3.5	3.2	4.0	1.3
Glossy Black/Grey + Translucent	4.7	4.3	8.0	3.8
Grey/Black Banding	20.5	25.8	16.0	20
Possible Banding	2.7	1.1	-	2.5
Red/Black Banding	0.8	-	-	-
Opaque Black/Grey	14.7	6.5	8.0	16.3

Table 6.30. Material characteristics for all secondary material (in percentages).

Spatial distribution shows much local variety with little regional patterning. Some broad trends may be observed, whereby it should be recalled that sample sizes are low and data for transect 14 are absent (Figure 6.18; Appendix 6.6: Tables 4-5; also Figure 5.21 for primary technology data):

- Data for primary and secondary blade material closely correspond in all three landscapes. Both have few diagnostic features in the Arborèa, and high frequencies in the Marmilla (transect 10). High frequencies (>70%) of diagnostic characteristics occur in Campidano in transects 04, 09 and 23. A lower frequency (c. 60%) occurs in transect 07.
- Secondary flake material in the Arborèa and Marmilla mirror primary data, with low percentages for diagnostic features in the former and high ones in the latter. Campidano data differ from primary technology. Percentages are generally lower, except for transect 23 where they are higher, and transect 13 where they are similar.
- Given the low number of artefacts it is unrealistic to talk about trends, but there are differences in frequency of diagnostic features for unifacial and bifacially retouched pieces (Appendix 6.6). Bifacially retouched pieces in the Arborèa have a high frequency of diagnostic features. Unifacially modified flakes and blades, however have few diagnostic features. In Marmilla transect 10 they more or less correspond to blade data, while in the remaining transects (04, 11 and 23) percentages of diagnostic features are higher than blade and flake material.

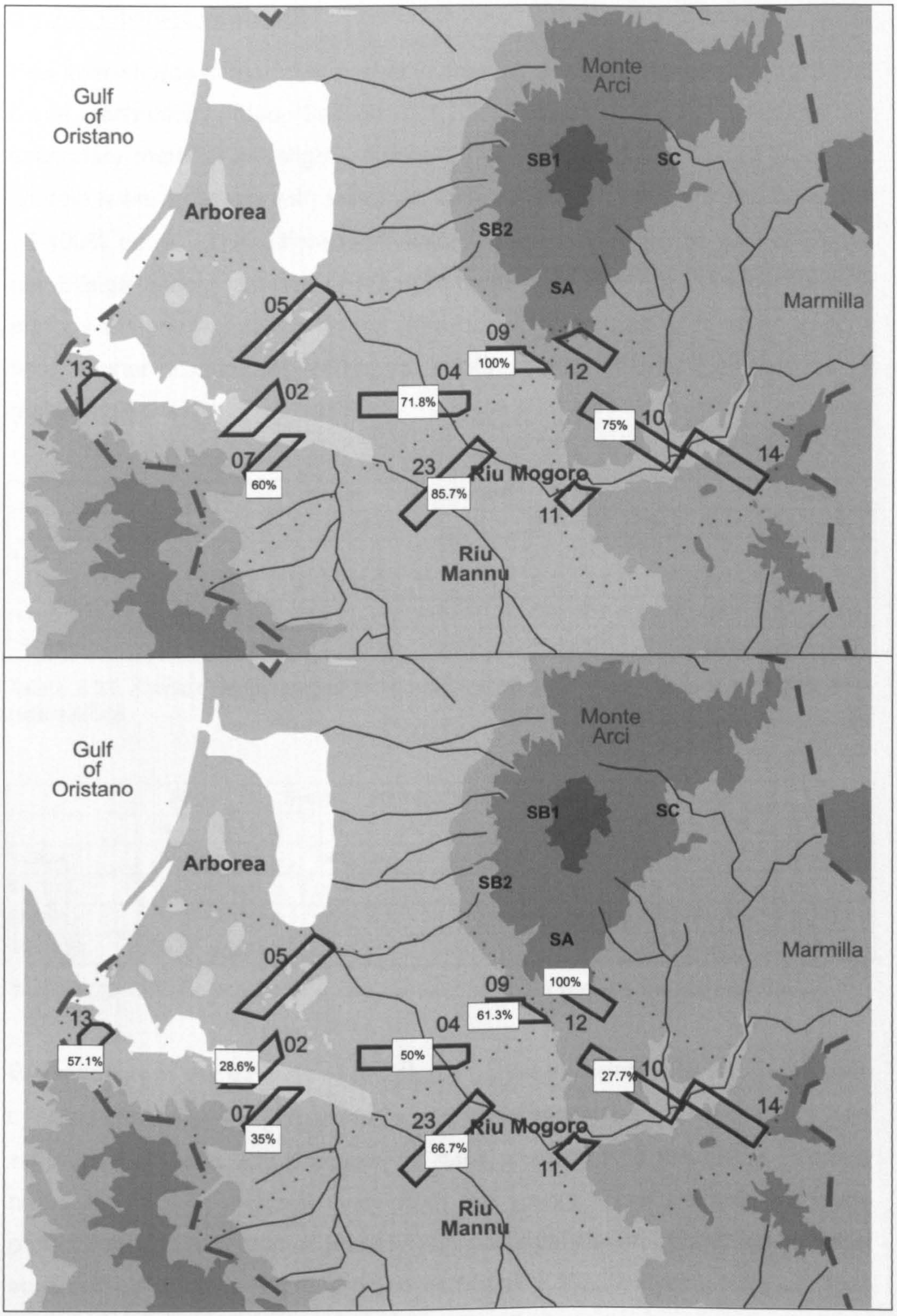

Figure 6.18. Percentage of diagnostic material characteristics (banding and/or translucency) for secondary blade (above) and flake (below) material. Transect 14 data excluded.

6.4.2.3. Opening strategies

Few inter-source differences existed in opening strategies for primary flake and blade technology (see Section 5.3.2.3; Tables 5.29-5.30). Figures for secondary material are slightly different (Tables 6.31-.6.32). Cortex types 1-2 contain fewer artefacts with less than 25% cortex, but substantially more with 75-100% cortex. This difference is linked to technology, since neither blades nor bifacial pieces contain any cortex types 1-2 over 50%. Lastly, as with primary material, modified blades from both primary and secondary sources have higher frequencies (60% vs. 40%) of low (<25%) percentages of remaining cortex.

	Flake		Blade		NH bifacial		N/R		Other		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
1-25%	45	42.1	5	62.5	6	85.7	33	64.7	17	48.6	106	50.9
25-50%	16	15.0	3	37.5	1	14.3	9	17.6	7	20.0	36	17.3
50-75%	14	13.1	-	-	-	-	5	9.8	4	11.4	23	11.1
75-100%	32	29.9	-	-	-	-	4	7.8	7	20.0	43	20.7

Table 6.31. Cortex percentages for cortex types 1-2 for secondary material. NH= non-hafted.

	Flake		Blade		Non-hafted bifacial		N/R		Other		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
1-25%	8	44.4	9	64.3	7	87.5	26	66.7	4	66.7	54	63.5
25-50%	8	44.4	3	21.4	1	12.5	7	17.9	1	16.7	20	23.5
50-75%	1	5.6	1	7.1	-	-	5	12.8	1	16.7	8	9.4
75-100%	1	5.6	1	7.1	-	-	1	2.6	-	-	3	3.5

Table 6.32. Cortex percentages for cortex types 3-4 for secondary material.

Examination of the location of remaining cortex revealed differences between opening strategies for primary flake and blade technology. Raw material from secondary sources was procured for flake production in the form of cortical nodules and was reduced away from the source. Raw material for blade production was procured at primary and secondary sources and consisted of semi-cortical nodules or prepared cores (Table 5.30). Analysis of the locations of cortex on modified flakes and blades further illuminate the observed differences in opening strategies (Table 6.33). Firstly, modified flakes show a much wider variety in cortex locations than blades. This partially reflects the greater directionality in knapping strategies, but it also suggests reduction of cortical nodules. Secondly, cortex on modified blades is mostly located on

distal and/or lateral sides, irrespective of source location. Lastly, cortex on modified flakes with cortex types 3-4 is also situated on lateral and distal sides. Thus, there is evidence for some degree of differential source location use. Flake production on secondary source material suggests reduction of cortical nodules, while flake and blade material from primary sources indicate reduction of semi-cortical nodules and/or prepared cores.

Cortex Location	Types 1-2				Types 3-4			
	Flakes (n= 104)	*Blades (n=8)*	*NH bifacial (n=2)*	*Other (n=14)*	*Flakes (n=16)*	*Blades (n=13)*	*NH bifacial (n=2)*	*Other (n=4)*
Platform	7.7	-	-	-	6.3	7.7	-	25
Proximal	1.0	-	-	-	6.3	-	-	-
Lateral side(s)	26.9	37.5	-	28.6	37.5	53.8	-	25
Middle	17.3	-	100	35.7	-	-	-	25
Distal	6.7	50.0	-	7.1	18.8	15.4	100	25
Bottom (of core)	-	-	-	7.1	-	-	-	-
Platform & lateral	2.9	-	-	-	6.3	-	-	-
Platform & dorsal	1.0	-	-	-	-	-	-	-
Proximal & lateral	1.9	-	-	-	-	-	-	-
Middle & lateral	2.9	12.5	-	-	-	-	-	-
Middle & distal	-	-	-	-	6.3	-	-	-
Distal & lateral	4.8	-	-	-	6.3	15.4	-	-
Bottom & side (of core)	1.0	-	-	-	-	-	-	-
Platform, lateral & distal	1.0	-	-	-	-	-	-	-
All but proximal & lateral	1.0	-	-	-	-	-	-	-
All but proximal	3.8	-	-	-	-	-	-	-
All but lateral side(s)	6.7	-	-	-	6.3	-	-	-
Edges	-	-	-	7.1	-	-	-	-
All dorsal	13.5	-	-	14.3	6.3	7.7	-	-

Table 6.33. Cortex location for cortical secondary pieces. NH= non-hafted.

6.4.3. Raw material selection: discussion and conclusion

Size analyses for modified flakes and blades corresponded to data derived from primary flake and blade technology, suggesting similar raw material selection criteria existed. Artefacts are larger, but not exceptionally so. Exploration of relationships between size distribution and distance to primary and secondary raw material sources revealed patterns comparative to figures for debitage and cores. There is a close, but not exact, correlation between sizes of modified flakes and local secondary SC sources. Data for blades are less conclusive and may indicate a mixture of primary and secondary source

use. A correspondence between large bifacial pieces and distance to raw material source exist for two specific locations, 04-B and 23-C; measurements for all other bifacial pieces are remarkably similar.

Source data are largely consistent with primary flake and blade technologies. Based on cortical data primary source use is suggested for blades, and secondary source use is linked to flakes. One must keep in mind that most bifacial pieces are non-cortical, and that most contain primary source cortex despite their proximity to secondary sources, as is the case for instance in transect 14. Visual characterisation once again corroborated primary technology figures. SA and SA/SB obsidian are the most common amongst modified blades and bifacial pieces. It is also prevalent amongst flakes, but they contain a stronger SC and SC/SB component. Interestingly, examination of the correlation between cortex and visual characterisation data showed a marked contrast with primary flake and blade technology. The basic association between blades = primary source use and flakes = secondary source cortex is maintained, but a considerable portion of SC flake material also contained primary source cortex.

Examination of opening strategies through remaining cortex percentages and cortex location indicated that different blank selection criteria existed. Cortex data for blades and bifacial pieces suggest that either non-cortical blanks were modified or those retaining less than 50% cortex. When present, cortex is mostly positioned on lateral and/or distal sides. Flake data show a higher cortical component with more pieces containing higher percentages of cortex, and a wider spectrum of cortex locations. Data on cortex position also largely correspond to unmodified data, supporting earlier noted different raw material selection criteria and procurement strategies. Flake material suggests reduction of cortical nodules, while blades indicate reduction of semi-cortical nodules and/or prepared cores. Lastly, exploration of material characteristics for aesthetic preferences mirror trends noted for unretouched artefacts. Retouched blades and bifacial pieces contain higher percentage of diagnostic features, translucency and banding, with some evidence for regional patterning.

6.5. Secondary technology: conclusion

Three things have negatively influenced my exploration of secondary technology as a socially-embedded practice: 1) the initially applied traditional theoretical framework, which conflated retouch with use, and 2) the corresponding focus on describing the static end-result of retouch to construct a tool typology, and 3) the clear problems in distinguishing between types of modification, *i.e.* intentional and pseudo retouch. Nonetheless, this analysis brought some noteworthy patterns to the fore.

Only small percentages of *Riu Mannu* assemblages are modified, despite the problems in clearly identifying intentional modification. Density and distribution analysis showed clear clustering of modified pieces in two areas, corresponding to patterns noted for primary material and irrespective of type of modification: 1) in the wider area along the river Mògoro in the Campidano plain and 2) on Mògoro terraces in the Marmilla. Unifacial modification is most common and widespread, while bifacially retouched pieces are strongly concentrated in two site locations – 04-B and 14-B – but a considerable percentage occurs in isolation or assemblages where contemporaneity with pottery is tenuous at best, *i.e.* in transect 02 and 11. The implications are interesting given that distribution patterns reflect not just locations where retouching took place, but also indicate use and discard patterns (see Section 7.2).

It has proven difficult to separate intentional and pseudo retouch. Analysis indicates that most modification was ad hoc, but some very broad traditions were nevertheless recognised. Site 04-B contains the only sizeable collection of modified blades which, when correlated to basic tool types used in lithic studies, resemble 'knives' (see Table 6.1). Modified flakes are found more widespread and have more variation in attribute patterning. Most are end, side, and convergent scrapers and knives. Data for transects 04 and 10 suggest that local 'standardised' trends existed, as both contain the bulk of parallel double-work edge modification (*e.g.* on both lateral sides or at proximal and distal sides) and modification at a 90º turn. There is a strong concentration of tanged arrowheads, complete and fragmented, in site 14-B, which is echoed by the distribution of pieces with non-invasive bifacial and/or alternating retouch.

Intermittent recording notwithstanding, it is intriguing that the few bifacial pieces for which unskilled knapping is (tentatively) suggested are exclusive to 04-B and 14-B.

Comparisons between size distribution for primary and secondary blade and flake technology revealed few differences and indicated similar procurement and production strategies. Moreover, examination of the spatial relationships between size distribution and distance to raw material sources revealed patterns comparable to figures for debitage and cores. There is a close, but not exact, correlation between sizes of modified flakes and local, secondary, SC sources. Data for blades are inconclusive and point to the use of both primary and secondary sources. The spatial relationship between bifacial pieces and raw material sources is also weak, and is only clear for two specific locations – 04-B and 23-C.

Source data are also largely consistent with primary flake and blade technologies. Using cortical data it is proposed that primary sources were predominantly selected for blade modification, and secondary sources for flake modification. It is noteworthy that cortical primary source cortex prevails on bifacial pieces, even though the sites are close to secondary sources. Visual characterisation once again corroborated primary technology figures. SA and SA/SB obsidian predominates amongst all modified pieces, but more strongly among blades and bifacial pieces. Modified flakes contain a stronger SC and SC/SB component. Correlation of cortex and visual characterisation data revealed a marked contrast between primary and secondary flake and blade technologies. A considerable portion of modified flakes attributed to SC obsidian contained primary source cortex. Thus, modified flakes and blades suggest a link between source location and modification whereby material from primary sources, in particular SA, but also SC, were modified more frequently than material from secondary sources.

Examination of remaining cortex percentages and cortex location support earlier noted different raw material selection criteria and procurement strategies (see also Section 7.1). They also provide further support for the idea that differing selection criteria and extent of modification existed for flakes and blades. As with debitage and core data, modified blades and bifacial pieces are

mostly non-cortical blanks or retain less than 50% cortex, which is positioned either on lateral and/or distal sides. Cortex data for modified flakes also correspond to debitage and core data. Compared to their blade counterparts, they contain a higher cortical component, more pieces with higher percentages of remaining cortex, and a wider spectrum of cortex locations. Thus, modified flake material suggests reduction of cortical nodules, while blades indicate reduction of semi-cortical nodules and/or prepared cores. Lastly, exploration of material characteristics for aesthetic preferences mirror trends noted for unretouched artefacts. Retouched blades and bifacial pieces contain higher percentages of diagnostic features, translucency and banding, with some regional patterning.

Chapter Seven

Sardinian lithic taskscapes and landscape

The main aim of this thesis has been to explore the spatial and temporal dimensions of the Sardinian lithic landscape. Following Bourdieu's (1990) concept of practice, Dobres's (2000) redefinition of technology as a verb and arena for interaction and Ingold's (1993) concepts of landscape and taskscapes, this thesis sees lithic technology as an inherently social practice (*cf.* Section 2.6). In keeping with lithic studies, lithic technology is explored through three main interlocking acts: procurement, production and use/discard. Given that these have left traces in the physical landscape, it becomes possible to explore the spatial and temporal structure of the lithic landscape.

This chapter first discusses the traditions and variations of the three lithic taskscapes recognised in the *Riu Mannu* dataset, and how these tie in with current studies in Sardinian and Mediterranean archaeology. Secondly, it discusses how this research has addressed the temporality of the lithic landscape.

7.1. *Riu Mannu* lithic taskscapes

Primary and secondary technology analyses have revealed a wealth of procurement, production and use/discard traditions and variations (Figures 7.1-7.2; Table 7.1). Their spatial distribution patterns are continuous across the three physical landscapes of the research area (see Sections 5.1; 6.1). Obsidian procurement, production and use/discard practice is spread out across the valley and the terraces of the wider Mògoro river area. A second much smaller distribution exists in the transitional Arborèa/Campidano region.

The regional distinction is therefore only maintained for the ease of presentation, and not for the discussion of the results. This section briefly highlights some of the main traditions and variations in data before discussing their interpretations and implications for study within the wider Sardinian and Mediterranean framework.

7.1.1. Traditions and variations

Three trends stand out among the main traditions in the *Riu Mannu* dataset (Table 7.1).

Firstly, procurement strategies are long-lasting in spite of a spatially and chronologically diverse dataset. Two main traditions can be recognised: 1) direct procurement of unprepared cortical nodules at secondary sources, which were very similar in size and shape despite the wide variability in raw material availability. They were brought back to sites for reduction, and 2) re-use of material (large cortical flakes, chunks and core fragments) that had been flaked previously and/or elsewhere for bipolar flake production. There is also a general connection between technology and obsidian type. Blade production and bifacial pieces are most frequent in SA obsidian, bipolar cores in SC and flake production in SA and SC. This trend is mirrored in diagnostic material characteristics. Diagnostic features such as banding and translucency are more strongly associated with blade and arrowhead production, and less with flake production.

Secondly, there is a close correspondence between production and use/discard, find contexts and procurement strategies. Cortical nodules are obtained from secondary and primary sources, brought to settlements, where flakes and blades are knapped, used and discarded (Figures 7.1-7.2: green bullets).

Lastly, strong primary flaking *chaîne opératoires* exist. Single-stage platform reduction predominates in both blade and flake production while single-stage and double-stage bipolar reduction is a second strong tradition in flake production. Direct hard hammer percussion is also a strong tradition, with secondary flaking predominantly informal and unifacial. A wide variety of strategies exist but a small set of 'tool' types are recognised.

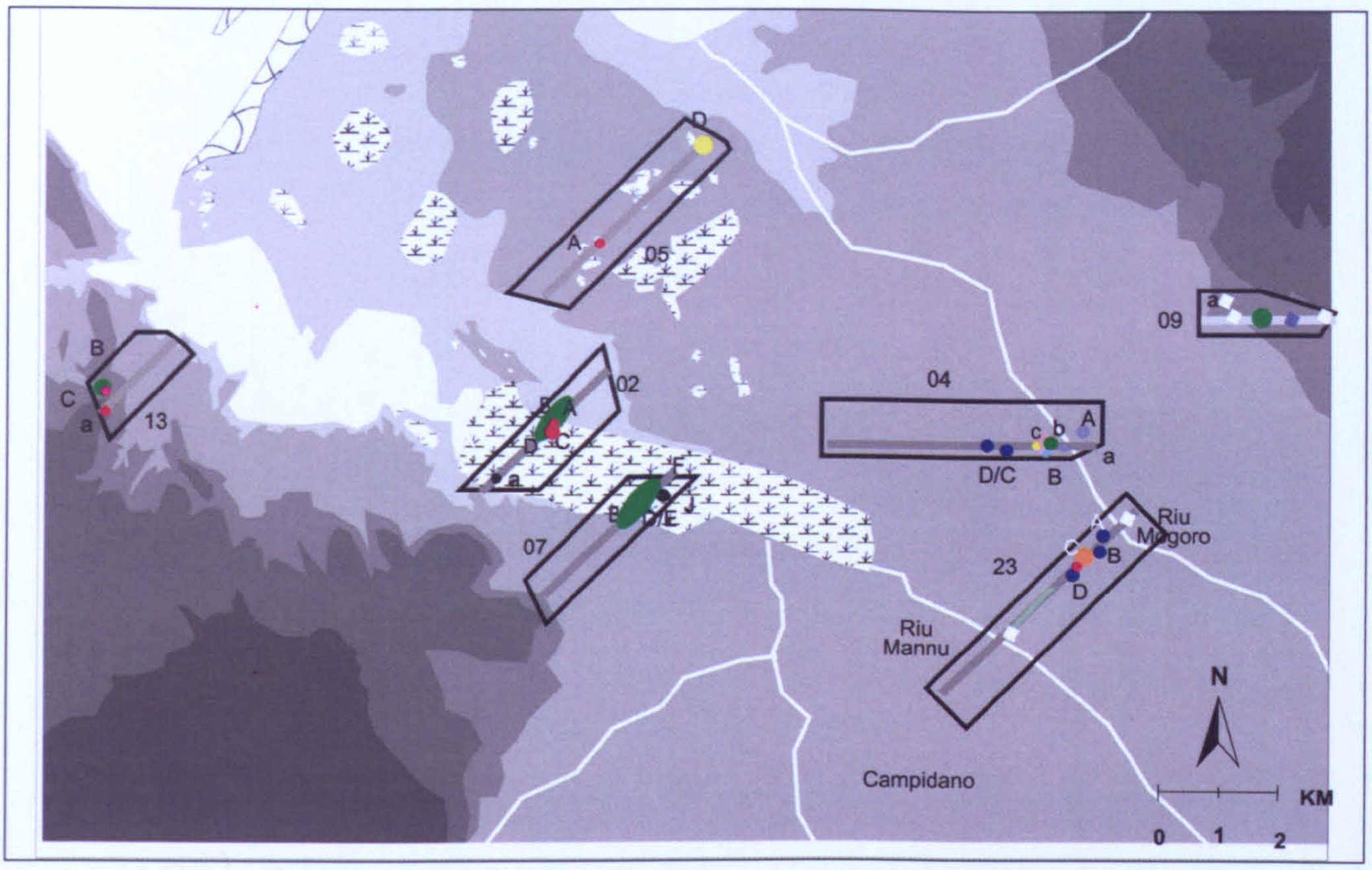

Figure 7.1. Production and use in the Arborèa and Campidano.

Key to map:
Yellow= use/discard blade technology
Pink= production, use/discard blade technology
Orange= production blade technology
Red= use-discard bifacial pieces
Light Blue= production bifacial pieces
Dark Blue= (re)use/discard of flakes and blades
Green= production & use/discard flake technology
Light Green= flake / blade production, flake use/discard?
Purple= use/discard flake technology
Black= limited nodule testing at secondary source zone
White= secondary source zones

Variations also exist and fall within four main patterns:

- Two other procurement strategies may potentially be recognised: 1) direct/indirect procurement at primary and secondary sources where macro cores were prepared, and taken to sites for further flake and blade production, 2) potential re-use of flakes and blades at later prehistoric settlements. This type of re-use differs from the one just discussed, because there are no indications that that they were used for further knapping. Re-use refers to other activities, although this is not the only explanation for the presence of these artefacts (see discussion in Sections 7.1.2.2; 7.2.2 below).
- Spatial separation in production and use/discard exists for blade and flake technology. Four, admittedly very small, assemblages hint at spatially separate phases of blade technology. Two sites predominantly

indicate blade core preparation, maintenance and reduction (12-a; 23-C), while at two others (04-c and 05-D) use/discard is most likely. Flake production and use/discard is likewise discrete, more widespread but also problematic to interpret (see below). Two types of find contexts exist: 1) flakes (and sometimes blades) are found at late prehistoric sites, perhaps indicating re-use or residuality of flaked material and 2) use/discard of (un)modified flakes and blades in small localised lithics-only concentrations or in isolation.

- Variations on the main primary flaking *chaîne opératoires* include ad hoc and bipolar 'blade' (*i.e.* blade-like flakes) and flake removals as well as double-and multi-stage cores with various combinations of platform and bipolar flake and blade removals.
- Bifacial (non-invasive, extensive and alternating) modification forms a small portion of the *Riu Mannu* secondary technology. Arrowheads and other bifacial pieces are concentrated in two locations (04-B and 14-B), where their production and use/discard corresponds or they are found in isolation, presumably indicating (un)intentional discard.

It is the interplay between lithic traditions and their variations and spatial relationships, however, that highlights the complex subtleties of the studied dataset and the inherently social character of lithic practice. Detailed examination of the relationship between source location, obsidian types, primary and secondary *chaîne opératoires* and aesthetic preferences, show that raw material availability, subsistence or sedentism/ mobility cannot solely explain procurement, production and use/discard patterns, as has commonly been argued in traditional lithic studies (see Section 2.3).

Site 04-B is a good example. This Neolithic/Chalcolithic settlement lies in a dispersed secondary source area, which is part of the wider Mògoro source zone. Despite its position, secondary source use does not predominate, but three combinations of source locations, obsidian types, *chaîne opératoire* and aesthetic preferences exist. Firstly, bipolar flake production and use/discard are tied to secondary SC source use, presumably procured from its immediate surroundings. Secondly, cortical nodules from non-local primary SA, and again presumably local secondary SC sources, are used interchangeably for platform

and blade flake production, both with high percentages of visually distinctive features – translucent and non-translucent banding. Lastly, primary SA obsidian with a high degree of translucent banding is virtually exclusive to bifacially retouched pieces. Interestingly, unifacially modified flakes and blades have lower percentages for diagnostic characteristics. Raw material with diagnostic features was perhaps selected deliberately for extensive modification because of aesthetically pleasing features, as well as the allegedly better knapping qualities for SA obsidian (*cf.* Hurcombe and Phillips 1998).

The spatial distinction between 04-B and nearby 04-c is accompanied by a difference in taskscapes. Onsite blade production and use/discard are clearly present and form a coherent unit at 04-B. The lithic assemblage at 04-c on the other hand, provides little evidence for onsite blade production and predominantly points to use/discard of unretouched complete and fragmented blades. Source data further underline these differences. At 04-B blades are in both primary SA and secondary SC obsidian with a slight predominance for the former, while secondary SC obsidian is prevalent at 04-c. Taskscapes at 04-c show additional differences. Flake production and use/discard correspond, but knapping strategies contrast. Cores predominantly indicate single and double-stage bipolar flake removal, while debitage and side-struck core platform rejuvenation flakes demonstrate platform flake reduction.

In sum, examining traditions and variations in procurement, production and use/discard, and especially their relationships and spatial coherence from a variety of research angles, teases out subtle differences that may otherwise be overlooked. In the next section I incorporate my findings in existing models of procurement, production and use/discard.

Traditions	Examples	Variations	Examples
PROCUREMENT			
Similar raw material sizes and shapes	Cortical nodules and/or re-use of flaked material for bipolar reduction 02-A-D, 04-B, 07-B-J, 09-A, 10-B, 10-C, 14-B	Potential re-use of flakes and blades	04-A, 04-C, 04-D, 05-C, 05-D, 07-F, 10-B, 14-E, 23-A, 23-B, 23-D,
Direct local procurement *of* secondary sources	02-A-D, 04-B, 04-c, 09-A, 10-B, 10-C, 14-C, 14-D	Direct/indirect procurement of both primary and secondary sources	04-B, 07-B-J, 14-B
		Indirect procurement of primary sources	11-a, 13-C, 23-C
Reduction *at* primary sources	Macroblade core production at Sennixeddu (Perdas Urias SC source zone) *cf.* Luglie 2004a	Reduction/nodule testing *at* secondary sources	02-a, 04-B
Connection technology and obsidian type	Blades and bifaces in SA obsidian. Bipolar core reduction in SC obsidian. Flake technology in SA and SC obsidian.		
Diagnostic material characteristics	Banding (translucent and non-translucent) in blades (04-B, 12-a, 05-D) and arrowheads (04-B, 14-B), non-diagnostic characteristics for flake material.	Flakes translucency	09-A
PRODUCTION, USE & DISCARD			
Close correspondence production, use/discard blade and flake technology	02-A-D, 04-B, 04-c, 07-B-J, 09-A, 10-a, 10-B, 10-C, 13-C, 14-B	Separation of production, use/discard flake and blade technology	Blade production: 12-a, 23-C Blade use/discard: 05-D, 04-c
			Flake use/discard: 04-A, 04-C, 04-D, 07-B-J, 09-b, 10-B, 11-a, 14-e, 14-f, 23-A, 23-B, 23-D,
			Residual flakes/blades: 05-A, 05-C, 11-a, 11-b, 10-A, 14-E, 14-a, 14-d,
Find context	Settlements 04-B, 09-A, 10-a, 10-B, 10-C, 13-C,	Non-settlement	Outlook / maintenance 14-B Production 12-a, 23-C
		Unclear	Isolated finds, small-sale concentrations
Pirmary flaking *chaîne opératoires*.	Single-stage platform blade and flake production and single-stage and double-stage bipolar flake production See Tables 5.13-5.14; Figures 5.8-5.9	Blade-like flake production Ad hoc blade production Ad hoc flake production	Ad hoc blades & blade-like flakes: 02-A-D, 04, 07-B-J, 09-A, 10-B See Tables 5.13-5.14; Figures 5.8-5.9

Hard hammer direct percussion	Flake and blade technology	Direct soft hammer percussion / indirect percussion and pressure flaking	Soft hammer/ indirect percussion: flake and blade technology Pressure flaking: arrowheads	
Informal unifacial secondary technology	Flake and blade blanks wide variety of modification strategies but small set of 'tool' types See Figure 6.1-6.3	Chunks, overshot flakes	04-B, 14-B	
		Arrowhead / bifacial pieces production	04-B, 14-B	
		Use/discard arrowheads / bifacial pieces	02-A-D, 05-A, 07-B, 07-D/E, 10-B, 11,13-a, 13-C, 23-C/D	
Skilled or efficient knapping abilities	Average co-efficient of variation: platform blade and flake technology Low percentage technical mistakes	Higher/lower than average skills High percentages of technical mistakes	Higher skilled	Blade production: 12-a, 23-C
				Tanged arrowheads: 14-B
				Bipolar reduction
			Lower skilled	'novice' cores (07-J, 09-A,10-B, 23)
				'novice' arrowheads (04-B, 14-B)
				High percentage technical errors: blades 05-D, 02-A-D, 07-B-J

Table 7.1. Main *Riu Mannu* procurement, production and use/discard traditions and variations

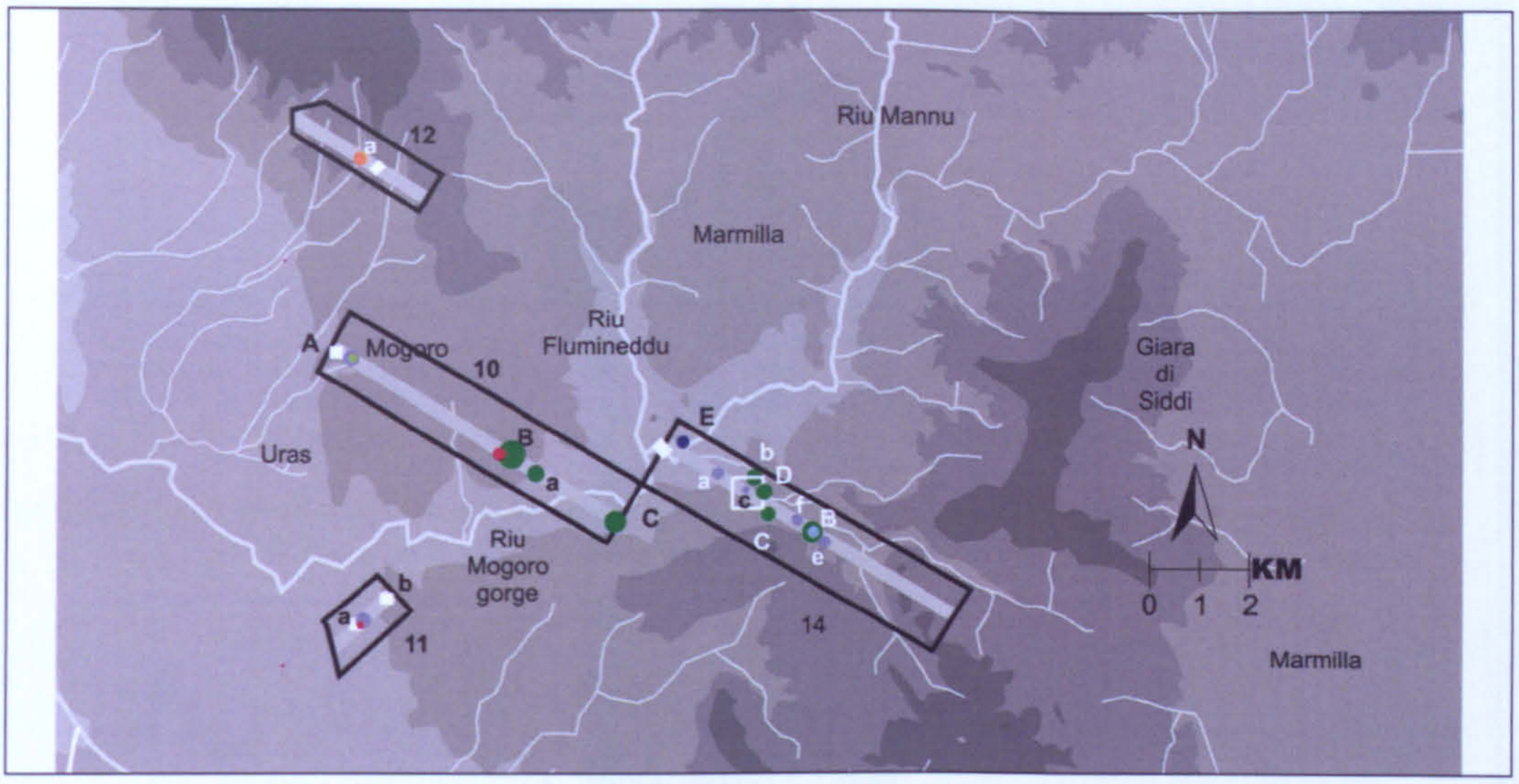

Figure 7.2. Production and use/discard in the Marmilla.

Key to map:
Orange= production blade technology
Red = use/discard bifacial pieces
Light Blue= production bifacial pieces
Dark Blue= (re)use/discard of flakes and blades
Green= production & use/discard flake technology
Lime Green= strike-a-light
Purple= use/discard flake technology
White= secondary source zone

7.1.2. Organisation of procurement, production and use/discard

Until recently, few Sardinian lithic studies have systematically explored the organisation of procurement, production and use/discard, although several ideas have been put forward (see Section 1.3; Table 1.5; but see the aims of the recently started Monte Arci project, Lugliè 2004a). Tykot has proposed a procurement model in which the Oristano province is considered an open access and direct procurement supply zone with simple, down-the-line exchange networks for the rest of the island (see Section 4.2.2; Table 4.3; Figure 7.3). Following this model, and given that most *Riu Mannu* transects lie in the Cagliari province, indirect procurement was expected to be predominant. Analysis of *Riu Mannu* data has revealed a more complex picture.

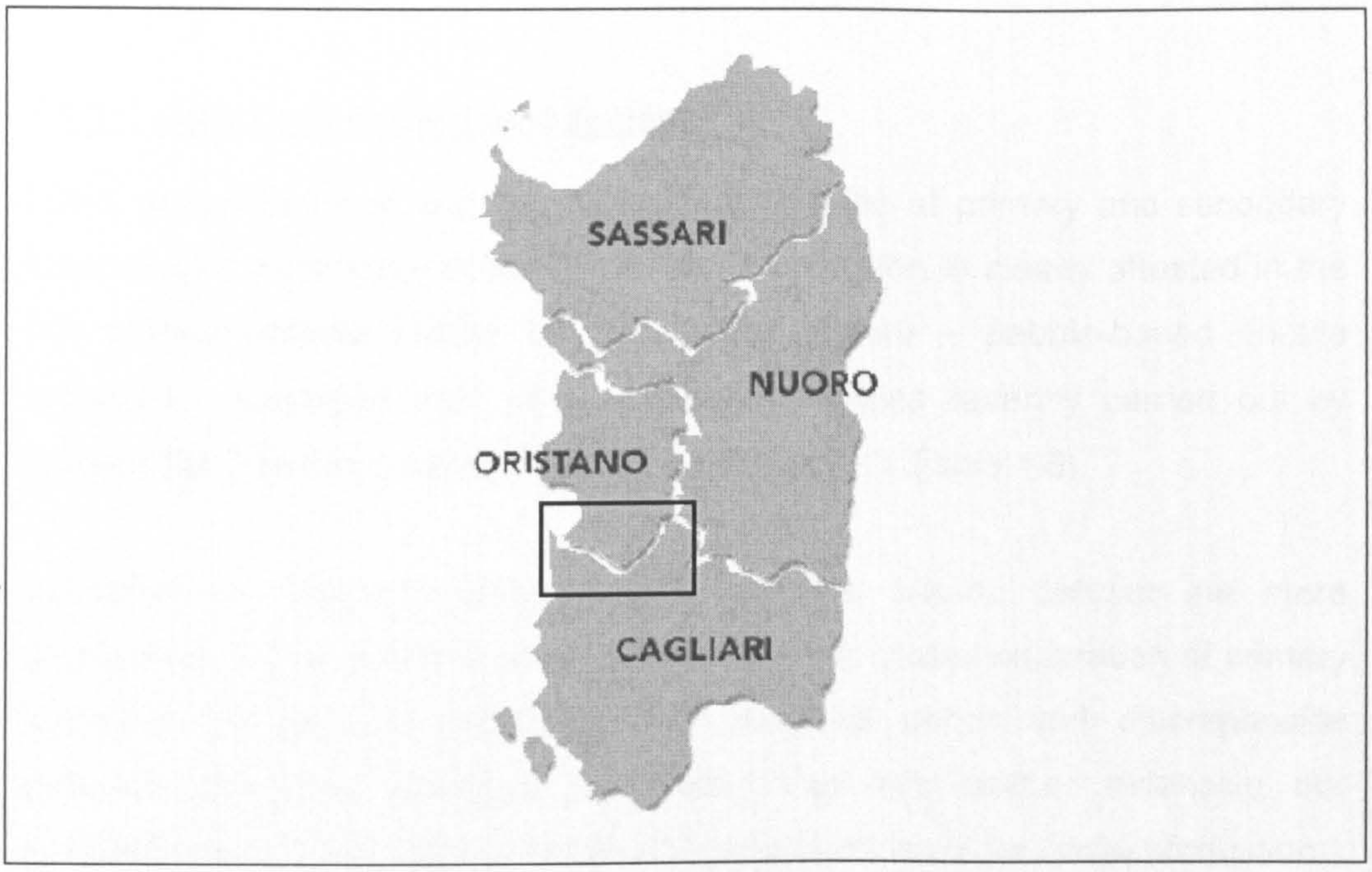

Figure 7.3. The four Sardinian provinces and the *Riu Mannu* research area

This research has used seven lines of evidence to examine procurement strategies: 1) size comparisons between primary and secondary technology, 2) the ratio of previous removals on cores to debitage and modified pieces, 3) the degree of spatial separation of knapping strategies, 4) cortex data, 5) opening strategies, 6) raw material selection criteria, and 7) exploration of the relationship artefact size and distance to raw material sources (also Table 3.21).

Four possible procurement strategies have been recognised: 1) direct procurement at primary and secondary sources for flake and blade production. Raw material procured consisted of cortical nodules that were medium (fist-sized) to large in size, and rounded to sub-rounded in shape, 2) direct or indirect procurement at primary sources for blade and flake production. Macro flake and blade cores that were prepared elsewhere, either directly at the source or in other sites, were brought to the site for further reduction, 3) Re-use ('direct/indirect procurement') of previously flaked material worked elsewhere – large cortical flakes, chunks and core fragments – for bipolar flake production and 4) direct/indirect procurement ('re-use') of previously and/or elsewhere produced flakes and, to lesser extent, blades for use without evidence for further reduction.

7.1.2.1. Direct and indirect procurement

Direct procurement of unprepared cortical nodules at primary and secondary sources that were brought back to sites for reduction is clearly attested in the *Riu Mannu* dataset (Table 7.1). A similar picture – pebble-based on-site reduction – emerges from other settlement studies recently carried out by several Sardinian archaeologists (see Section 1.3.2; Table 1.8).

Indicators for indirect procurement in the *Riu Mannu* dataset are more ambiguous. A few potential pointers exist such as spatial separation of primary knapping stages, the introduction of prepared cores and discrepancies between core and debitage data, but these are neither extensive nor straightforward. Three points hint at indirect procurement for blade production:

- Two small *Riu Mannu* sites suggest spatial separation for blade production. Site 12-a, located close to primary source zone SA, is predominantly indicative of blade core preparation and/or maintenance, while 23-C suggests reduction of prepared blade cores, again indicative of primary SA source use.
- Two other small-scale sites (04-c, 05-D) suggest use/discard of blades, with little indication of production such as cores, core rejuvenation pieces, debris and cortical debitage. 05-D hints again at use of primary SA source use, while 04-c mostly suggests secondary SC source use.
- Cores with blade removal are more often reduced to the point of exhaustion than flake cores (Table 5.36).

Similarly, three aspects might be indicative of indirect procurement for flake production:

- Low cortical percentages (c. 30%), few pieces of more than 50% remaining cortex and discontinuous cortex removal patterns point to reduction of prepared cores for flake production from primary SA and secondary SC sources at 14-B and primary SA and SC sources at 13-C.
- Certain places (*e.g.* 02-A-D, 07-B-J, 10-C, and 14-B) have indicated a discrepancy between *chaîne opératoires* on cores (single- and double-

stage bipolar reduction) and on detached pieces (platform reduction) for flake production.

- A difference exists between numbers of previous removals on cores versus numbers of minimum numbers of detached pieces, in particular for flake production (Table 7.2).

	Arborèa		Campidano					Marmilla				Total
	02	05	04	07	09	13	23	10	11	12	14	
MNI Blades	5	6	116	10	3	6	24	3	-	4	7	184
Blade removals on cores	6	-	124	16	7	6	17	13	-	-	12*	
MNI Flakes	61	19	468	116	54	15	103	229	7	14	382	1468
Flake removals on cores	15	8	106	15	25	15	11	28	-	-	55*	

Table 7.2. Comparison of the number of flake and blade removals on all cores and the minimum number of individual debitage pieces (complete and proximal pieces only). *= excluding 18 unstudied cores.

Separate lithic taskscapes for flake technology exist but exploring procurement strategies is limited by their assemblage composition. Most assemblages are isolated or small-scale concentrations of modified and unmodified flakes (Table 7.1; Sections 5.1; 6.1 and Figures therein). They probably imply use/discard, although their *in situ* character is problematic (see 7.2. below). A second group of separate taskscapes consist of cores. In comparison to other artefacts, they are most frequently found in isolation. At times, cores are also absent where core rejuvenation flakes, debitage and debris testify to onsite production (see Section 5.1.5). Several interpretations are possible, which are not necessarily mutually exclusive. First of all, and pertaining to their absence in locations of production, it has been tentatively suggested that cores have a more mobile life history and may be indicative of indirect procurement Secondly, and pertaining to their frequent occurrence in isolation, they may reflect distinct core use/discard patterns. Most isolated cores are single or double-stage bipolar cores. They may represent onsite discard, *i.e.* left behind after flake production. It is also possible that they reflect discard of tools. It has been suggested in the wider debate on bipolar technology that they are tools, wedges, or *piece esquillées,* rather than cores (Andrefsky 1998: 119-120; Shott 1989c). Regardless of artefact type, the majority of isolated cortical pieces indicate secondary SA and SC source use, although a few point to primary SA source use (Appendix 5.11; Table 7.3).

Cortex types	Obsidian type	02	05	04	07	09	13	23	10	11	12	Total
Non-cortical	SA	1	-	6	-	2	-	6	5	3	1	24
	SA/SB?	7	-	6	1	5	2	5	3	4	-	33
	SC	1	1	4	1	-	-	5	3	2	-	17
	SC/SB?	2	-	7	-	-	-	1	1	1	1	13
1-2 (secondary source cortex)	SA	2	-	8	-	1	1	7	2	-	-	21
	SA/SB?	-	1	8	-	2	-	2	-	1	-	14
	SC	2	-	13	-	-	-	6	3	1	-	25
	SC/SB?	-	-	3	-	-	-	4	1	1	-	9
3-4 (primary source cortex)	SA	-	-	5	-	-	-	1	1	-	-	7
	SA/SB?	2	-	7	1	-	-	2	2	-	2	16
	SC	-	-	4	-	-	-	-	-	-	-	4
	SC/SB?	1	-	-	1	-	-	1	-	-	-	3
		18	2	71	4	10	3	40	21	13	4	186

Table 7.3. Source location and obsidian types for all isolated *Riu Mannu* finds, excluding transect 14.

Examination of procurement strategies at source zones provides further information. Earlier, a discrepancy between the use *of* and *at* the Monte Arci source zones was noted. Limited evidence for reduction at SA and SB sources contrasts with the clear proof of their use seen in sites across Sardinia and elsewhere. It was suggested that both procurement of cortical nodules, taken away for reduction and the existence of prehistoric quarries in the Monte Arci SA source zone cannot yet be ruled out (see Section 4.2.1; Table 4.1). Firstly, modern perlite quarrying has severely affected archaeological recovery in these zones. Secondly, as just discussed, at least four *Riu Mannu* sites indicate reduction of primary SA cores that were prepared elsewhere, presumably at least in part in the source zones. Macroblade core production is recognised at Sennixeddu, an extensive prehistoric quarry in the Perdas Urias SC source zone on the Monte Arci, and certainly testifies to such a process (Lugliè 2004a). Most *Riu Mannu* secondary sources do not show any evidence for nodule testing, core preparation or reduction. There are two exceptions, 02-a demonstrates small-scale nodule testing, while 04-B is a settlement on top of a wider secondary source area.

Four points of caution also need to be considered before the existence of indirect procurement can be confirmed. Firstly, unprepared cortical nodules can be exchanged, 2) direct percussion often results in core fragmentation especially obsidian given its brittle character so that the absence of cores and discrepancies between removals on cores and detached pieces need not

reflect exchange, 3) spatial separation of reduction and the existence of quarries are not straightforward indicators of indirect procurement (see Section 1.3.3) and lastly, 4) there are no clear exceptions in observed *chaîne opératoires* that suggest finished pieces were brought in. 'Exotic' raw materials, exceptionally large pieces or extensively retouched pieces are all absent, although flint artefacts may be an exception (see Table 1.8). Clearly, distinguishing direct or indirect procurement is not as straightforward as usually assumed.

7.1.2.2. Re-use?

Two other trends have been recognised that could indicate a shift away from exploitation of raw material sources to re-use as a procurement strategy, although this interpretation is not straightforward. Firstly, flaked material – (non-)cortical flakes, chunks and core fragments – are re-used as parent material for bipolar reduction. It is presupposed that the flaked material selected for re-use is acquired from the immediate surroundings and is not obtained from elsewhere. Bipolar technology and its use of previously flaked material as parent material occur throughout the research area (see Section 5.3.1; Table 5.20). This type of re-use does not appear to be tied to a particular period, as it occurs in contexts ranging from the Neolithic to the Punic period (Tables 7.4-7.5; for discussion of chronology see 7.2 below).

	Arborèa					Campidano							Marmilla							
Parent material	02-A	02-a*	02-A-B halo	02-B	05-C	04-B	04-c	Isolated	07-B	09-A	Isolated	Isolated	10-a	10-B	Isolated	14-a	14-B	14-B halo	14-c	14-e
Flake	-	-	1	-	-	4	1	1	-	1	-	1	1	1‡	1	1	1	1	-	-
	-	-	-	-	-	1#	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	1†	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cortical flake	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Core fragment	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chunk	-	-	-	1	1	-	1	1*	1	1	1	-	-	-	-	-	2	-	1	1
Total	1	1	1	1	1	4	2	2	1	2	1	1	1	2	1	1	3	1	1	1

Table 7.4. Find contexts for *Riu Mannu* non-nodular parent material used in single-stage bipolar core technology.

Key to table:
*= Bipolar 'blade' removal
#= Ad hoc flake production
†= Platform mixed flake/blade reduction
‡= Platform flake reduction.

	Arborèa					Campidano					Marmilla		
Parent material	02-A	02-A-B halo	02-C-D halo	isolated	05-D	04-B	04-C	07-B halo	07-J*	23-C	10-B	10-B halo	14-B
Flake	-	-	1	1	-	1	1	-	-	-	-	1*	1
	-	-	-	-	-	1#	-	-	-	-	-	-	-
Cortical flake	-	-	-	-	-	1	-	-	-	-	1	-	-
Core fragment	-	-	-	-	-	1	-	-	-	-	-	-	-
Rejuvenation flake	-	-	-	-	-	1	-	-	-	-	-	-	-
Core fragment	-	1‡	-	-	1#	-	-	-	1□	1†	-	-	-
Chunk	1	-	-	-	-	1▲	-	1#	-	-	-	-	1
Total	1	1	1	1	1	5	1	1	1	1	1	1	1

Table 7.5. Find contexts for *Riu Mannu* non-nodular parent material used in double-stage bipolar core technology.

Key to Table:
*= Ad hoc 'blade' core
#= Platform flake & bipolar flake core
†= Double-stage platform flake core
‡= Ad hoc mixed & bipolar flake
□= Platform mixed & platform flake
▲= Multi-stage platform flake and bipolar flake

A second type of potential re-use is a small number of unmodified complete and fragmented flakes and blades that are found among several later prehistoric sites (Table 7.1). As stated above, the interpretation of this second group of finds is difficult. Both find context and chronology are problematic. There is no evidence that these artefacts were produced onsite, since any other primary flaking evidence is absent. Likewise, they do not show any traces of secondary modification (retouch) or re-use for bipolar reduction. Secondly, it is unclear whether or not the spatial contemporaneity with the late prehistoric pottery assemblages, also denotes a chronological contemporaneity. Two interpretations seem equally likely at this stage. They are contemporaneous with the late prehistoric date of the pottery assemblages and they were introduced as finished pieces, perhaps procured (hence re-use) from sites nearby. This phenomenon is seen elsewhere in the Mediterranean and certainly possible for Sardinia as well (for references see Section 2.5.1 or Karimali 2005 for a succinct summary). Secondly, they are not contemporaneous with the pottery assemblage and are residual from earlier activities. In this case they closely resemble the finds from other small scale

concentrations and isolated finds that are scattered across the research area. These are problematic to interpret (see Section 7.2.2. below).

Procurement: conclusion

In conclusion, a variety of procurement strategies have been recognised in an area for which archaeologists have generally posited just direct or indirect procurement. This research demonstrates that it is worthwhile to move beyond that dichotomy and explore procurement strategies in more detail. Moreover, contrary to traditional lithic studies, *Riu Mannu* data do not show a clear division among secondary sources, direct procurement and expedient technologies on the one hand, and non-local, primary sources, exchange, craft specialisation and curated technologies on the other (see Section 2.3; Table 2.1). In the *Riu Mannu* dataset, primary and secondary sources are interchangeably local and non-local, associated with direct and indirect procurement, and virtually the entire dataset would usually be classified as 'expedient'. Moreover, there are no indications that any of the procurement strategies are organised beyond a household level. Specialised control over raw material sources or production is notoriously difficult to establish archaeologically, although some physical markers for source control, greater standardisation, and stricter separation of reduction phases are often thought to be indicative (see Section 2.3). Current work at the Sennixeddu quarry has not revealed any archaeologically visible 'territory' markers. Examination of procurement strategies has only just started and has revealed figures similar to the *Riu Mannu* data, indicative of skill but not specialisation (Lugliè 2004a: Table 1). Likewise, there is no evidence for control over sources or spatially distinct reduction stages at the *Riu Mannu* secondary sources. Very small-scale nodule testing was recognised at 02-a, and while 04-B is positioned in a secondary raw material source, there is little evidence for specialist or production beyond local requirements.

7.1.2.3. Specialisation or skilfulness?

I previously argued that chronological and socio-political boundaries, and the traditional view of technology as a nature-determined mechanism have created a binary opposition between expediency and curation/craft specialisation, whereby the former is overlooked in favour of the latter (*cf.* Section 2.6). I also

argued that exploration of skill on an assemblage level would be a more fruitful approach. This study has explored knapping abilities through four angles of interest (see also Section 3.4.2.4): 1) consistent levels within and across primary and secondary knapping strategies, traditions and variations, 2) technical errors such as overshot features, steps/hinges and steep platform angles, and 3) evidence for their corrections, and lastly 4) knappers' ability to manipulate the specifics of each raw material nodule.

This study revealed that so-called simple or expedient assemblages, especially single-stage flake, blade and mixed flake/blade reduction and bipolar flake reduction are skilfully knapped. Four main points support this:

- Co-efficients of variation for primary technology are lowest for bipolar reduction and blade production at 12-a and 23-C, suggesting higher than average skills (Table 5.31; Figure 5.23). Co-efficients for platform flake and blade reduction are very similar, echoing other similarities between the two technologies. Comparison of the ratio core stage to previous removals demonstrated that single-stage platform reduction was most effective, while bipolar reduction is most consistent (Table 5.33).
- Unifacial secondary technology figures are very similar to primary technology, thus reinforcing the idea that these were not made or brought in from elsewhere (Table 6.25). Bifacial pieces show a different picture, with the highest regularity of all *Riu Mannu* pieces for tanged arrowheads (Table 6.26). Their strong concentration in one location (14-B) combined with other evidence from that area is suggestive of arrowhead production, but the sample size is so small that any interpretation of specialisation remains speculative.
- Examination of technical mistakes revealed two clear regional patterns (Tables 5.37-5.39). High percentages of step/hinge distal terminations on blades in transects 02, 05, 07 and 13 strengthen the idea that blade production may be separate from flake production, despite small sample sizes and low blade indices. Other indicators suggest inexperienced knapping ('novice' arrowheads, overshot flakes and blades) is concentrated in 04-B and 14-B. So-called novice cores are more dispersed (07-J, 09-A, 14-D and isolated in transect 23). They

also appear to be associated with later prehistoric assemblages, if contemporaneity of assemblages is accepted (see 7.2. below).

- Core trimming flakes removing steps/hinges along the core surface show that technical mistakes were also corrected.

Despite these interesting patterns, it is at present difficult to assess what these figures really represent. First of all, it should be remembered that all comparisons made are relative to the *Riu Mannu* dataset only, as there is no comparative material available from other Sardinian assemblages. The only exception to this is the recent study by Lugliè (2004a) on the blade core production at the Sennixeddu quarry. He concluded that there were no signs of specialisation although knapping was skilful in general.

Secondly, the nature of the dataset must be taken into account. These changes may also reflect the palimpsest nature of survey material. The *Riu Mannu* dataset is a combination of long settlement histories with high probabilities for residuality. Thus, rather than representing contemporaneous assemblages of experienced and inexperienced knappers, the 'novice' pieces may also indicate a general decline in knapping skills. The 'decline' of lithic technology in later prehistory is a complex topic, which falls outside the scope of this study, but will be addressed in future research (Ford *et al.* 1984; Rosen 1997). The majority of *Riu Mannu* 'novice' cores are found dispersed over complex assemblages where contemporaneity is at issue, so that 'decline' is as likely as an interpretation as 'novice'. The bifacial pieces, however, present a slightly different picture. Contemporaneity is less at issue for 04-B and the assemblage is chronologically relatively tight (Late Neolithic/Chalcolithic). Decline therefore seems a less likely interpretation. Similarly, the assemblage at 14-B is more suggestive of different knapping skills than decline. This site is located near a spring on the slope of sa Costa Manna, overlooking the Mògoro valley (Figure 7.4). It contains the highest number of modified pieces, in particular side and end-scrapers, knives, knife fragments and nearly all multi-work edge modification and bifacially retouched pieces. Several bifacial pieces are fragmented, and appear to have been abandoned as a result of technical mistakes or seem to be pre-forms or novice attempts at making arrowheads (see Tables 6.10; 6.12-6.16).



Figure 7.4. Location of concentration 14-B Sa Mitza de sa Costa Manna, on the slope of Sa Costa Manna overlooking the Mògoro valley.

It is therefore proposed that arrowhead production and instruction in their production, and food processing probably took place, perhaps while observing and hunting game. This is a practice still continued today as shown by the abundance of gun shells in the area. Admittedly, the chronology of the site is problematic. It is a lithics-only site that cannot be securely dated, although it is tempting to suggest an early prehistoric (Neolithic?) date given its interpretation. It should be understood, however, that given the small sample sizes, these 'decline' or 'novice' interpretations, are very preliminary. Much more work needs to be done on larger assemblages from securely dated (excavated) assemblages in more varied contexts.

Thirdly, raw material properties and flaking methods must be taken into account. Obsidian is brittle and despite its homogeneity, it does contain flaws. Additional research, both experimental and studies of other archaeological assemblages, needs to be carried out to assess whether or not these *Riu Mannu* percentages fall within the spectra of errors expected for Sardinian obsidian from primary and secondary sources. Likewise, the effects of different types of percussion on the type and degree of technical errors need to be explored. Direct percussion is more likely to produce a higher percentage of steps and hinges (Whittaker 1994: 106-112).

Lastly, recent Sardinian lithic studies have indicated that different skill levels and different modes of production existed between flint and obsidian assemblages. Flint blade production is prismatic and possibly knapped by specialists, while obsidian flake and blade production is domestic skilled but not specialised (see Table 1.8). It is generally assumed that the flint sources are Sardinian, although, as far as I am aware, characterisation studies have not been carried out. Two flint sources are known, one in the north of the island (Perfugas) and one in the Marmilla (Masullas) (*e.g.* Contu 1997a; Lilliu 1988). Some personal (and anecdotal) observations also hint at differential knapping abilities in obsidian. The arrowheads found at the 04-B, for example, contrast with other sites in the wider river Mògoro area (Figure 7.5). I have seen more bifacial pieces and of finer quality (*e.g.* clearly pressure flaked and larger in size (over 8çm)) in a private collection for Puisteris and in informal (*i.e.* unsystematic sampling) *Riu Mannu* collection of Serra sa Furca (G. Boassa personal collection; de Bruijn 1998).

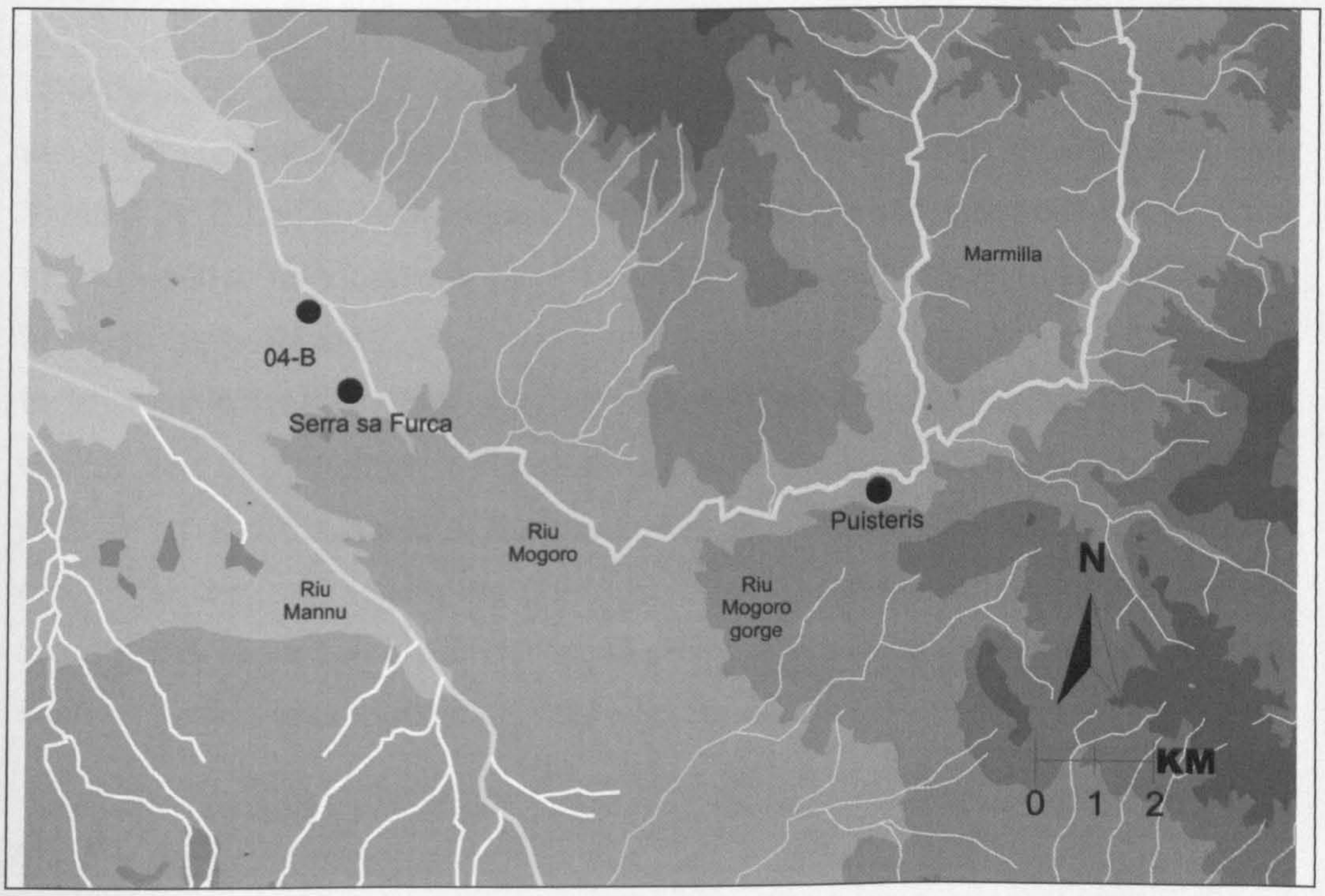

Figure 7.5. Location of Neolithic sites 04-B, Serra sa Furca and Puisteris.

This research suggests that primary flaking was not aimed at blank production for secondary technology. Instead it is targeted at the production of flakes and blades, which were used with little further modification. Secondary modification

is relatively rare, even when including 'probably retouched' pieces (see Section 6.1). Exploration of knapping abilities or specialisation in unifacial secondary technology revealed a similar picture. Little patterning could be found in the detailed analysis of retouch practice, although broad parallels exist with basic 'tool' types such as denticulates, notches, or end- and side scrapers (see Section 6.3.2; Table 6.1). It is difficult to assess how the *Riu Mannu* data compare with other Sardinian lithic studies. Few studies list percentages or modification details, but 'tool' types described are burins, denticulates, notches, and side and end-scrapers (Tables 1.5; 1.8). Another problematic aspect is recognising intentional modification. It has previously been pointed out that it was not always possible to distinguish between pseudo-retouch, intentional retouch and/or use wear. This is a problem common to obsidian artefacts from survey material, and especially the 'tool' types normally recognised (McBrearty *et al.* 1998; see Sections 3.1.2.3; 6.3.2.1). Thus, attributing social meaning merely through a typological approach as is commonly done in traditional and Sardinian lithic studies, is of limited value.

In conclusion, there are few clear indicators for specialisation of primary and secondary technology, conforming to most other 'expedient' assemblages (see Table 2.2). Detailed explorations have, however, counterbalanced some of the more negative connotations (*e.g.* 'unskilled' or 'unstandardised') often implied for such assemblages. Production and use/discard of primary and secondary technology correspond for most of the studied *Riu Mannu* dataset, and is closely tied to settlements. Some small-scale scatters have indicated distinct production and use/discard, but these are problematic to interpret and do not challenge the mostly domestic mode of production and use (see below). Clearly, it is essential fort similar types of studies to be carried out at other sites such as settlements, burials and so-called ritual sites.

7.1.2.4. Aesthetic preferences

One of the aspirations of this research has been to examine whether or not diagnostic features of obsidian could be indicative of aesthetic preferences in Sardinian lithic practice. Recapping, three main patterns have been recognised:

- Translucent (SA) and non-translucent (SC) banding in blade technology

- Translucent banding (SA) in bifacial pieces
- Non-diagnostic features in flake technology, with the sole exception of a translucency in the flake assemblage of 09-A.

There are some obvious limitations that should be taken into consideration. Firstly, translucency could be affected by artefact thickness and flaking technology, subsequently distorting analysis of aesthetic preferences and source attribution (Section 4.4). I expected blades and bifacial pieces to be thinner, and correspondingly show higher percentages of full translucency. A brief exploration of data from transect 04, which contains a substantial portion of blades and bifacial pieces, shows that expectations are not entirely met (Table 7.6). Marginally translucent pieces are thicker than translucent or completely translucent ones, but this is not related to flaking technology. Bifacial pieces for instance are the exception, as completely translucent artefacts are thicker than marginally retouched pieces. Similarly, flakes are generally thinner than blades or bifacial pieces but they do not show higher percentages of translucent or completely translucent features. It may therefore be concluded that the observed preferences for diagnostic features in blade and bifacial technology are not skewed by flaking technology but reflect human preference.

Diagnostic features	MNI flakes			MNI blades			Bifacial pieces		
	N	%	AV T	N	%	AV T	N	%	AV T
Marginally translucent	23	16.2	8.9	3	5.7	8.5	2	25	8.8
Marginally translucent internal patterning	26	18.3	11.1	10	18.9	8.5	1	12.5	6.9
Translucent internal patterning	71	50.0	6.3	29	54.7	6.9	3	37.5	8.8
Translucent	8	5.6	5.6	-	-	-	-	-	-
Completely translucent	5	3.5	3	-	-	-	-	-	-
Completely translucent internal patterning	9	6.3	6.3	11	20.8	7.8	2	25	16.9
Total	142			53			8		

Table 7.6. Average thickness (AV T) for the minimum number of pieces (MNI) for unmodified flakes, blades and bifacial pieces in transect 04.

Secondly, as a result of long-term exposure on the ground surface, weathering and patination are likely to have affected the degree to which material characteristics, particularly glossiness and colour, can be recognised. The high frequency of weathered and patinated artefacts with the *Riu Mannu* attribute

'indeterminate' in the raw material characteristics variable clearly reflects this (Table 7.7).

Artefact condition	09	10	11	13	14	2	23	4	5	7	Total
Fresh	1	4	-	-	-	6	-	18	-	3	32
Weathered	73	115	33	12	12	32	23	306	1	75	682
Patinated	6	18	12	1	-	22	18	22	6	3	108
Total	80	137	45	13	12	60	41	346	7	81	822

Table 7.7. Artefact condition for all artefacts with 'indeterminate' raw material characteristics.

Thirdly, raw material availability and quality certainly influences raw material selection criteria, but as this research has indicated, human choice, including aesthetic preferences, also play a part. Translucency and banding for instance are inherent in the natural properties of obsidian, but these are not always macroscopically visible and do not occur equally within each obsidian type or nodule (see Table 4.8). High occurrences of these characteristics in archaeological datasets thus do not simply represent the spectrum of raw material properties, but also choices on the part of the knappers. Likewise, the predominance of mostly flawless SA and SC over the phenocrysts-filled SB obsidian may indicate a preference for good quality raw material.

It is temping to see the higher extent of banding in blades and bifacial pieces as an extension of the geometric patterns (banding, spirals, zigzags) seen in broadly contemporaneous (Late Neolithic/Chalcolithic) pottery assemblages and in burial decoration. Currently, however, the connection is speculative. Clearly, additional research is needed. Firstly, study of lithic assemblages from secure contexts is needed to confirm the *Riu Mannu* trends and date them more precisely. Secondly, an extensive survey of these geometric patterns is also required to substantiate the suggested correlations. Thirdly, the influences of ground surface exposure on raw material characteristics should be examined. Lastly, it should be investigated whether or not and to what degree primary and secondary source material and/or diagnostic or non-diagnostic raw material differ in flaking quality.

In conclusion, it is clear that a detailed study of the three main elements of lithic practice, procurement, production and use/discard and their spatial

relationship provides insightful means of understanding human activity in the landscape.

7.2. Temporality of the Sardinian lithic landscape

Gaining an understanding of the temporality of the lithic landscape and taskscapes is tied to the need for reliable chronologies, and thus, as outlined earlier, to the three main problems in lithic survey studies, how to define, date and interpret lithic scatters (Section 2.5). In this section I return to these aspects and discuss how my research has dealt with them. Note that this does not include a discussion of the natural and cultural post depositional processes or the 'work in progress' character that have shaped the Sardinian lithic landscape and their impact on gaining an understanding of prehistoric activity in the research area, as this has been discussed previously (see Section 3.1.2.2).

Keeping the previously discussed problems with chronology in mind (Section 3.2), the main dating tools used in this study are 1) correlation of lithic and ceramic assemblages, 2) consistency in lithic assemblage composition and 3) correspondence of *Riu Mannu* trends with those known from other Sardinian lithic studies (*e.g.* Tables 1.5; 1.8).

7.2.1. 'Secure' temporal developments

Using the above criteria, secure dates can be established for four gridded concentrations. Some of the subtleties noticed in the lithic dataset may now be tied to chronological trends (Table 7.8; 7.1). Firstly, blade and arrowhead technology are common to early prehistory (Neolithic/Chalcolithic). Secondly, platform and bipolar flake technology are widespread in both early and late prehistoric contexts in the *Riu Mannu* dataset with an increased predominance in later prehistory. Certain lithic studies specifically link bipolar technology to late prehistoric periods (Section 2.2). This connection is less clear for the *Riu Mannu* data, but not unlikely given that flaked material is often used as parent material. Thirdly, in early prehistory, primary and secondary sources are used contemporaneously, with an increase of secondary sources and re-use in later prehistory. Lastly, aesthetic preferences play a more noticeable role in raw material selection criteria in earlier rather than later prehistory and are linked to

blade and arrowhead technology. Qualitative data from contemporaneous sites outside the grid areas and the ungridded concentrations with additional qualitative collections show similar trends (Table 7.8: respectively, sites marked with an asterix *, or with lower case letters).

Transect	Context	Interpretation	Chronology	QT	QL
04	04-B	Settlement	Neolithic-Chalcolithic	496	598
		Halo 04-B		105	88
09	09-A	Settlement-single tower nuraghe	Nuragic	64	80
		Halo 09-A		12	2
10	10-B	Settlement? /Settlement-complex nuraghe / Settlement next to nuraghe	Chalcolithic/ Final Bronze Age-First Iron Age / Punic	162	304
		Halo 10-B		4	51
	10-a	Eroded settlement	Bronze Age	17	7
	10-C	Settlement-complex nuraghe / Settlement next to nuraghe	Final Bronze Age-First Iron Age / Punic	67	89
		Halo 10-C		10	13
13	13-C*	Settlement-nuraghe	Bronze Age	-	42
	13-B*	Settlement-limited number of huts	Bronze Age	-	7
14	14-a	Off-site from sites in wider area	Eneolithic-Roman Imperial	13	16
	14-d	Off-site from sites 14-D, b and c nearby	Eneolithic-Bronze Age-Roman	27	32
	14-b*	Wider plateau around burial	Eneolithic (Monte Claro)	-	13
	14-C*	Settlement-complex nuraghe; isolated huts nearby	Nuragic	-	12
	14-D*	Construction	Nuragic	-	15

Table 7.8. Chronology and interpretation for securely dated Riu Mannu concentrations.

Key to Table:
Capital letters = gridded sites.
Lower case letters = Ungridded concentrations with additional qualitative collections
*= Qualitative samples at sites outside the main grid areas.

Following these trends some tentative dates may be proposed for concentrations where dating was previously problematic given the lack of pottery and/or ambiguous associations with ceramic assemblages (Table 7.9). Additional research is, however, clearly needed to compare survey results with other material, preferably from excavations, to clarify these trends. Such comparisons are desirable in any case, given the nature of the Sardinian archaeological record, with its long settlement histories in clustered areas. At the moment such a comparison is still difficult to carry out given the lack of detailed and/or published lithic studies (see Section 1.3).

Transect	Context	Interpretation	Chronology pottery	Proposed chronology lithics	QT	QL
05	05-D	Cemetery associated with nearby farm?	Punic-Roman Republican	Early prehistoric residual?	13	9
07	07-J*	Production use/discard flake technology; use/discard blades?	Undated	Late prehistoric Bronze Age?	-	70
		Halo 07-J			22	21
12	12-a	Core preparation and blade core reduction / maintenance	Undated	Early prehistoric?	-	37
14	14-B	Observation – production / tool maintenance?	Undated	Early prehistory, early /middle Neolithic?	768	339
		Halo 14-B?			226	1
23	23-C*	Blade production, some use/discard?	Undated	Early prehistoric?	25	42
		Halo 23-C			31	42
	23-B	Settlement-farmstead	Punic	Early prehistoric residual?	18	25

Table 7.9. Proposed chronology and interpretation for previously undated *Riu Mannu* concentrations. Key to table as above.

7.2.2. Limitations in establishing temporality

As pointed out earlier, coarse dating mechanisms and long settlement histories have resulted in three main problems for understanding the temporality of the lithic landscape (see Section 3.2; all even numbered figures in Appendix 3.1). Firstly, ambiguous or imprecise correlations between lithic and ceramic assemblages have made it difficult to distinguish between contemporaneous and residual finds, especially in transects 02, 07, and 23. Detailed lithic analysis however, has teased out subtle differences that may indicate chronological changes but which are not (yet) possible to attribute to specific periods. Special Interest Area 02 A-D is a good example. Lithics in this area broadly correspond to the four gridded late prehistoric (Punic/Roman) sites (Figure 7.6). The lithic assemblage shows three main trends:

- Flake production and use/discard with local secondary source use
- Possible blade production and use/discard
- Arrowhead use/discard and possibly production

The flake assemblage from Special Interest Area 02-A-D is uniform and shows many similarities with other later prehistoric assemblages: 1) unidirectional platform reduction and single-stage bipolar reduction using previously flaked material, 2) direct procurement at secondary sources, 3) reduction of cortical pebbles with direct percussion and a high degree of core fragmentation and lastly, 4) ad hoc secondary technology consisting mostly of notches, end and

side scrapers on cortical and non-cortical flake blanks. Contemporaneity with the ceramics is possible but an earlier (Bronze Age?) date cannot (yet) be ruled out. The blades and bifacial pieces are more problematic. Artefact numbers are low for both, but some differences nonetheless suggest that they are distinct from the flake production and are residual earlier prehistoric activities. Blades are rare. It could be that blade-like flakes form part of the flake production. Their source data, however, run contrary to that of the flakes and they contain a much higher percentage of technical errors, especially hinged/stepped distal terminations. Bifacial pieces show a similar picture. Source data indicate non-local primary source use and abandonment as a result of flaking mistakes is also tentatively suggested for two pieces. In both cases further indicators for onsite production are absent. Thus, the merits of a detailed exploration of the relationship between source location, obsidian type and flaking technology, and a disengagement of chronology as a basis for analysis are clear. The approach applied in this thesis teases out subtle differences that would otherwise go unnoticed.

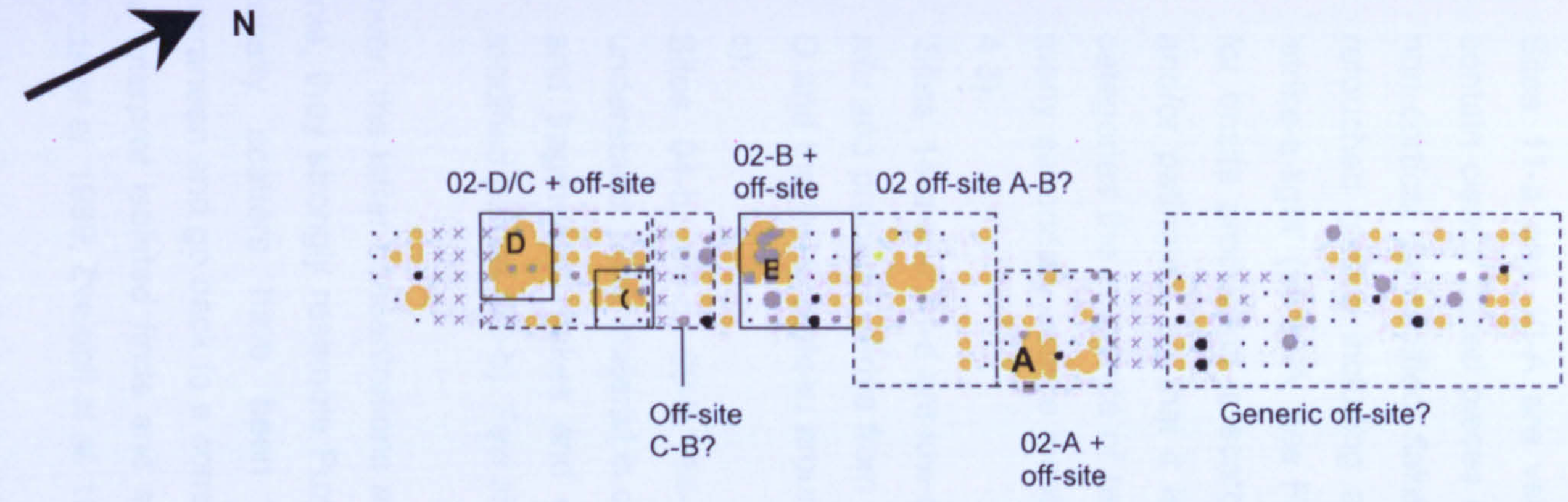

Figure 7.6. Finds distribution transect 02. Orange= pottery distribution, grey/black= obsidian distribution (for legend see Figure 3.9; Appendix 3.1).

Secondly, it is difficult to date and interpret small-scale concentrations near main gridded ones (*e.g.* Special Interest Areas 14-B and 14-C) but especially those found in isolation (*e.g.* 02-a, 04-a, 09-a, 09-b, 10A, 11-a, 11-b). Detailed analysis has again provided additional insights (Table 7.10).

- Some 'sites' and stretches of isolated finds consist mostly of pseudo artefacts and are a reflection of the spectrum and fragmented nature of raw material. The *Riu Mannu* fieldwork methodology has more or less created these 'sites', since the individual pieces often resemble archaeological artefacts (Section 4.1.3).
- Sites 11-a and 10-A are very similar to the previous category, but contain clearly flaked pieces next to pseudo artefacts. The former are non-cortical unmodified flakes with SA features, and some clearly retouched pieces including an arrowhead fragment (at 11-a) and a 'strike-a-light' (at 10-A, see Figure 7.2: red and grey bullet). Evidence for onsite production is scarce and most pieces are heavily abraded and/or patinated, so that it is unlikely that they are *in situ*. For both categories the presence of pseudo artefacts is unsurprising, given the many secondary source locations in the Marmilla (Section 4.1; Figure 4.3).
- 'Sites' 14-a and 14-d are low-density lithic scatters that are no longer *in situ* and probably derive from sites nearby (14-E, *nuraghi* 14-C and 14-D and the wider plateau around Eneolithic burial complex 14-b and 14-c).
- Sites 04-b, 04-c, 09-b, 14-e, and 14-f are more problematic to understand. Most material is clearly flaked and they consist of complete and fragmented flakes and chunks, some blades (04-c), and some modified pieces (09-b). Few show clear evidence for onsite production.

Moreover, the latter concentrations are not just a *Riu Mannu* phenomenon. In Sardinia, they strongly resemble Puxeddu's *stazioni* (Section 4.2.2.1). Similar low-density scatters have been found in England, Ireland and the Mediterranean and go back to a common question in survey archaeology: how do we interpret isolated finds and small concentrations? (Ammerman 1985; Edmonds *et al.* 1999; Zvelebil *et al.* 1987).

Context	Chronology and interpretation pottery	Proposed chronology and interpretation lithics	QT	QL
02-A	Punic-Roman Republican farmstead	Late Prehistoric (Bronze Age, Punic?) Flake production, use discard. Blades and bifacial pieces residual earlier prehistoric activities?	6	29
02-B	Punic-Roman farmstead + site halo		28	58
02-C	Punic-Roman storage, associated with 02-D + halo		15	51
02-D	Punic-Roman Republican farmstead		2	4
Isolated finds 02	N/A	Low-density secondary source area, dispersed use/discard flakes	26	25
02-a*	N/A	Low-density secondary source area, limited testing/reduction	-	18
04-a	N/A	Part of Campidano secondary source area	16	-
04-b	N/A	Flake use/discard; raw material	26	12
04-c	N/A	Production, use/discard flake technology; use/discard blades	74	178
Isolated finds 04	N/A	Mostly part of Campidano secondary source area; isolated use/discard	81	72
07-B	Final Bronze Age-First Iron Age, Settlement? + halo	Late Prehistoric (Bronze Age, Punic?) Flake production, use discard. Blades residual earlier prehistoric activities?	14	47
07-C	Punic-Roman Settlement? + halo		6	6
07-D	Punic-Roman Republican small subsidiary building to 07-E stable or depository		-	4
07-E	Punic-Roman Republican Settlement-farmstead (accompanied by burials?) + halo		48	62
07-F	Punic-Roman Republican Settlement-large farm		15	8
09-a*	N/A	Secondary source area	-	29
09-b	19-20th century AD Abandoned fields	Use/discard flakes	34	19
Isolated finds 09	N/A		12	10
10-A	'knapping/hunting event'	Secondary source area, flake use/discard	27	20
Isolated finds 10	N/A		71	30
11-a	N/A	Secondary source area; use/discard flakes	69	-
11-b	N/A	Secondary source area	57	-
Isolated finds 11	N/A	Secondary source area; use/discard flake technology	50	4
14-a	Eneolithic-Roman Imperial	Off-site from elsewhere	13	16
14-d	Eneolithic-Bronze Age-Roman	Mixed material from 14-D, b, c?	27	32
14-e	N/A	Production, use/discard flakes	70	22
14-f	N/A	Use/discard flakes	30	4
Isolated finds 14	N/A		20	13
Isolated finds 23	N/A	Flake & blade production? Flake use/discard	23	41

Table 7.10. Proposed interpretation for small-scale *Riu Mannu* concentrations and Special Interest Areas. Key to table as above

Edmonds and colleagues (1999) have put forward an interesting explanation, suggesting that they represent occasional, small-scale activities (Section 2.4.2.1; Table 2.4). Although it is tempting to interpret the Sardinian sites in a

similar manner, such comparisons are not straightforward given the environmental and cultural differences between the datasets (see also the wider discussion on taskscapes, Section 8.3). Additional research is needed for the Sardinian sites, for instance test pitting and wider block surveys in the wider areas.

The final problem in understanding the lithic landscape and the temporality of the lithic landscape is distinguishing between potentially re-used and isolated artefacts. Several Punic/Roman and Late/Post Roman sites in the *Riu Mannu* dataset contain small assemblages of flakes/blades (Table 7.11). Since the *Riu Mannu* field methodology has demonstrated the fluidity of finds distribution, it is difficult to ascertain whether these finds are contemporaneous with the ceramics or residual earlier activities. Three points support the hypothesis that these are re-used artefacts *i.e.* pieces obtained from elsewhere: 1) there is a lack of onsite production, 2) virtually all pieces are non-cortical, and 3) there is evidence for similar trends from excavations in Sardinia (Michels 1987). Hydration dating has also indicated that re-use occurred, although information on lithic technology is scarce (Dyson *et al.* 1990). Although purely speculative, it is tempting to suggest that material was obtained from nearby abandoned settlements or scatters for re-use, the lack of macroscopic usewear or modification traces notwithstanding.

These findings contrast with recently studied Punic/Roman sites in the Arborèa from the Terralba Rural Settlement Project (Figure 7.7). Intensive surveying yielded only small numbers of obsidian pieces, and detailed analysis demonstrated that the majority of these were pseudo artefacts. It was proposed that this lack of lithic technology followed other pronounced regional differences (de Bruijn 2003). Punic settlement and land use patterns in the Arborèa differ from those observed in the Marmilla and Campidano, leading van Dommelen (1998: 146-151; 157) to argue that inhabitants were probably immigrants from North Africa.



Figure 7.7. Location of the five studies sites from the Terralba Rural Settlement Project (van Dommelen & Sharpe 2004: Figure 5).

Unfortunately, the only publication of an excavated Punic farmstead mentioned one find. Given that a list of find categories is absent, however, it is unclear whether more were found (Sanciu 1997). Elsewhere in the Mediterranean and Britain the use of stone in later prehistory is also increasingly accepted and recognised (*e.g.* Section Humphrey & Young 2003; Karimali 2005; see also references in Section 2.5.1).

Transect	Context	Interpretation	Chronology (pottery based)	QT	QL
04	04-A*	Villa?; Settlement?	Roman Republican-Early Imperial; Late Antiquity (6-7th AD)	8	-
	04-D	Unknown; Punic farm; unknown	Final Bronze Age-First Iron Age; Punic; Roman Imperial	12	8
		Halo 04-C-D	Final Bronze Age-First Iron Age; Punic-Roman?	10	7
05	05-A	Unknown; settlement-farmstead	Final Bronze Age-First Iron Age; Punic-Roman Republican	1	2
	05-B	Settlement-farmstead?	Punic-Roman	-	1
	05-C	Settlement-extensive open 'village' with isolated huts	Final Bronze Age-First Iron Age	1	5
		Halo 05-C		1	6
	05-D	Cemetery associated with nearby farm?	Punic-Roman Republican	13	9
14	14-E*	Settlement	Punic-Roman	1	8
23	23-A	Villa + farm + sheep pen	Roman Late Republican-Imperial	7	4
	23-B	Settlement-farmstead	Punic	18	25
	23-D	Shed	Punic	16	4

Table 7.11. Punic/Roman and Late Roman settlement sites with small and proposed contemporaneous lithic assemblages.

7.2.3. Riu Mannu fieldwork methodology

As discussed earlier, the *Riu Mannu* fieldwork methodology was specifically designed to address certain issues common in survey archaeology, in particular field and walker effects, and site recognition/survival (Table 3.2). It is clear from the discussions above that the both type of collections (the point-by-point quantitative and the qualitative diagnostics) have contributed to forming a greater understanding of the lithic landscape and taskscapes (also section 3.1.2.1). The contributions may be summarised as follows:

- Quantitative collections have demonstrated that find distributions are fluid; it is difficult to establish boundaries for lithics 'belonging' to main sites, site haloes, small concentrations or isolated finds.
- Quantitative finds may have brought to light the existence of late prehistoric (Iron Age) flake technology. They have also highlighted the existence of a specific category of pseudo artefacts, where individual pieces could not easily be attributed to a human or non-human flaking agent but context was a decisive factor.
- Quantitative finds have emphasised that the bulk of lithic finds are non-diagnostic unmodified flakes, blades and debris. For the *Riu Mannu* data in particular they have highlighted the existence and frequency of core fragmentation, and in places have hinted at a long(er) life history for cores.
- Three types of small-scale qualitative collections have provided additional information on lithic activity and the lithic landscape, revealing subtleties or complexities in the dataset that would have otherwise gone unnoticed: 1) those positioned in areas next to gridded sites (*e.g.* 07-J, 04-c, 23-C) have emphasised the difficulty in distinguishing 'site' boundaries, 2) those in areas where natural and cultural post depositional processes prevented point-by-point collection (12-a) and 3) those with local higher-than-average densities (10-A, 04-c, 23-C) have provided a partial view on lithic activity otherwise missed.
- Qualitative collections have served as a reference point, at times confirming trends noted (*e.g.* 10-a, 14-C and 14-D) or adding additional information on lithic practice (13-C).

Thus, the merits of full collection combined with detailed post-fieldwork analysis as opposed to relying on classification during the fieldwork are clear, even when lithic specialists are part of the field teams. They have provided many new insights that contributed towards gaining a greater understanding of the lithic landscape and taskscapes. The recognition of several additional small-scale find concentrations after fieldwork is one example (*e.g.* 04-b, 04-c see Section 3.2). Detailed artefact study of 'undiagnostic' artefacts is another example. It has shed light on core fragmentation, for instance, and highlighted how difficult and subjective it can be to distinguish between artefacts (*e.g.* pseudo artefacts, flaking debris, core fragmentation, bipolar struck flakes, edge damaged flakes and intentional etc. see Sections 3.1.2.3; 6.3.2.1). Detailed artefact analysis and examining the relationship between flaking technology, source location, and obsidian types has also revealed subtle differences in assemblage composition of spatially close concentrations (*e.g.* 04-B and 04-c special interest areas 02-A-D or 07-B-J). The differences in taskscapes are clear, even though they cannot (yet) be tied to chronological developments.

7.3. Conclusion: Sardinian lithic landscape and taskscapes

In conclusion, this research has provided new insights that are not only valuable to Sardinian and Mediterranean archaeology but also to survey and lithic studies. It has emphasised the importance of examining the existence and use of secondary raw material sources. It is clear that raw material availability, mobility or subsistence do not solely drive source use. Various combinations of primary and secondary source locations and obsidian types occur in areas where one source location or obsidian type prevails. Secondly, it has demonstrated that the detailed study of primary and secondary flaking of 'expedient' assemblages reveals the interplay between grand strategies ('archaeological traditions') and local variations. It has demonstrated how inherently social lithic technology is. Likewise, it is clear that the traditional focus on retouched artefacts as the 'tools' that 'carry' social information is not tenable. An assemblage-wide approach is more insightful. Thirdly, it has shown that the study of lithic practice is an integral and insightful means of understanding human activity in the landscape and a valuable approach for survey archaeology. It utilises a much wider dataset and has brought many

interesting patterns and questions to light that are worthy of further investigation.

Chapter Eight

Studying lithic landscapes and taskscapes: future directions

It is clear that like any research project, this thesis raises as many new questions as it answers old ones. This chapter therefore summarises the contribution that this study has made to Sardinian and Mediterranean archaeology and particularly the wider frameworks of social technology, lithic landscape and survey studies. Lastly, some suggestions for further research are outlined.

8.1. Sardinian and Mediterranean obsidian studies

In my discussion of Sardinian archaeology, I have made a distinction between primary and secondary data studies where 'primary' studies took place *in* Sardinia, added new data, and addressed existing research biases. Secondary studies however, were those *of* Sardinia, which included the island in wider Mediterranean frameworks, and/or reviewed Sardinian research without necessarily carrying out new projects (see Section 1.2.3.). My research is clearly a 'primary' data study. It has embedded detailed data analysis in a clear theoretical and methodological framework to avoid the descriptive data presentations and intuitive interpretations that have characterised Sardinian archaeological discourse for so long (see Section 1.2). In my review of Sardinian lithic studies I showed that their focus on lithic consumption was connected to the two concepts, cultural evolutionism and isolationism, that have shaped Sardinian archaeological discourse (Section 1.3.1). Research is characterised by a virtually exclusive focus on consumption, which is often simply equated with retouched pieces (for references and examples see section 13.1; Table 1.5). My research has begun to even out this focus, and has provided much-needed information on procurement and production strategies in Sardinia. As such, it also makes a significant contribution to the new trend in Sardinian lithic studies that had begun to broaden its research scope (*e.g.* Lugliè 2000a; see Section 1.3.2; Table 1.8).

Moreover, this study has demonstrated that it is worthwhile to implement a strong analytical and conceptual framework, which is still too rare in Sardinian lithic studies. It is the combination of detailed analysis of all artefacts, including the undiagnostic artefacts, with the explicit focus on lithic practice as a process that has demonstrated the inherently social nature of day-to-day practices. This contrasts with the more common focus in Sardinian archaeology on 'monumental' aspects of (material) culture, and cuts across its traditional functional/social divide. Social information is not merely present in retouched pieces, decorated pottery, monuments, stone and bronze figurines. My careful examination of the spatial and temporal interplay between source location, obsidian types, primary and secondary *chaîne opératoires* and aesthetic preferences has also demonstrated that long standing *habitus* exists in lithic practice (see Section 7.1). Procurement, production and use/discard strategies were not easily tied to specific regions or time periods. At the same time, variations in these long standing traditions also existed, and local choices are clearly visible in the aesthetic preferences, at 04-B there is a clear correlation between blade technology and banding (translucent or not) in SA and SC obsidian for instance (see Section 7.1.2.4). The benefits of this type of micro-level analysis advocated in my research are clear for Sardinian and Mediterranean obsidian studies. Two examples illustrate this further. Firstly, my research has, for instance, demonstrated that existing models of procurement, production and use/discard are too one-dimensional and trends at particular sites or areas are too quickly extrapolated to a whole region and/or the whole island. My analysis of procurement, for example, showed a variety of strategies existed in an area for which generally either direct or indirect procurement is posited (Section 7.1.2).

A second example that illustrates the merits of my approach is the how attention for small-scale concentrations, and the separation between use and retouched pieces has expanded current knowledge on the consumption of obsidian. Despite the predominant association of production and use/discard with permanent settlements, part of the dataset demonstrates that occasional and different activities occurred elsewhere. Two good examples are the isolated arrowheads and the isolated bipolar cores (Sections 5.1; 6.2). The isolated arrowheads and arrowhead fragments presumably reflect hunting patterns, and were discarded after use. It is purposefully left open whether or

not this discard is intentional or not. Data do not allow making that distinction. The isolated bipolar cores are more ambiguous to interpret. They may have been left behind after flake production, but they may also reflect discard of tools, for instance, as wedges to split bone (Hayden 1980). Note that I have generally been careful not to suggest specific types of activity in order to avoid making simplistic interpretations. In future research similarities with types derived from usewear analysis could, for instance, be explored. It is also important to note that although there are problems with their interpretation, and I have been reluctant to assign specific activities, their overall significance and their contribution to our understanding of the Sardinian lithic landscape is clear. They emphasise the continuity of lithic practice across the landscape, even in time periods for which full sedentism is usually accepted (Section 2.3).

Lastly, both the new evidence for the extensive use of secondary sources and the realisation that a variety of procurement strategies exist challenge the traditional picture that has posited down-the-line exchange from the Monte Arci to settlements in Sardinia. This study has demonstrated that primary and secondary sources are interchangeably local and non-local, and are not linearly tied to direct and indirect procurement. At 04-B, for example, direct procurement from secondary sources in the immediate surroundings of the site ('local') for bipolar flake production coincide with direct/indirect procurement of cortical nodules from primary ('non-local') and secondary sources (local) for platform flake and blade production (see Section 7.1; Table 7.1). Moreover, there is little indication that any of the procurement or production strategies are organised beyond a household level or went beyond local consumption (Section 7.1.2). Obviously then, this study also has repercussions for wider Mediterranean obsidian exchange models. The colonial perspective and linear or meta-*chaîne opératoire* viewpoint, in which Sardinia and the Monte Arci are merely regarded as a raw material source, should be adjusted (Section 1.3.3). These Mediterranean obsidian studies now need to take the local (Sardinian) modes of procurement and production into account. They could, using the framework developed within this thesis, for example, examine 1) whether primary or secondary source obsidian occurs in their assemblages, 2) in what condition these materials were brought in (*e.g.* in unworked nodules, preformed cores or a combination of both), and 3) whether or not source use is tied to specific primary and secondary flaking strategies.

8.2. Technology and lithic studies

The approach advocated in this study not only contributes towards Sardinian and Mediterranean obsidian studies, but also to traditional and social technology and lithic studies. This study has clearly demonstrated the value of moving beyond the dichotomies that are so common in traditional technology and lithic studies. The just outlined discussion of my detailed examination of procurement strategies, for instance, has clearly demonstrated the value of moving beyond the direct or indirect procurement dichotomy. Likewise, this study has demonstrated the value of examining 'expedient' assemblages on their own merit, instead of merely (and negatively) contrasting them to curated 'tools' or artefacts and assemblages that indicate craft specialisation. By moving away from this simple or complex distinction, this study has shown that 'expedient' assemblages can be knapped skilfully, that it is possible to recognise different degrees of skill, and that strong knapping traditions can exist (see Section 7.1.2.3). This is not a realisation that is unique to Sardinian archaeology (see Bamforth & Finlay in press). Recent lithic studies in Sweden, for instance, have also noted similar trends (Lindgren 2003). Thus, this research and its findings contribute to the growing body of studies in social technology and *chaîne opératoire* studies, and help to lessen the near-exclusive focus on the social value of elaborate knapping techniques and elaborately retouched tools (for examples and references see Section 2.2). Moreover, by concentrating on process as a social endeavour rather than on forms (retouched pieces) that 'have' or 'carry' social information, the traditional problem in, for instance, the style/function debate that 'simple' tools do not have social information or adequately demonstrate 'intentionality', becomes obsolete (Section 2.3.2). As this research has demonstrated, it is at the interplay between archaeological traditions and their variations in source locations, obsidian types, primary and secondary flaking strategies, aesthetic preferences, and context that the inherently social nature of technology is clearest. Detailed post fieldwork analyses have revealed subtle differences in procurement, production and use/discard strategies that cannot solely be attributed to adaptation to environmental conditions and risks (Section 7.1).

This study has also demonstrated that it is feasible and worthwhile to move away from the traditional distinction between domestic=functional=economic and non-domestic=symbolic=social. By studying lithic technology as a practice, and focussing on exploration of the processes of procurement, production and use/discard across find contexts it is no longer necessary to consider artefacts in one context (*e.g.* in settlements) 'functional' and in another (*e.g.* in burials) 'symbolic'. Instead it is possible to explore the traditions and variations in social practices comprehensively. In the *Riu Mannu* dataset, for example, a preference for diagnostic material characteristics (translucent and non-translucent banding) was recognised in blade technology and arrowheads, and was linked to a much wider practice of geometric patterning in material culture that connects contexts rather than divide them. Admittedly, this research has only begun to suggest patterns and potential links and future research is required, but these initial explorations are certainly encouraging.

Lastly, the methodology in this research could also be useful for social technology and *chaîne opératoire* studies. The implementation of Ingold's (1993; 2000) landscape and taskscapes concepts, for instance, and their combination with survey data that record continuous human activity, has expanded on their site and excavation bias (e.g. Dobres 2000; see Section 2.1.2). Moreover, by using social lithic technology and the taskscapes as central themes in analysis and interpretation, commonly overlooked material, such as isolated finds or chronologically undiagnostic artefacts make a valuable contribution to our understanding of social lithic landscapes. These tend to be overlooked in analysis and interpretations when the emphasis is placed on spatial and temporal information (see also Section 3.3).

8.3. Landscape and survey studies

The combination of a social approach to technology and landscape is not only illuminating for technology and lithic studies but also for landscape and survey studies. Earlier it was noted that to date few social approaches in landscape and survey archaeology have included lithics in their interpretations. Finding, defining, dating, but especially interpreting lithic scatters have been considered the main obstacles (see discussion and references in Sections 2.4 and 2.5). The *Riu Mannu* field methodology in combination with the approach advocated

in this study, offer insights that may contribute to landscape and survey projects elsewhere.

Two aspects of the *Riu Mannu* field methodology, continuous recording of artefact presence and absence on a point-by-point basis, and full collection of all archaeological artefacts, have addressed some of the 'field and walker' biases that are such common concerns in survey archaeology, especially finding and defining lithic scatters (see Table 3.2). The pseudo artefacts illustrate this well, and show the value of staying on the cautious side when attempting to find lithics. By definition, pseudo artefacts 'should' not have been collected given that the aim of the project was to collect *archaeological* artefacts. Moreover, recording the type and extent of natural and cultural post depositional processes has shed light on the formation of the lithic landscape without get lost in the 'original pattern' fallacy (Section 2.4.2.2).

This study has also emphasised the merits of detailed post-collection study for lithic survey data. Several examples may illustrate this. Concentration 10-A, for instance, was initially interpreted by the field crew as a 'knapping event'. Analysis has shown that most pieces were pseudo artefacts and therefore reflected the variety in raw material in the secondary source zone. Likewise, detailed analysis of the dataset in special interest area 02-A-D revealed subtle but important differences. Density and distribution analysis showed a rough overlap between lithics and the later prehistoric pottery assemblages. Artefact analysis has revealed three different taskscapes that may also be chronologically distinct (see Section 7.2.2). This is not to deny the value of density analysis. It is a good starting point and was used as such to classify four types of lithic scatter density (special interest areas, concentration, localised small scale concentration and isolated finds) that represent a range of densities in the *Riu Mannu* dataset. Interpretations, however, have drawn on the type of lithic taskscapes represented, the correspondence of the lithic distribution with other finds, and the detailed analysis.

Another advantage of this study for other survey projects is the reworking and layering of the concept of a lithic landscape by adopting a taskscape perspective. It is a broader and more inclusive approach than when chronology is used as analytical structuring device. It is not dependent on chronologically

sensitive artefacts and allows for a fuller inclusion of undiagnostic artefacts, small-scale concentrations, and isolated pieces. Their inclusion and the exploration of the physicality of the lithic taskscapes have led to a greater understanding of the spatially and temporally continuous nature of production and use/discard in the landscape. Thus, while certain practices cannot be dated, they have still provided important information about lithic practice. As outlined above, however, the clear illustration of the inherently social nature of lithic technology, an 'expedient' one for that matter, may be of most use to other survey projects. People's routine engagement with, and contribution to, the main traditions in lithic practice have clearly been demonstrated.

8.4. Suggestions for future research

As with any newly implemented approach, new problems and research questions have surfaced over the course of this research. Some of these are practical and pertain specifically to Sardinian and wider Mediterranean obsidian studies, while others concerns wider theoretical and methodological issues that are relevant for social technology, landscape and survey studies. A few key concerns are highlighted here.

The following suggestions for research pertain mostly to Sardinia. My dataset consisted for the most part of open-air (settlement) evidence in west central Sardinia. To increase our understanding of the Sardinian social lithic landscapes, lithics from other areas and contexts such as cave settlements or burials should now also be studied, preferably using the framework developed here, of course. This new research does not just entail new surveys or excavations, but could also include the (re-)study of already collected assemblages. In my review of Sardinian archaeology I noted that the discipline has a long-standing history of surface collection and excavation by amateur and professional archaeologists. It would be negligent to overlook assemblages that could, relatively easily, provide a wealth of extra information. Excavated materials, for instance, could provide tighter temporal control for the trends observed here. Incorporating or (re-)studying old collections has its own set of problems especially in terms of collector and sample biases (Gardiner 1987). It is, however, a worthwhile endeavour, as is demonstrated by recent re-evaluations by others and myself of Puxeddu's work (see Section 4.2.2.1; also Usai, E. 2004). The methodological framework used here for the study of lithics

can easily be applied to other collections, in particular: core biography, the knapping abilities analysis, the use of cortex as a means to distinguish between primary and secondary sources, and descriptions of raw material characteristics for visual sourcing.

Other possible future research that would contribute significantly to our understanding of the Sardinian and west Mediterranean lithic landscapes and taskscapes includes:

- Study of the remaining body of *Riu Mannu* transects, or excavation of some of the *Riu Mannu* areas, such as special interest area 04-B, the wider area around 23-C, or the small-scale concentrations and stretches of more isolated finds.
- Systematic survey of regions in Sardinia where raw material obsidian sources are definitely not available.
- Study of the procurement, production and use/discard practices of non-obsidian raw materials such as flint and quartz. Small percentages were found in the *Riu Mannu* dataset, and although they were not discussed in this thesis, they will be studied in the future.
- Detailed examination of procurement and production strategies at primary and secondary source zones, especially quarries. The University of Cagliari has recently initiated a long-term survey and excavation project, the Monte Arci Project, with such aims, in which I participated (see Section 4.2.1).
- Further examination of the relationship between primary and secondary sources. In this study, I used cortex as a means to separate primary and secondary sources, but more extensive and systematic exploration of the link between the range of cortex types and source locations is needed.
- Integration of the Sardinian findings into existing models on procurement and production strategies in the west Mediterranean obsidian exchange studies. In particular the possibility that raw material from secondary sources was exchanged must now be examined.

A last suggestion for further research concerns the wider theoretical debate on interpreting lithic scatters, in particular small-scale concentrations and isolated

finds. Analysis indicated that some represent the spectrum of raw material availability, while others were the result of natural and cultural postdepositional processes (see Section 7.2.2). More problematic was the distinction between the small-scale concentrations and isolated finds that occurred in close proximity to large-scale concentrations and those found in late prehistoric assemblages. The latter may be contemporaneous with the assemblage it is part of, and perhaps indicate re-use. They may also be residual from earlier activities, or perhaps resemble small-scale concentrations near larger ones or isolated finds. It was tentatively proposed that these may resemble short term or occasional activities, along the lines of Edmonds and colleagues' (1999) single camp or short term occupation sites, or as the lithic equivalent of Bintliff *et al.*'s (1999; 2000, 2002) hidden prehistoric landscape of "ephemeral occupation- and activity foci shifting within small areas of landscape" (Bintliff *et al.* 1999: 165; see Sections 7.2.2; 2.4.2.3). It is an intriguing option that is worthy of further examination, as are the resultant questions that arise. Which types of occasional occupation or activities are represented, and to what time period can they be attributed? In the Edmonds *et al* study these 'sites' are dated to early prehistoric periods (Mesolithic-Neolithic) in which settlement was less permanent. Perhaps the Sardinian sites could represent something similar, although they do not contain any of the diagnostic artefacts (*e.g.* microliths) of early prehistoric periods. If they are not indicative of early prehistoric activity, they may indicate a higher mobility and 'off-settlement' activities in archaeological periods usually considered fully sedentary. Clearly, interpretative models that examine such activities are necessary.

In sum, this thesis has offered an alternative approach to the study of lithic landscapes and taskscapes that is useful not only for Sardinian archaeology but also for those with an interest in social lithic technology, landscape and survey archaeology.

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APPENDIX 1.1.

Overview of Sardinian archaeology: periodisation, chronology, main sites and characteristics/topics of discussion and references.

Period	Dates* and cultures	Main sites	Main characteristics & remarks†	References#
Palaeolithic *Lower*	Approx. 500,000 BP	Riu Altana 1-2, Sa Coa de Sa Multa, Interiscias, Laerru	Lithic assemblage: early Clactonian / Protolevallois	Arca *et al.* 1982; Cherry 1992; Martini 1992; 1999; Sondaar 1998
Middle	Approx. 200,000 BP	Preideru, Codróvulos-Pantallinu, Sa Pedrosa-Pantallinu, Giuanne Malteddu, Riu Altana series 3	Lithic assemblage: Late Clactonian	
Upper	Approx. 30,000 BP	Santa Maria is Aquas	Lithics	Mussi & Melis 2002
	Approx. 20,000 BP	Corbeddu 1	Human phalanx	Sondaar 1998
	Approx. 14,6000-12,500 BP	Corbeddu 2	Faunal assemblage indicates human presence	Klein Hofmeijer *et al.* 1987; Klein Hofmeijer & Sondaar 1992; Klein Hofmeijer 1997; Martini 1992; Sondaar 1998
		Corbeddu 3	Faunal assemblages with small number of lithic artefacts	
Mesolithic?	?	Grotta di Su Coloru – Laerru	Flint flake with crumbs of charcoals	Trump 1998
Preneolithic	8,750 BP	*Corbeddu* 4	Faunal assemblage shows human activity, human remains	Klein Hofmeijer *et al.* 1987; Klein Hofmeijer & Sondaar 1992; Klein Hofmeijer 1997; Martini 1992; Sondaar 1998
	?	Su Paris de sa Turre	'Archaic' (Mesolithic?) elements to Early Neolithic lithic assemblage	Artudi & Perra 1992; Lugliè 1998: 11
Neolithic (Prenuragic) *Early*	6000?-5300 BC Cardial I	Su Carroppu	Cave (excavations) and open air sites (surface finds), ceramics, lithics, domesticates	Alba 1990; Artudi 1989; Artudi & Perra 1993; Atzeni 1981; 1987; 1992; Atzeni *et al.* 1982; Contu 1997a: 43-260; Lilliu 1988: 29-114; Loria & Trump 1978; Lugliè 1998; Rowland 2001: 10-24; Sanges 1984; Tanda 1998; Trump 1983; Tykot 1994; 1999; Webster 1996a: 44-52
	5300-4700 BC Filiestru	Filiestru, Grotta Verde, Pauli Putzu, Pauli Annuas, Santa Chiara, Punta Campu Sali, Su Paris de sa Turre, Capo S. Elia ; Grotta Sa Korona (Monte Majore)		
Middle	4700-4000BC Bonu Ighinu	Filiestru; Sa 'Ucca de Su Tintirriolu; Corbeddu ; Cuccuru s' Arriu; Puisteris	Open air and cave sites, ceramics, lithics, burial tombs, stone figurines	
	4800BC? / 3500BC? San Ciriaco	San Ciriaco; Cuccuru S'Arriu	The precise date and position of this 'facies' are unclear. Tykot: Middle Neolithic, others: Late Neolithic. Predominantly known through pottery.	Atzeni 1987: 92; Balmuth 1992: 668; Atzeni *et al.* 1982; Tykot 1994: 122; Santoni 1992

ate	4000-3200? BC Ozieri	Puisteris, Cuccuru s' Arriu, San Gemilliano di Sestu, Monte Olladiri, su Coddu Selargius, Grotta del Guano, Craviole Paderi, S' Abuleu, *ziggurat* Monte d' Accoddi, *domus de janas* Anghelu Ruju, Santu Pedru, Su Crussifissu Mannu, *dolmens* Pranu Mutteddu	Island wide culture, predominantlty open air settlements, *dolmes de janas* burials, dolmens, statue menhirs, stone/ceramic figurines, first copper artefacts. Indigenous development versus Aegean or Near Eastern (diffusionist) models.	As above and Atzeni 1962; Campus 1997; Contu 2000; Ferrarese Ceruti 1972; Puxeddu 1962; Melis 1994; Migaleddu 1996; Ugas, G. *et al.* 1985; Usai, A. 1993
Chalcolithic (Prenuragic) *Early/Middle*	3200?-2700? BC Sub-Ozieri, Filigosa, Abealzu	Filigosa, Abealzu material mostly found in *domus de janas*, cist graves, *allées couvertes*. Sub Ozieri on settlements	Dating is insecure, some consider all 'cultures' similtaneous.Monte Claro best known, occurs in settlements, burials, ritual sites, increased settlement fortifications. Origins of Monte Claro culture.	Atzeni 1959; Campus 1997; Castaldi 1999; Contu 1997a: 261-389; Demurtas & Demurtas 1991; Ferrarese Ceruti 1981; Moravetti 2000; Lilliu 1988: 155-316; Lilliu & Ferrarese Ceruti 1959; Rowland 2001: 25-35; Tykot 1994:124-125; Usai, A. 1993; Webster 1996a: 52-84
Middle/Late	2700?-2200? BC Monte Claro	San Gemelliano di Sestu, Monte Olladiri, Enna Pruna, su Guventu, Grotta del Guano, Sa Sedda de Biriai, Monte Baranta, Proto nuraghe Brunku Magudui		
Late/Final	Beaker (A/B)	Mostly found in funerary contexts *e.g.* Monte Olladiri, Marinaru, Ponte Secco, Nuraxineddu	Dates unclear: Tykot: Beaker A runs contemporary with Monte Claro, Beaker B with Bonnanaro A. Prestige exchange vs. palaeocolonialism	
Bronze Age (Prenuragic) *Early*	2200-1900 BC Bonnanaro A (Corona Moltana)	Corona Moltana, Sant' Iroxi-Decimoputzi, Su Crussifissu Mannu, Nuraghe Sa Turricula, Duos Nuraghes, Noeddos,	Funerary contexts: *domus de janas*, caverns, cist graves, *allées couvertes, tombes de giganti*. Appearance (debated) of proto-, (a.k.a. pseudo-, gallery or corridor) *nuraghi*	
Middle **(Nuragic)**	1900-1600 BC Bonnanaro B (Sa Turricula)	Su Nuraxi, Albucciu, Montegonella, Malchittu, Trobas, Goronna, Thomes, Sa Mandra e Sa Giua	Appearance of tholos *nuraghi*, cavern burials, *tombe di giganti*	As above and Lilliu 1988: 317-354
	1600-1300 BC Nuragic I		Increased contact with Near East, Europe, Cyprus.	As above and Contu 1997b; van Dommelen 1998: 87-113; Lilliu 1988: 355-470; 483-579; Rowland 2001:36-52; Santoni 2001
Late	1300-1150 BC Nuragic II	*Nuraghi:* Palmavera, Su Nuraxi di Barumini, Genna Maria Villanovaforru, Losa di Abbassanta, Cuccuru Nuraxi, Sa Domu Beccia, Antigori, Bruncu 's Orcu, bronze hoard: S'Arrideli, well sanctury: Sant' Anastasia	Complex *nuraghi*; contact with Cyprus, Myceneans, metal exchange/ trade, *tombe di giganti*, well-sanctuaries, *bronzetti*	
Final	1150-850 BC Nuragic III		As above & precolonisation of Phoenicians, increased social complexity, Nuragic villages alongside *nuraghi*	
Iron Age *Early*	850-730 BC Geometric / Phoenician / Nuragic IV	Indigenous sites: Duos Nuraghes, M. Olladiri, San Sperate, Ortu Comidu, Serra Orrios, Phoenician cities: Bitia, Bosa, Cuccureddus, Monte Sirai, Nora, Othoca, Sulcis, Tharros, Monte Prama statues	Indigenous: as above, decline / destruction of indigenous Nuragic society Phoenician colonisation cities, *tophets*, increased contact with Greece and Eturia	Bernardini & D'Oriano 2001; van Dommelen 1998: 69-113; Lilliu 1988:471-482; Rowland 2001: 53-71; www.nora.it
	730-580 BC Orientalising / Phoenician / Nuragic IV			
	580-510 BC Archaic / Phoenician / Nuragic IV			

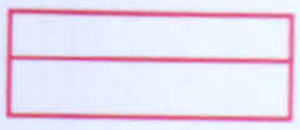
Late	510-238 BC Punic / Nuragic V	Punic 'forts': Macomer, Monte Luna, Santu Teru. Punic cities: Karalis, Neapolis, Nora, Olbia, Sulcis, Tharros. Antas. Punic occupation at Nuragic sites: Ortu Comidu, Genna Maria, Siaxi, Brunchiteddus, Su Nuraxi, Bruncu Espis, Fontanazza, Pauli Murtis, Cuccuru 's Arriu	'Divided Sardinia' ('intigrated elite vs. assimilated' lower classes), fortifications, urbanisation. Reseach hampered by problematic recognition of Punic ceramics. Heavy dependence on literary sources	van Dommelen 1998: 115-159; van Dommelen & Sharpe 2004; Lilliu 1988: 471-482; Rowland 2001: 72-88. www/sardinia.arts.gla.ac.uk/Terralba For sites see also van Dommelen 1998: 236-288
	238-1 BC Roman Republican / Nuragic V	Punic sites, including *nuraghi* as above. New colony Turris Libisonis (Porto Torres). New towns: Valentina, Acquae Hypsitanae (Forum Traiani-Fordongianus), Uselis.	Views on romanisation primarily based on literary sources. Search for Roman elements (mosaics, architecture, inscriptions, pottery). Continuation of Punic culture = 'failed romanisation'. For alternative view see van Dommelen 1998	Dyson & Rowland 1991a; van Dommelen 1998: 161-209; Rowland 2001: 89-125
	1AD-476 AD Roman Imperial / Nuragic V	As above	Often sites are generically Roman, making specific dating problematic; few sites are excavated, survey has indicated most Roman evidence	

Note: * For the Neolithic onwards from Tykot 1994 and in calendar dates. BP based on dates given by respective authors. Question marks represent the insecurity of the dataset. For prenuragic cultures pottery styles form the chronological basis, while for Nuragic period, dating principles are based on architecture. †For later periods individual sites are less important, and more general themes are topics of discussion. †#This is not a complete review of all sites, characteristics and references, but provides an broad summary and entry into the periods of Sardinian archaeology relevant for this thesis.

APPENDIX 3.1.

This appendix contains two types of maps. All uneven figure numbers show the immediate topography of each individual transect. All even figure numbers show the pottery and obsidian finds distribution of the main grid for each transect.

Legend for transect figures



Transect outline with main grid line.

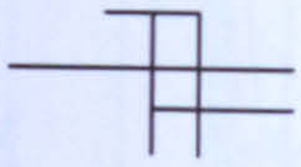


Rivers and streams

Contour lines



Modern towns



Modern disturbances (river canalisations, farms etc.)

Legend for find distribution maps

x cancelled points

· = empty points

● (graduating in size with increased densities) = main and site grid points with pottery

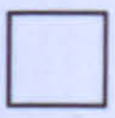
■ (graduating in size with increased densities) = qualitative collections with pottery

● (graduating in size with increased densities) = main and site grid points with obsidian

■ (graduating in size with increased densities) = qualitative collections with obsidian

● (graduating in size with increased densities) = main and site grid points with obsidian (represented) and pottery (not represented)

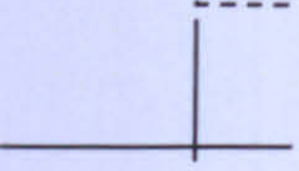
■ (graduating in size with increased densities) = qualitative collections with obsidian (represented) and pottery (not represented)



Riu Mannu concentrations. Numbering follows Project conventions. transect number and an alphabet letter, assigned in alphabetical order.



Site haloes



Local x-coordinates

Local y-coordinates

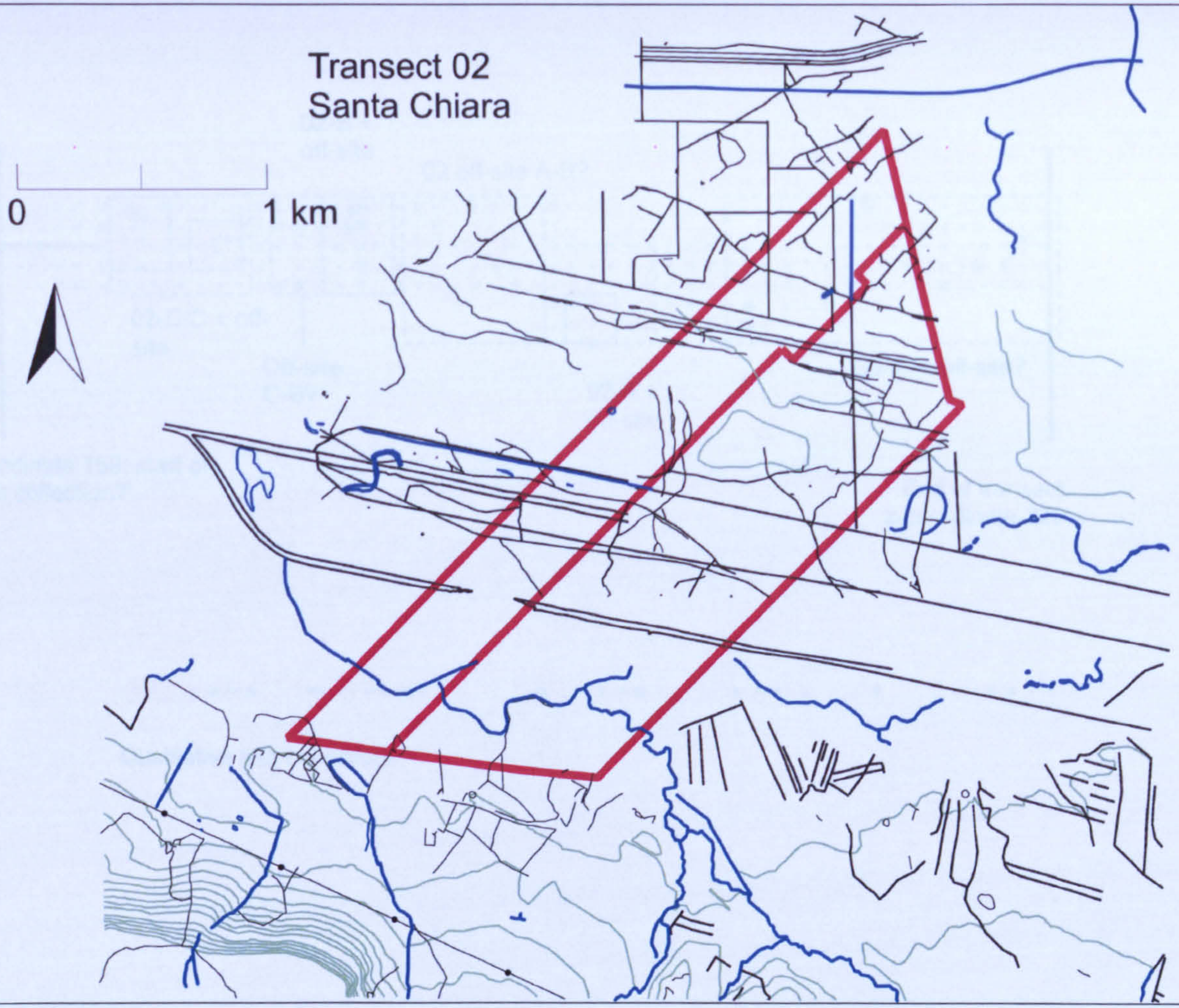


Figure 1. Topographic map of transect 02

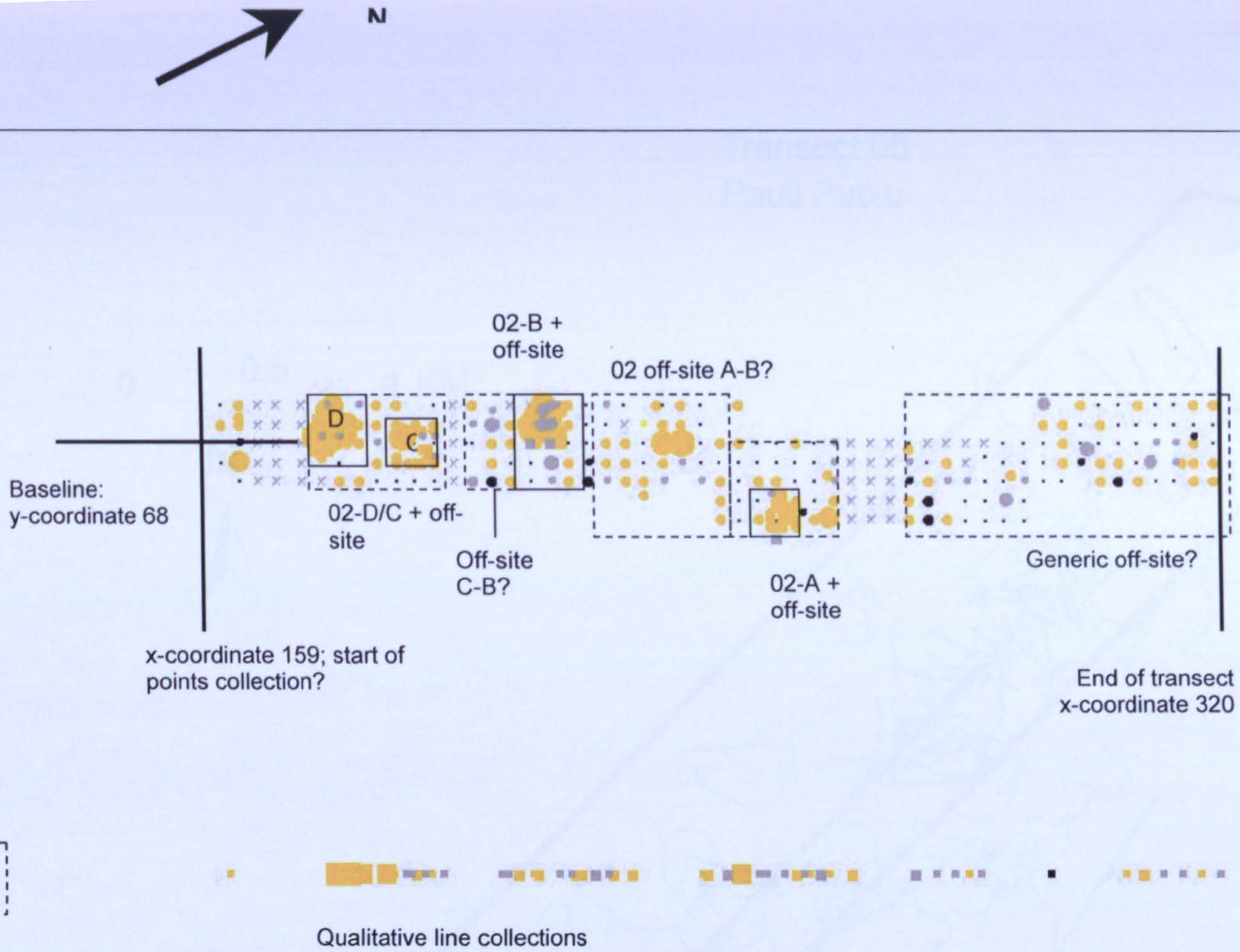


Figure 2. Transect 02 pottery and obsidian find distribution

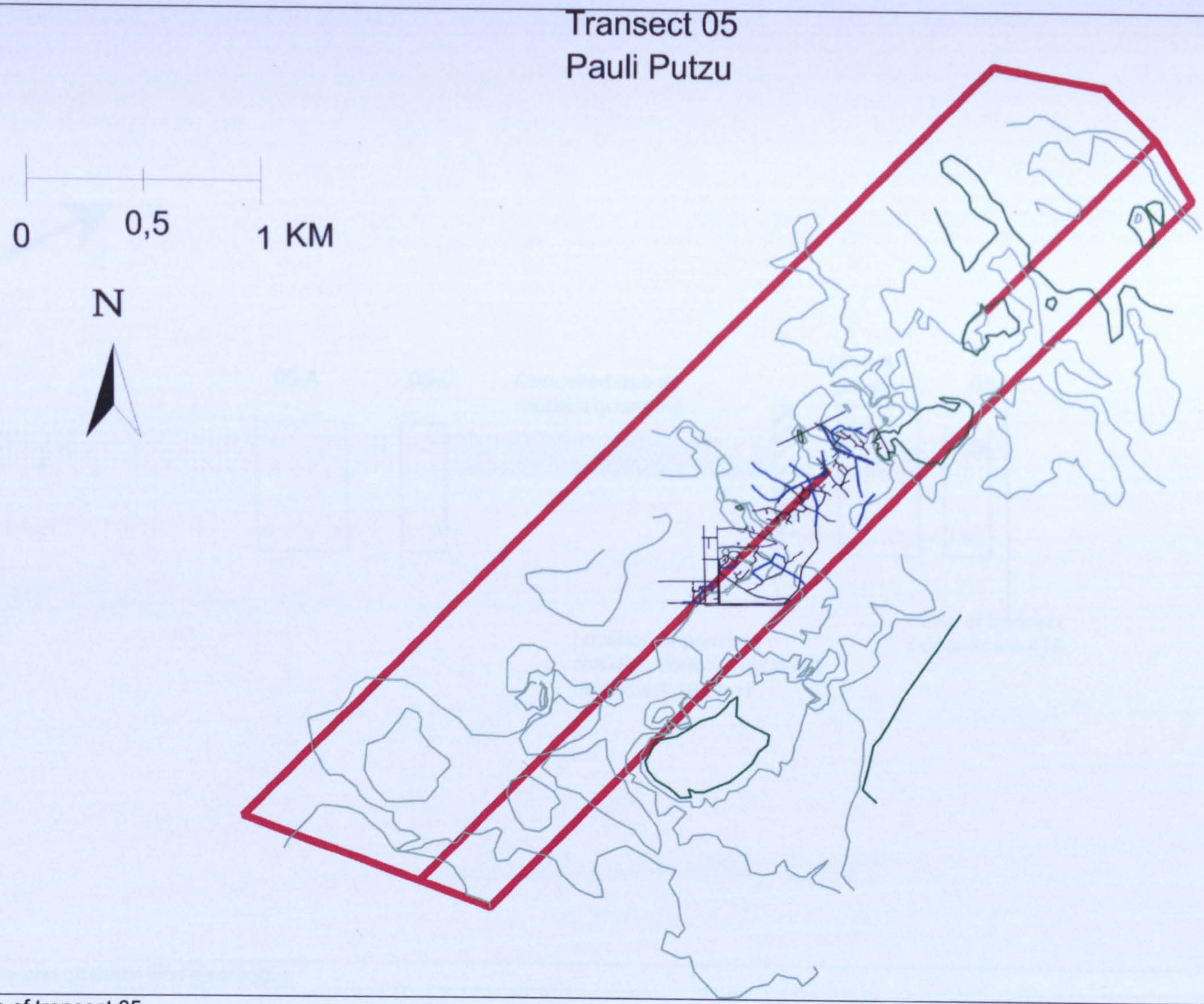


Figure 3. Topographic map of transect 05.

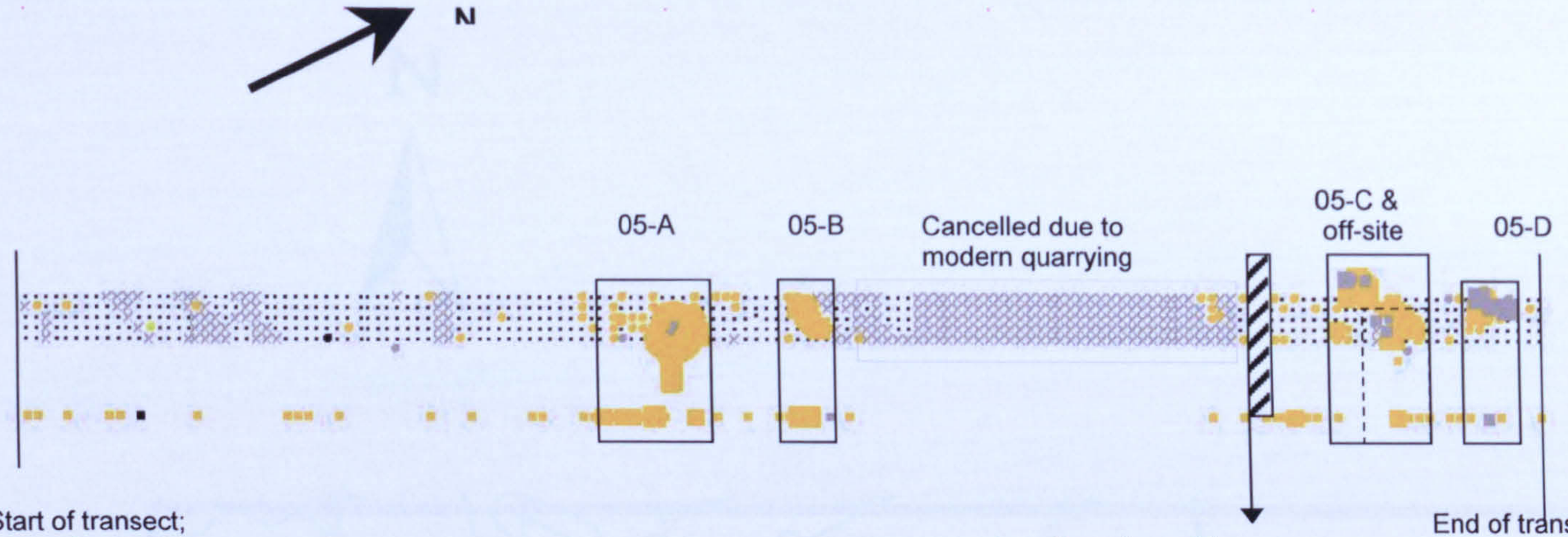


Figure 4. Transect 05 pottery and obsidian find distribution

CAMPIDANO

0 1 2 km

N

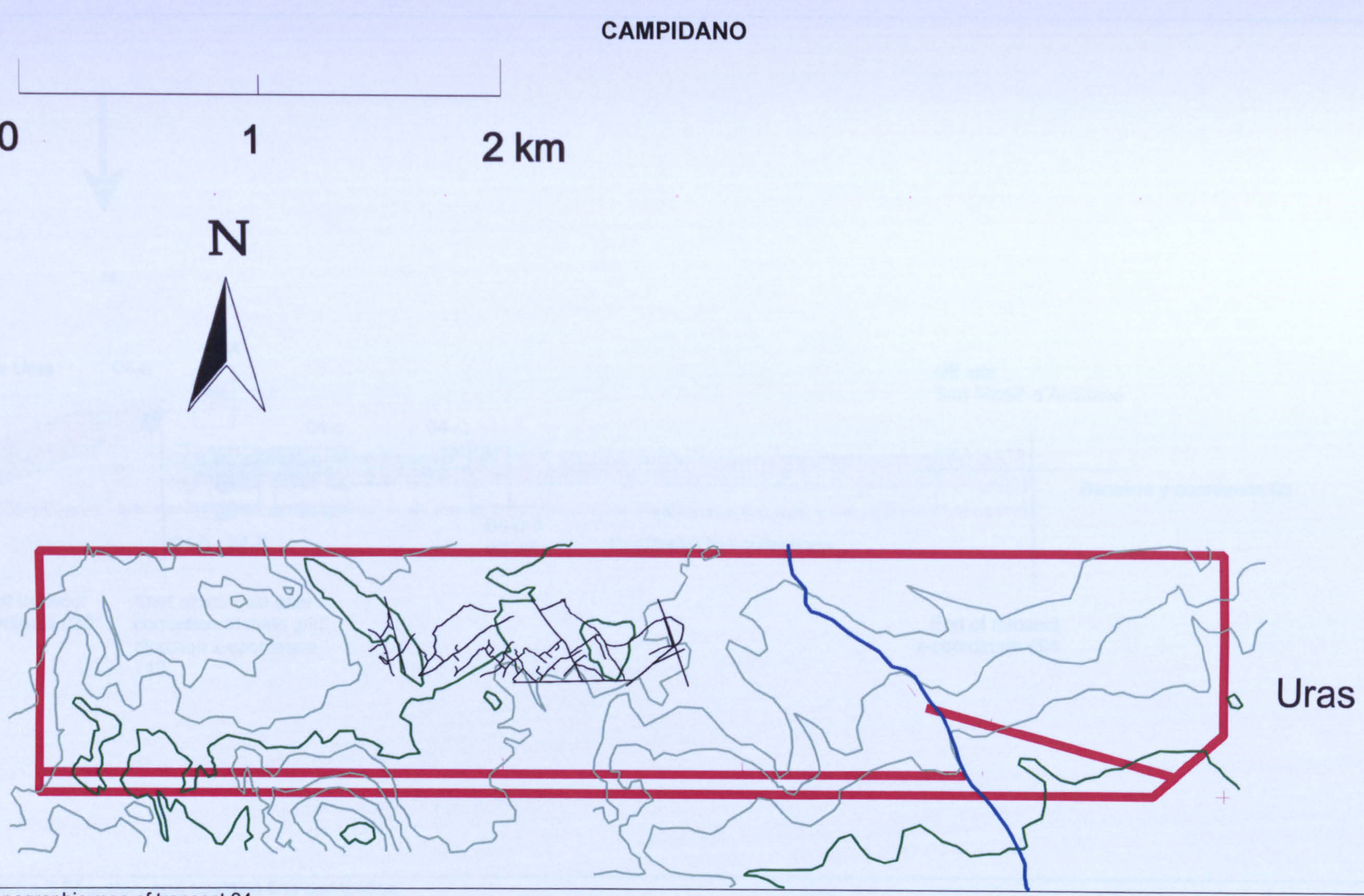


Figure 5. Topographic map of transect 04.

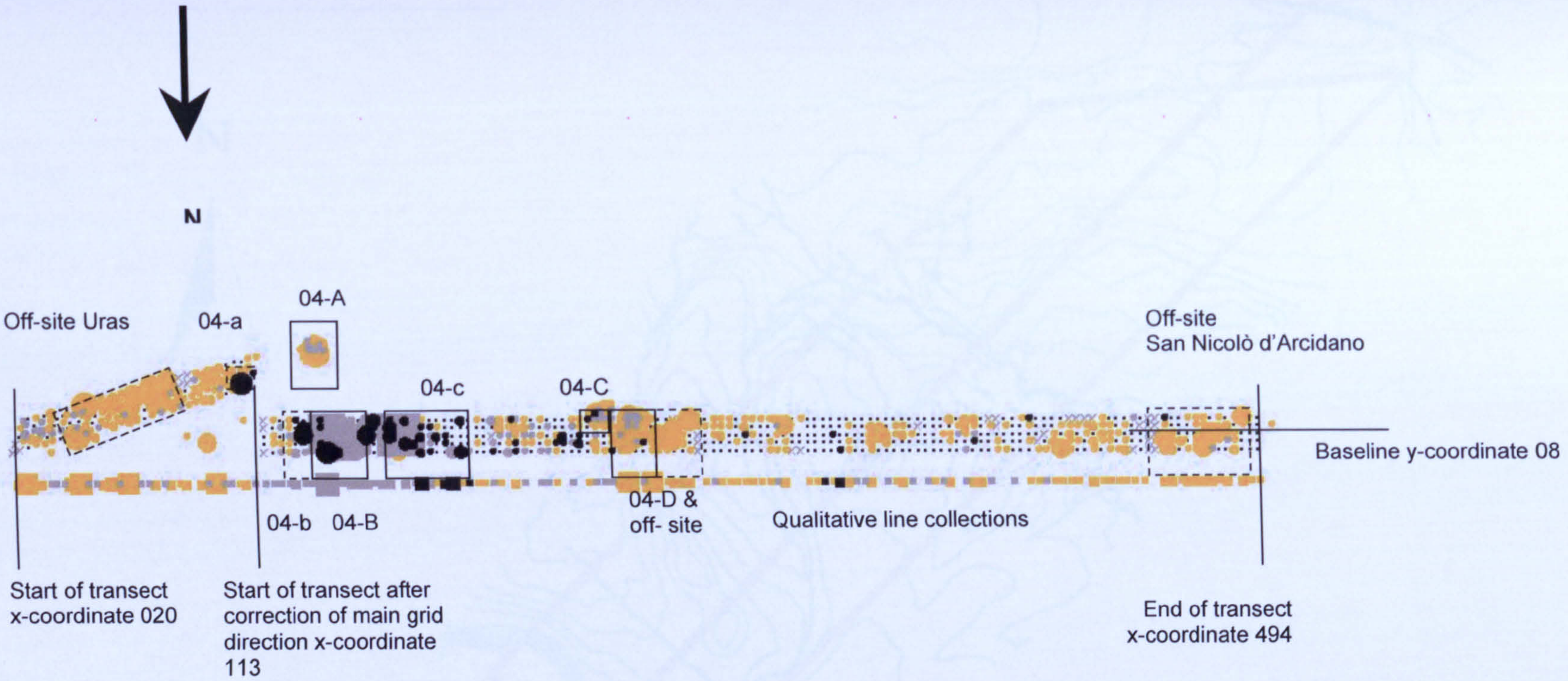


Figure 6. Transect 04 pottery and obsidian find distribution

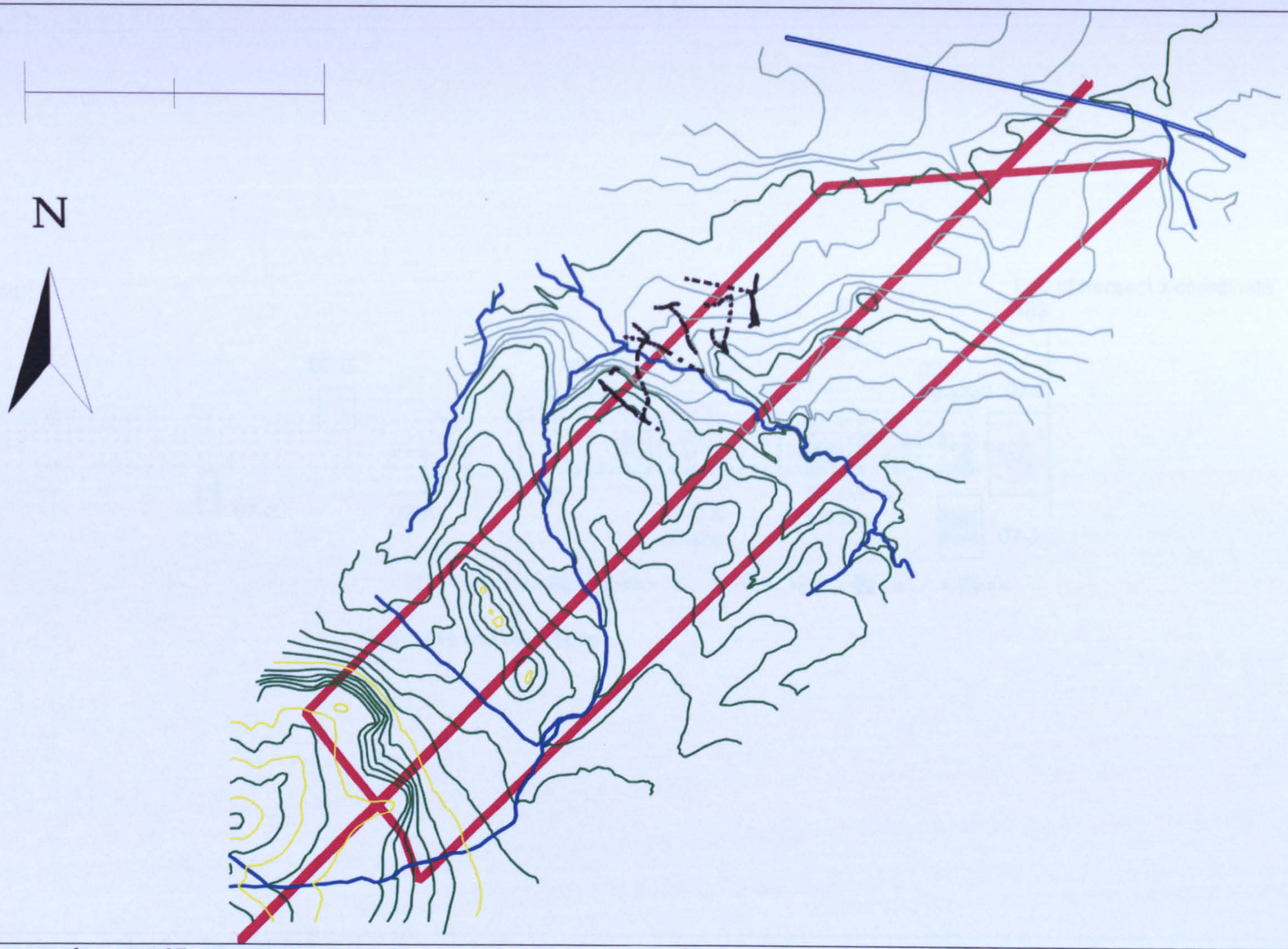


Figure 7. Topographic map of transect 07.

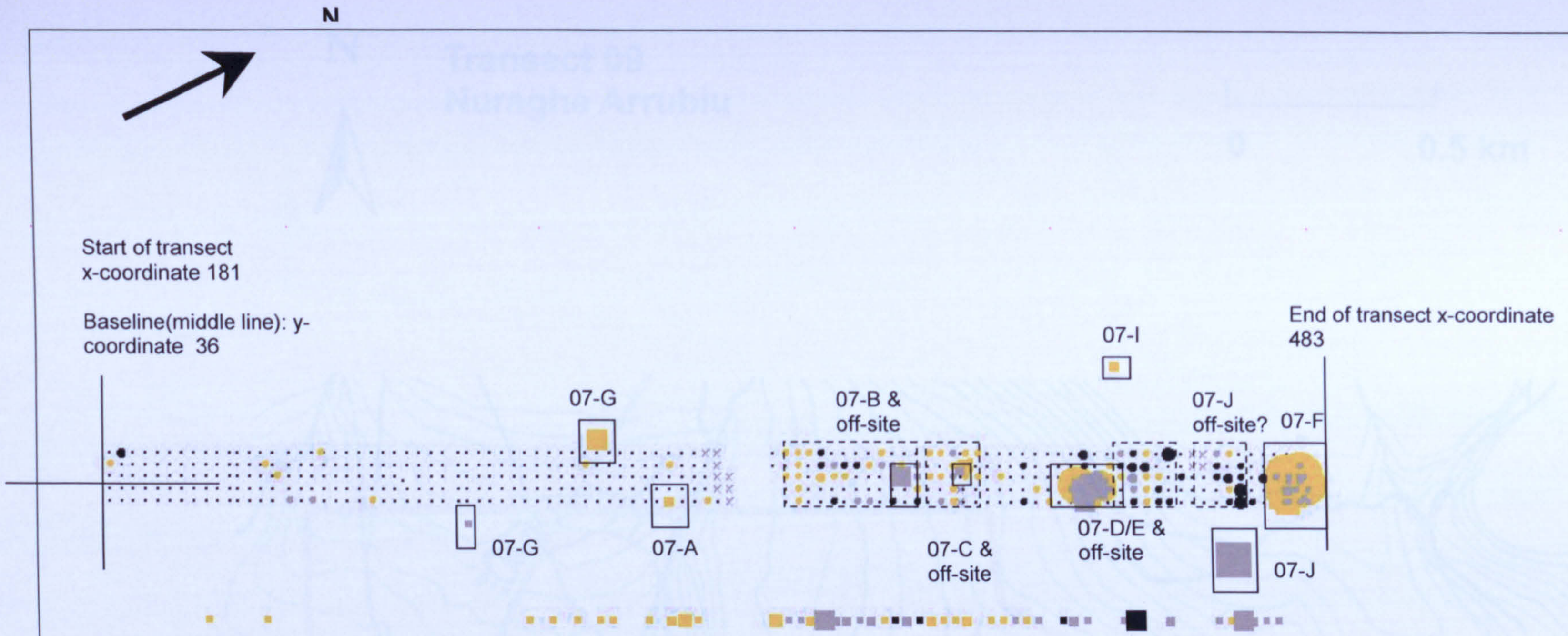


Figure 8. Transect 07 pottery and obsidian find distribution

N

Transect 09
Nuraghe Arrubiu

0 0.5 km



Figure 9. Topographic map of transect 09.

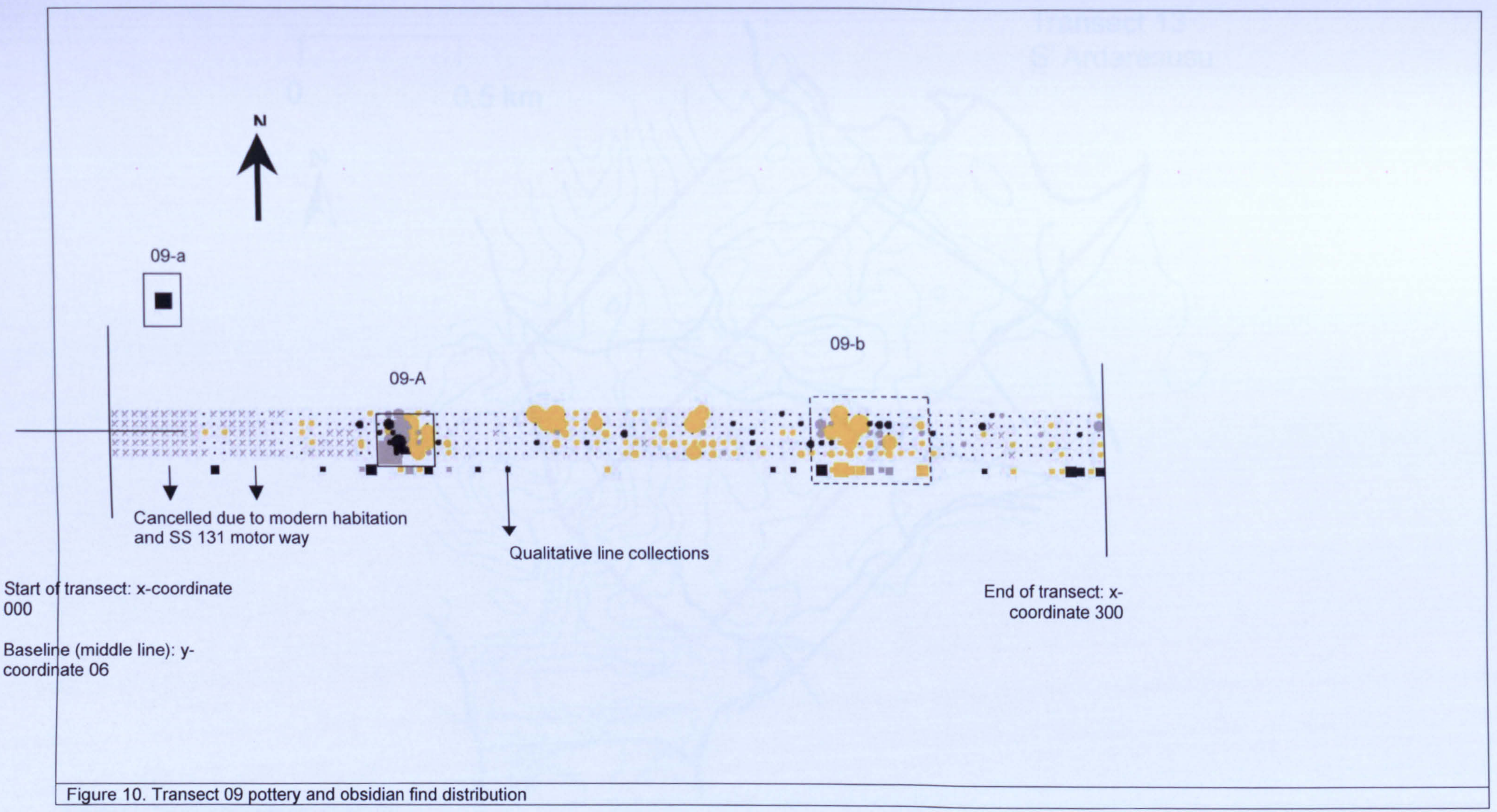


Figure 10. Transect 09 pottery and obsidian find distribution

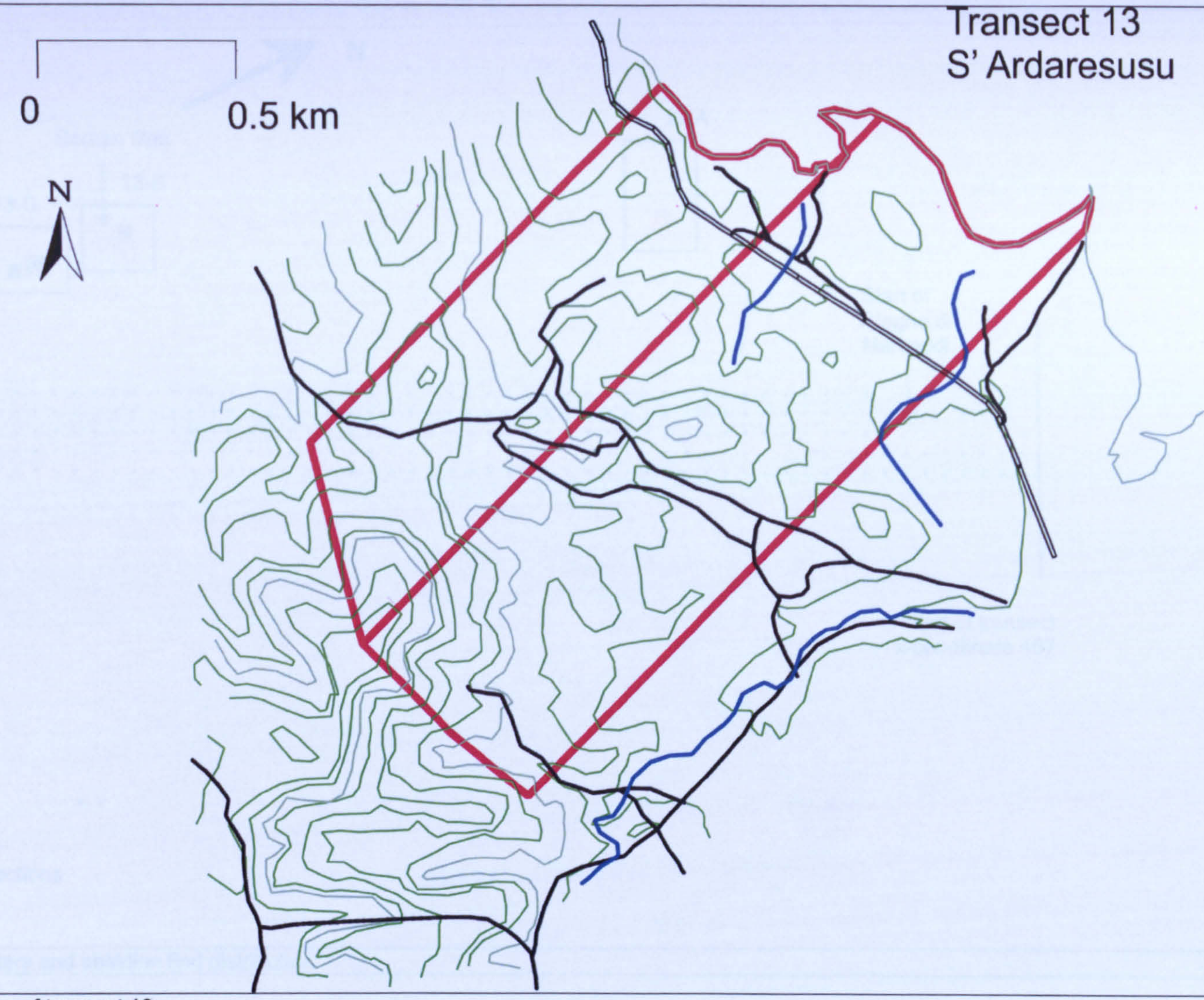


Figure 11. Topographic map of transect 13.

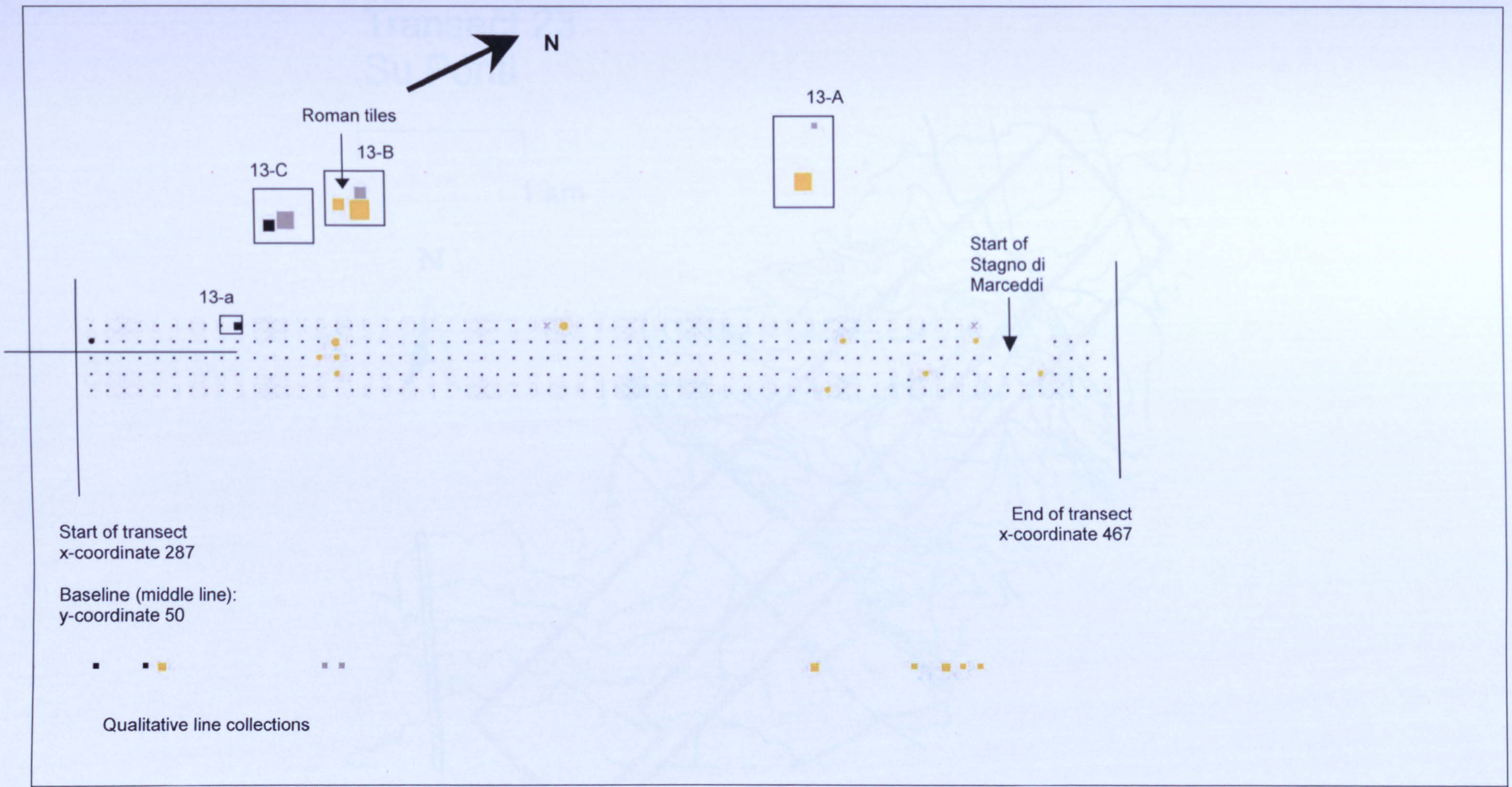


Figure 12. Transect 13 pottery and obsidian find distribution

Transect 23
Su Ponti

0 1 km

N

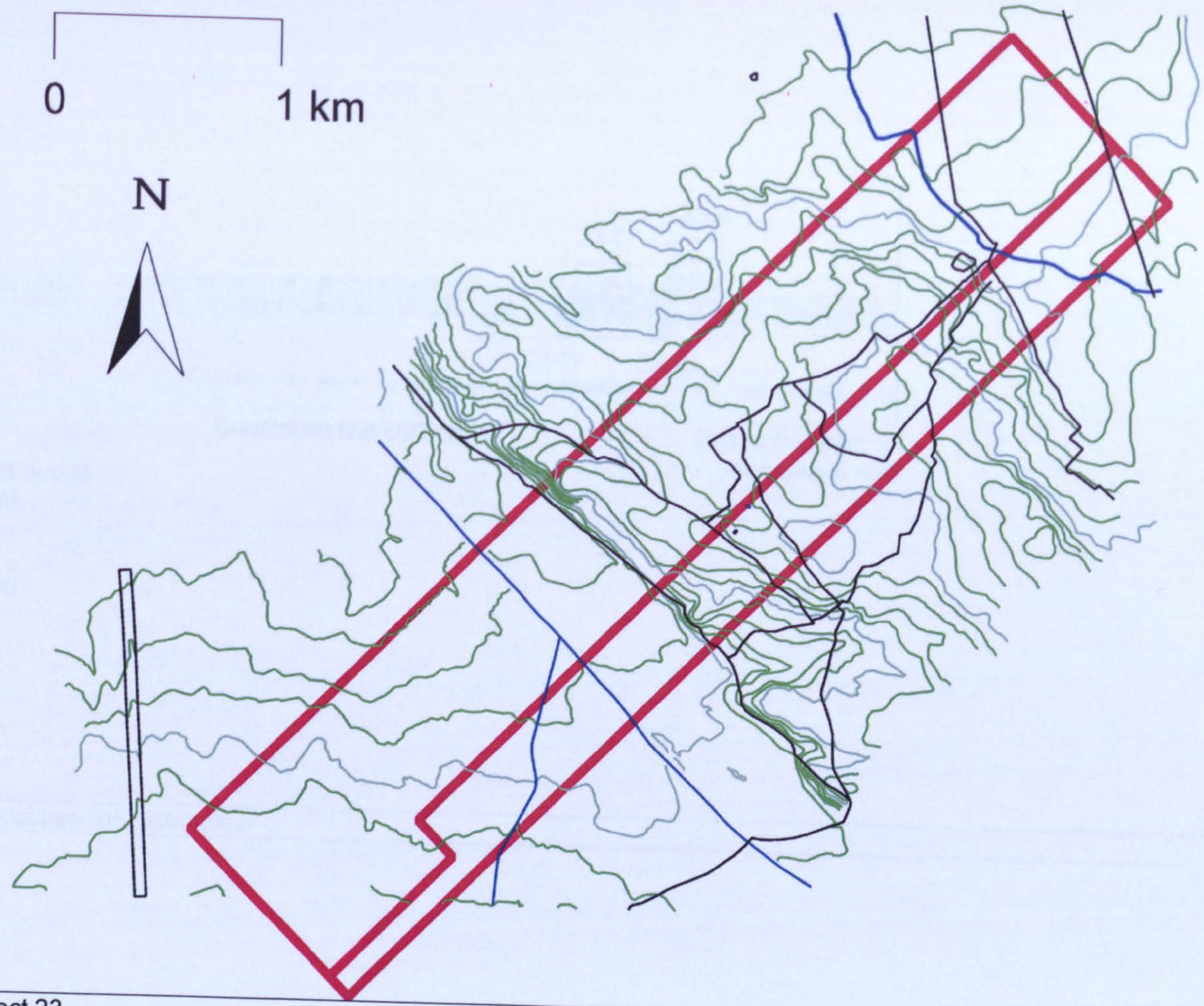


Figure 13. Topographic map of transect 23.

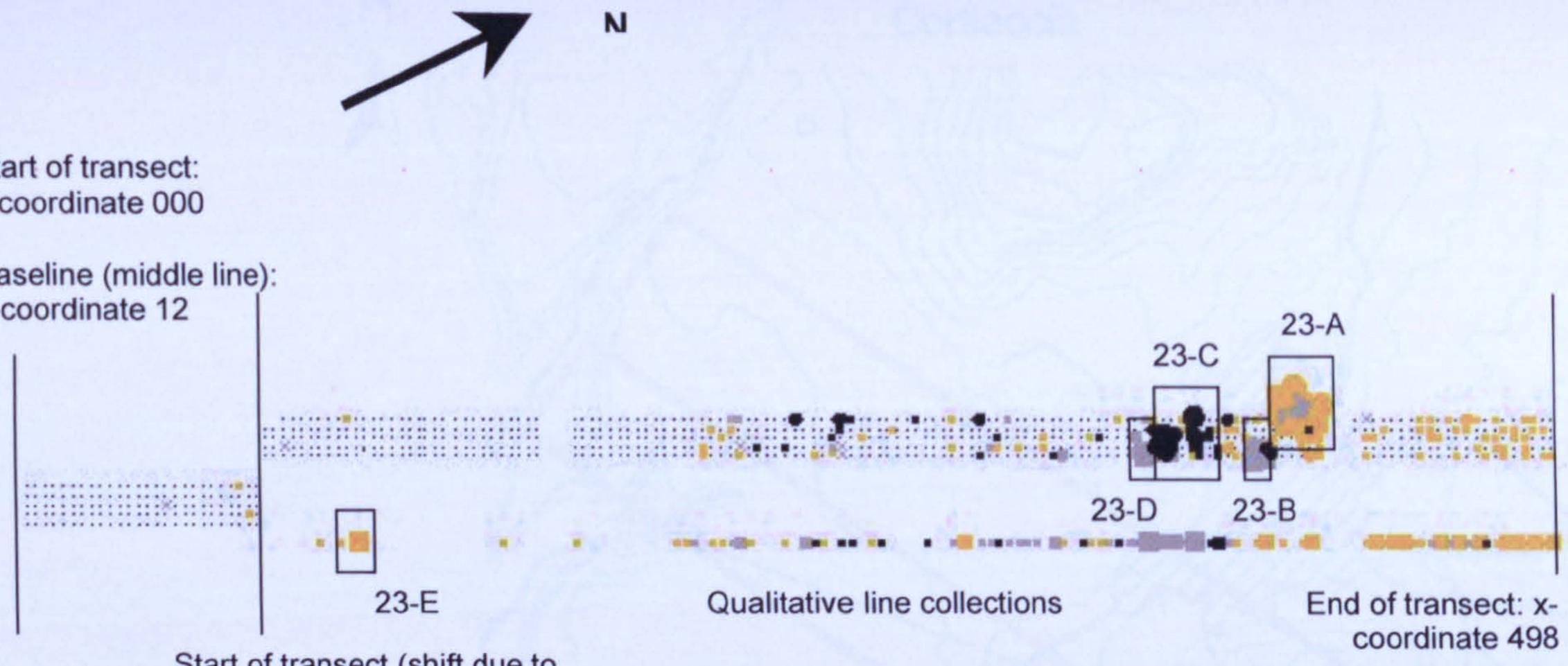


Figure 14. Transect 23 pottery and obsidian find distribution

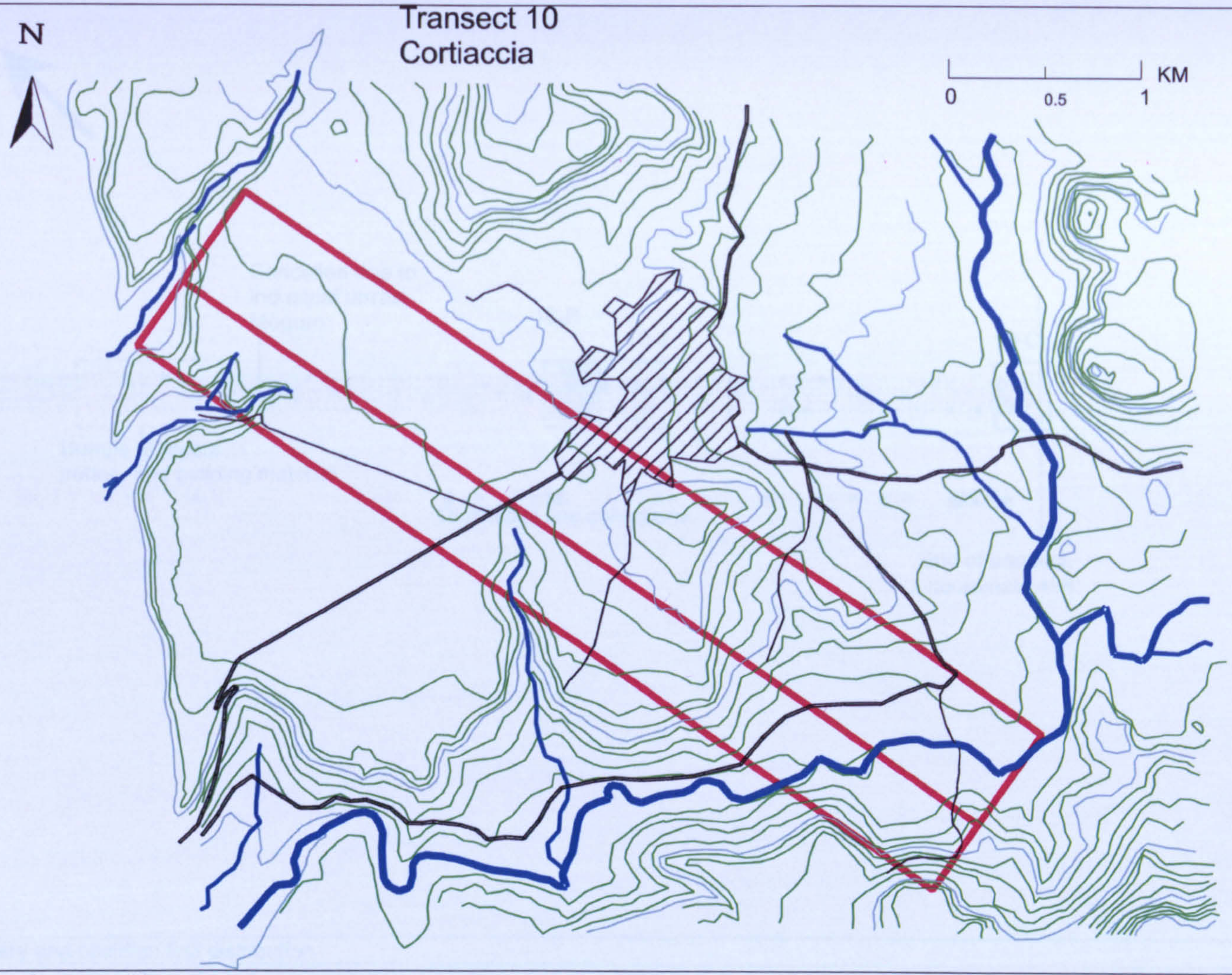


Figure 15. Topographic map of transect 10

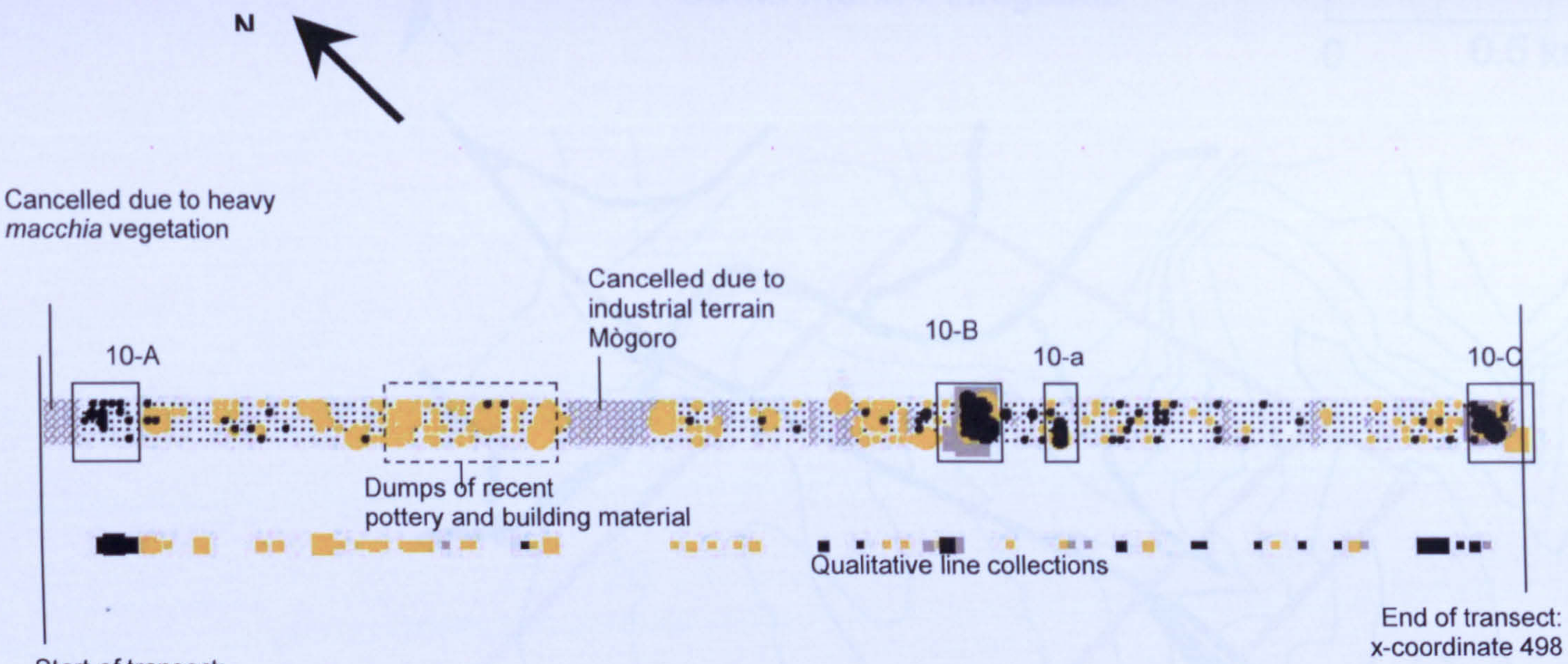


Figure 16. Transect 10 pottery and obsidian find distribution

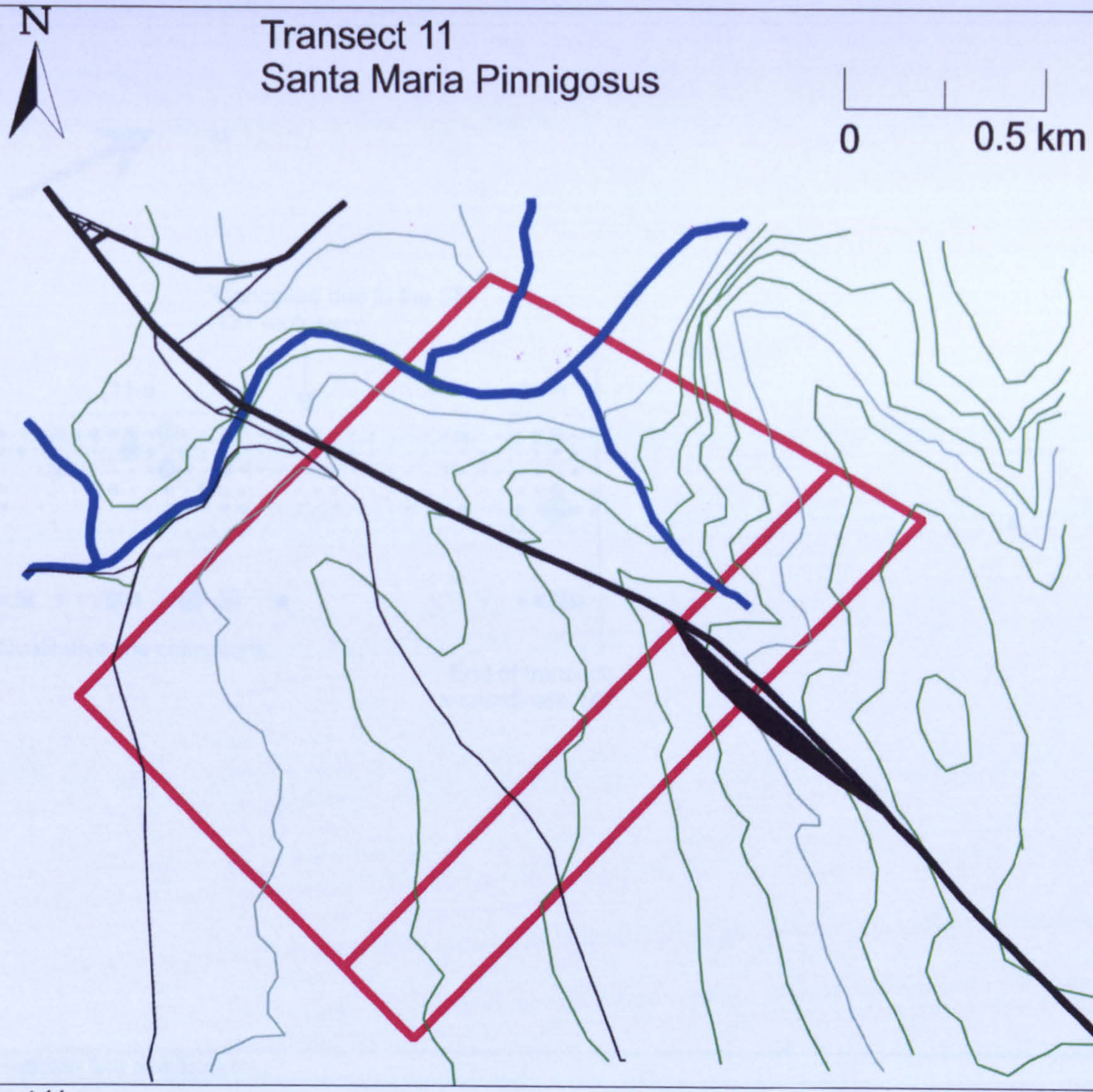


Figure 17. Topographic map of transect 11

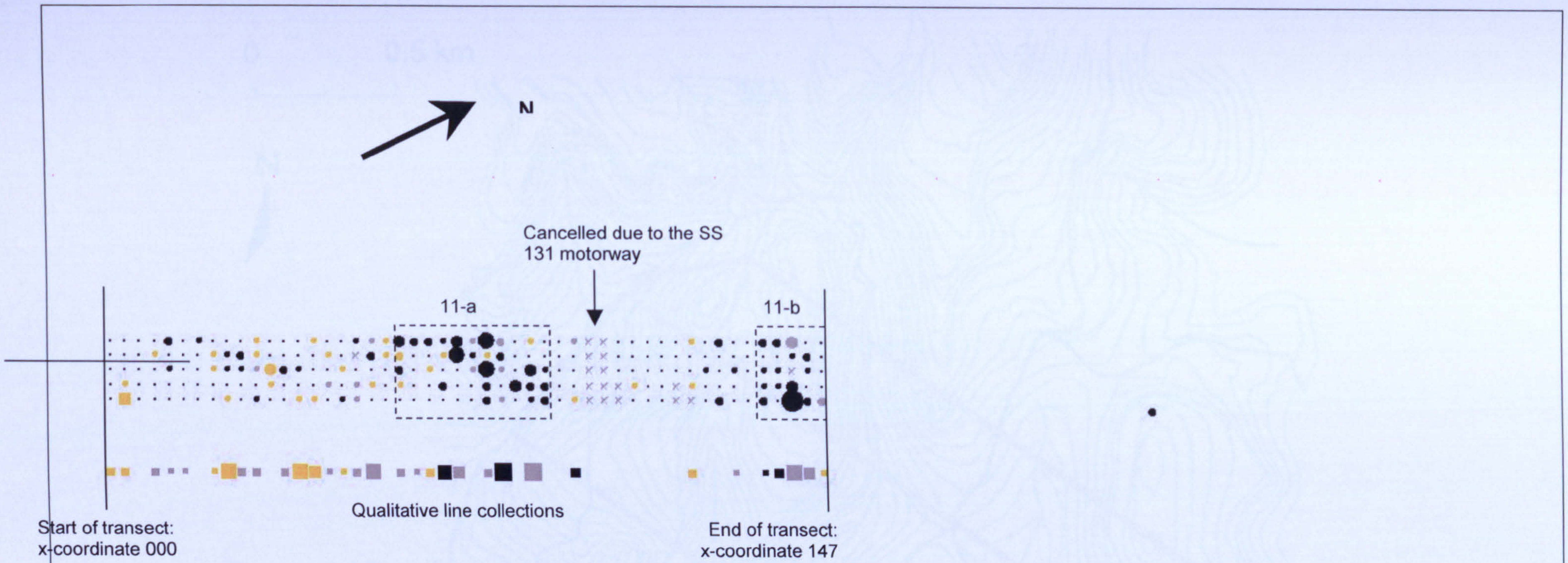


Figure 18. Transect 11 pottery and obsidian find distribution

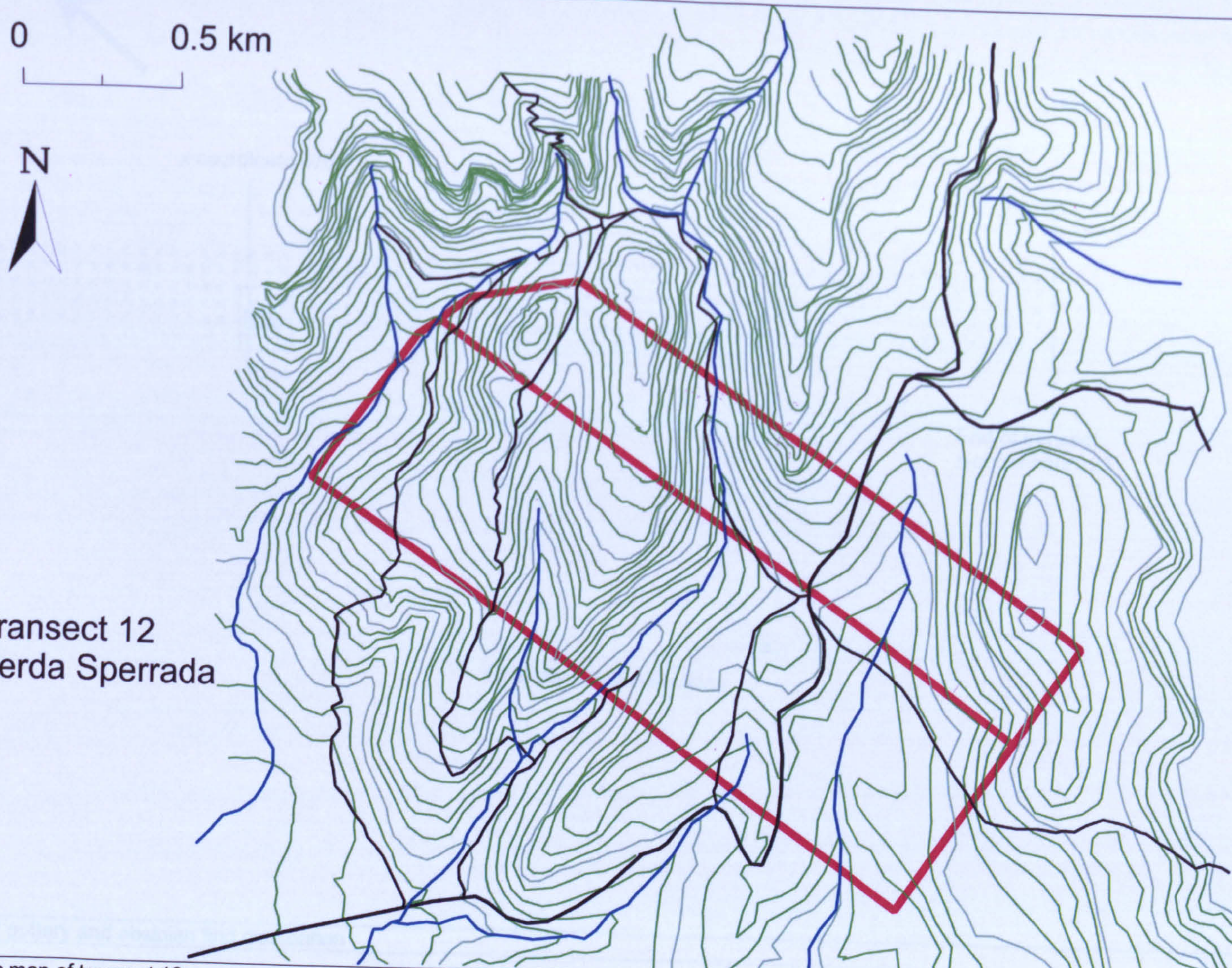


Figure 19. Topographic map of transect 12

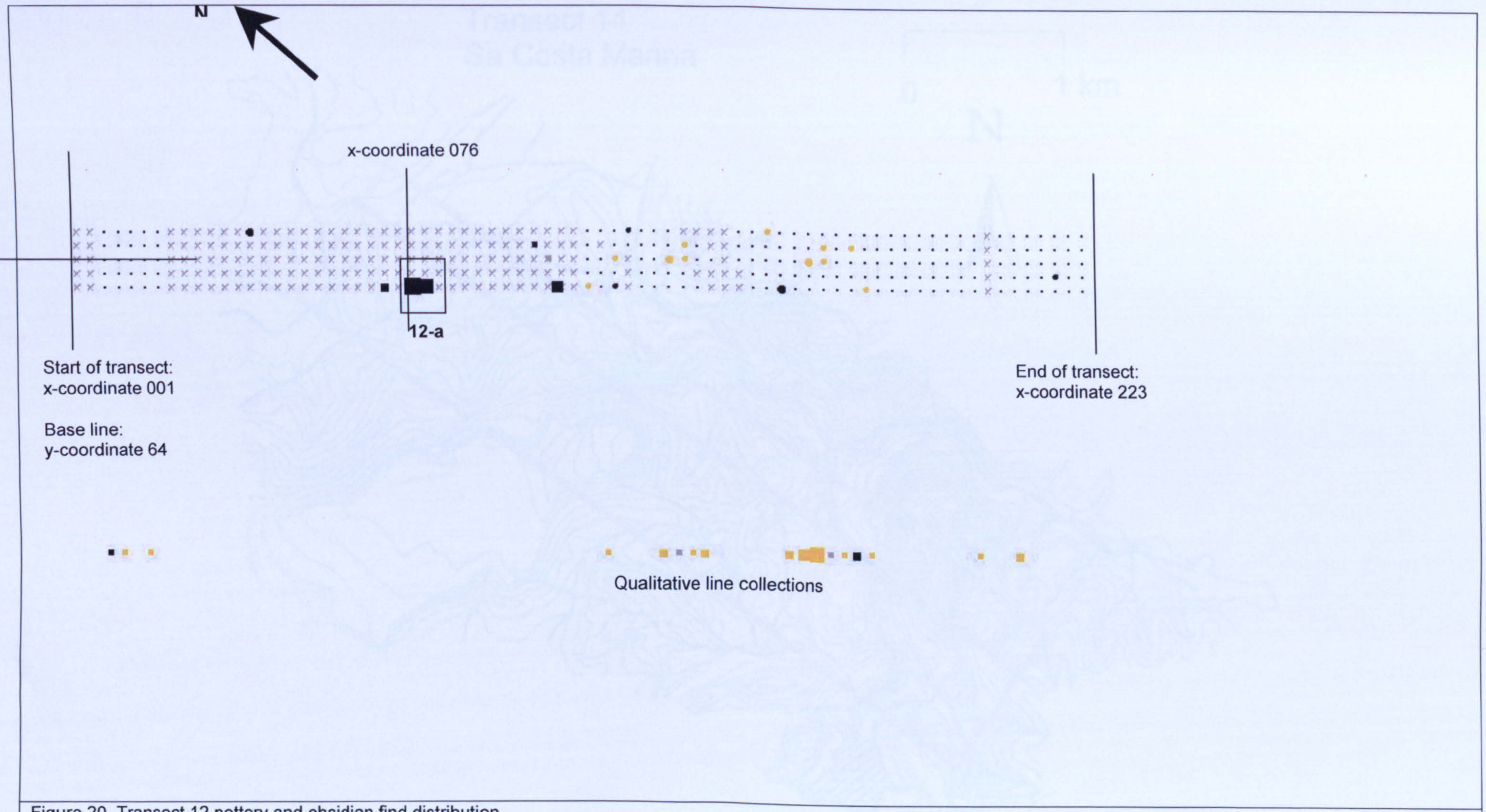


Figure 20. Transect 12 pottery and obsidian find distribution

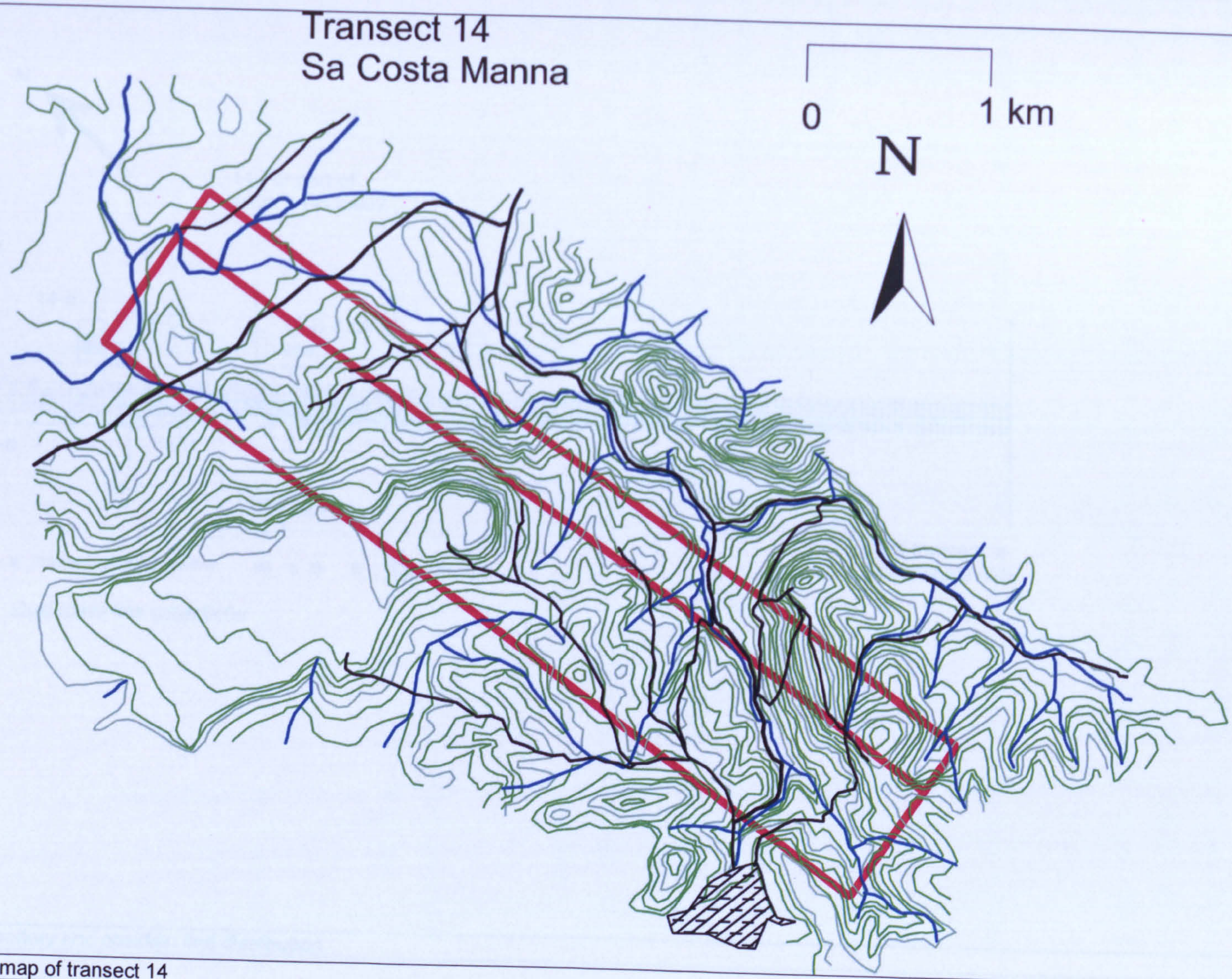


Figure 21. Topographic map of transect 14

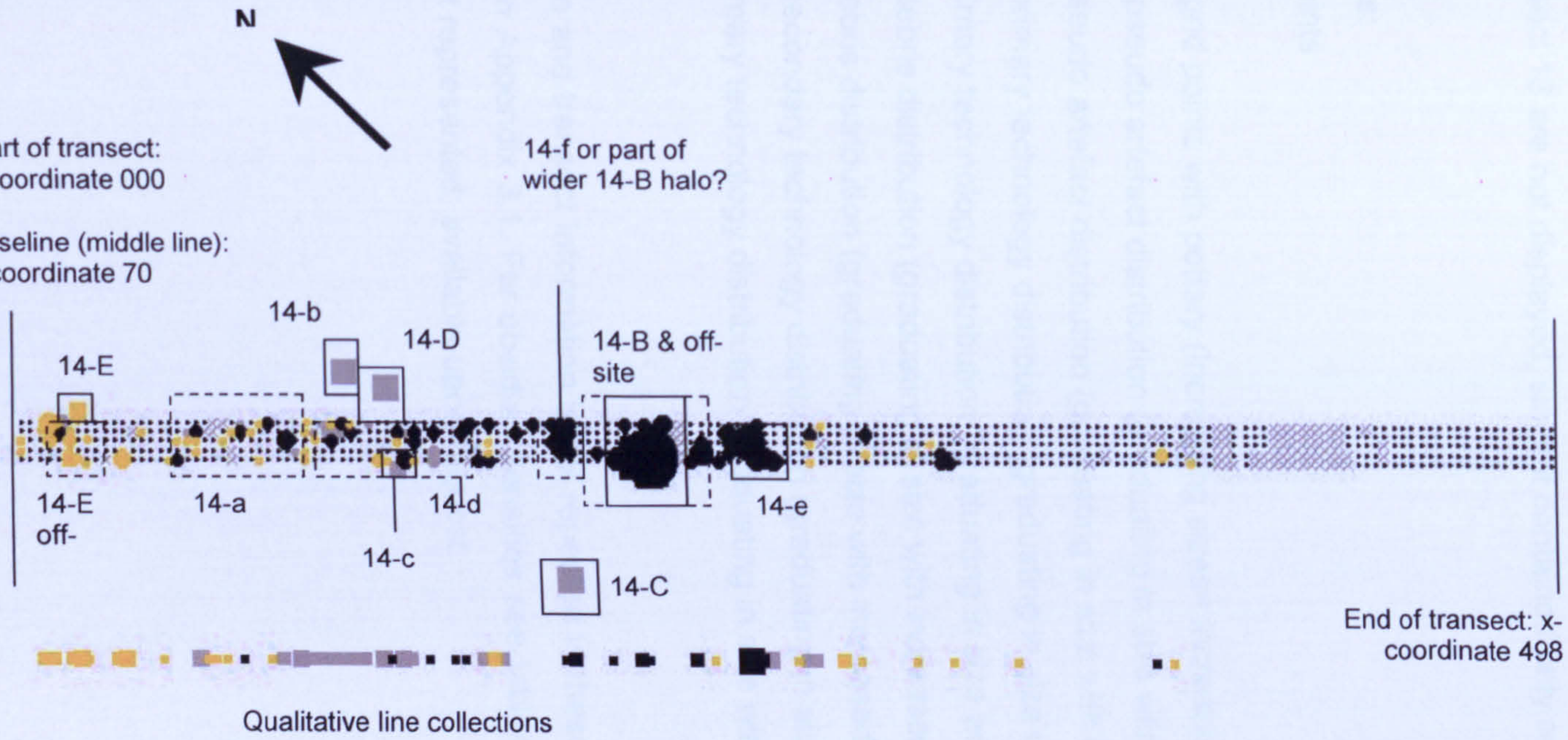


Figure 22. Transect 14 pottery and obsidian find distribution

Appendix 3.2
Lithic find distribution for all transects

This appendix contains the basic find distribution for all transects; subdivided into pseudo artefacts, primary flaking material (cores, rejuvenation pieces, flakes and blades), debris (chunks and fragments) and secondary flaking material (all retouched pieces, including those with pseudo retouch).

Figures for transect 13 are not displayed, since it contained only one quantitative find (a flake).

Legend to maps:

x = cancelled points

· = empty points

● main and site grid points with pottery (increasing sizes= increasing densities)

● = quantitative pseudo artefact distribution (graduating in size with increased densities)

■ = qualitative pseudo artefact distribution (graduating in size with increased densities)

●= quantitative primary technology distribution (graduating in size with increased densities)

■= qualitative primary technology distribution (graduating in size with increased densities)

●= quantitative debris distribution (graduating in size with increased densities)

■= qualitative debris distribution (graduating in size with increased densities)

●= quantitative secondary technology distribution (graduating in size with increased densities)

■=qualitative primary technology distribution (graduating in size with increased densities)

Note that the site and transect information is not repeated in these figures; this represented in the uneven figures in Appendix 3.1. For obsidian densities see tables 3.10-3.19 in Section 3.2. other find densities not represented; available upon request.

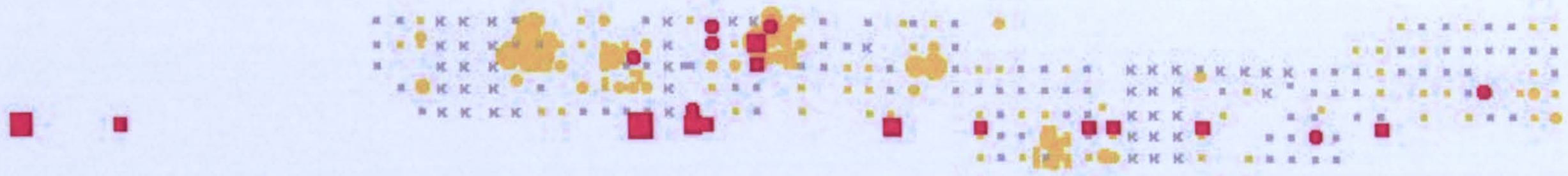


Figure 1. Transect 02. Pseudo artefacts distribution

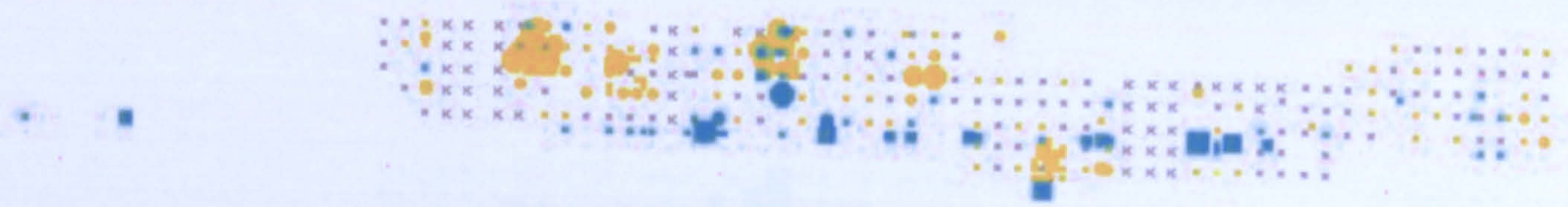


Figure 2. Transect 02. Primary flaking distribution

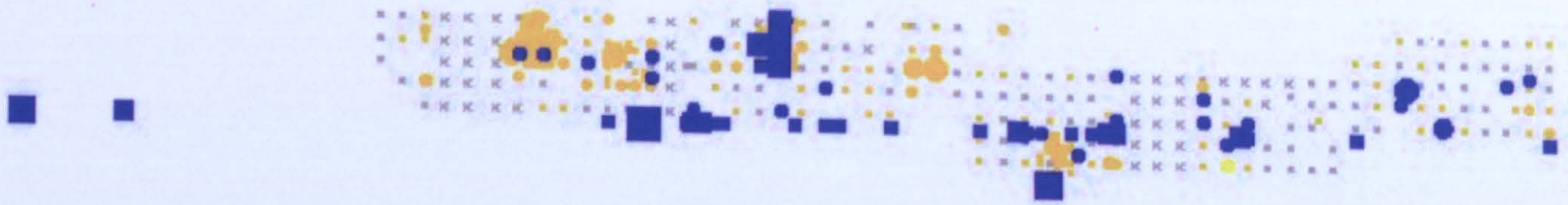
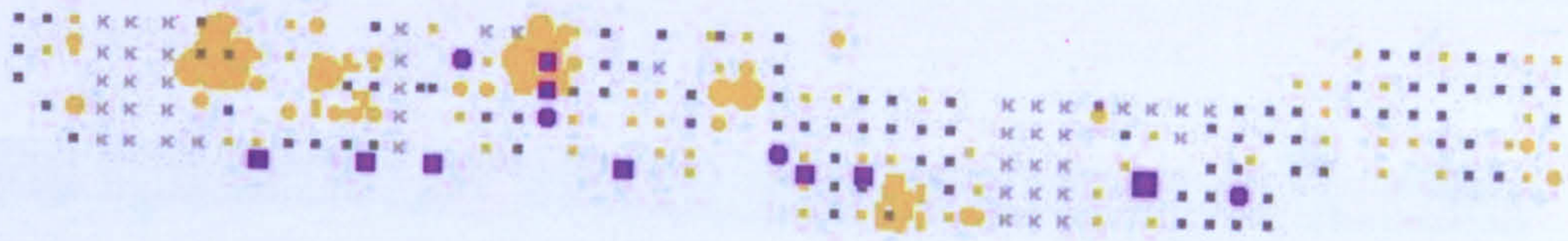


Figure 3. Transect 02. Debris distribution



Transect 04. Secondary flaking distribution

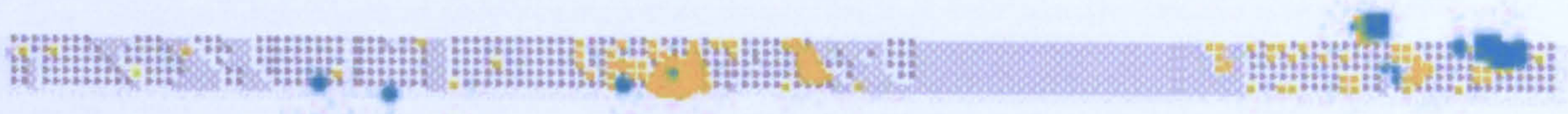


Figure 5. Transect 05. Primary flaking distribution

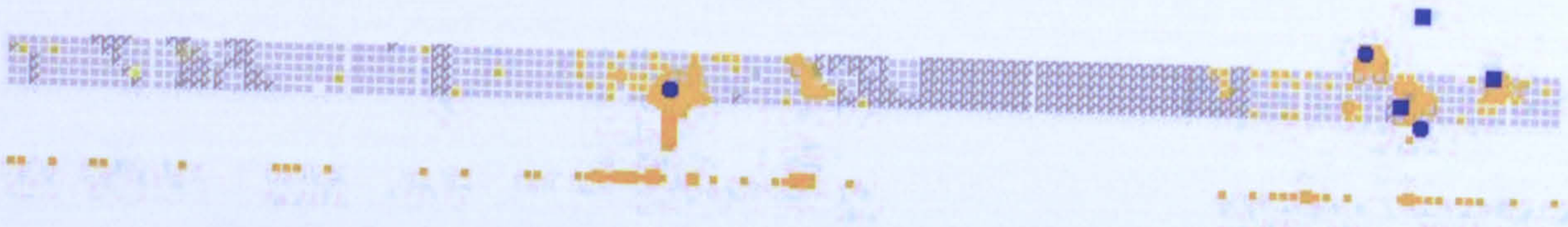


Figure 6. Transect 05. Debris distribution

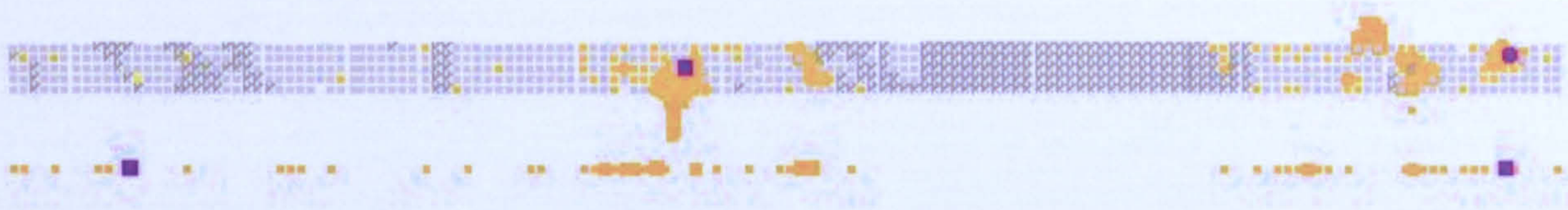


Figure 7. Transect 05. Secondary flaking distribution



Figure 8. Transect 04. Pseudo artefacts distribution

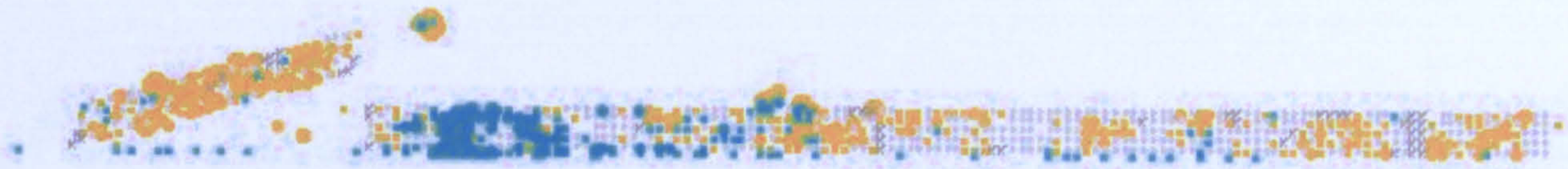


Figure 9. Transect 04. Primary flaking distribution

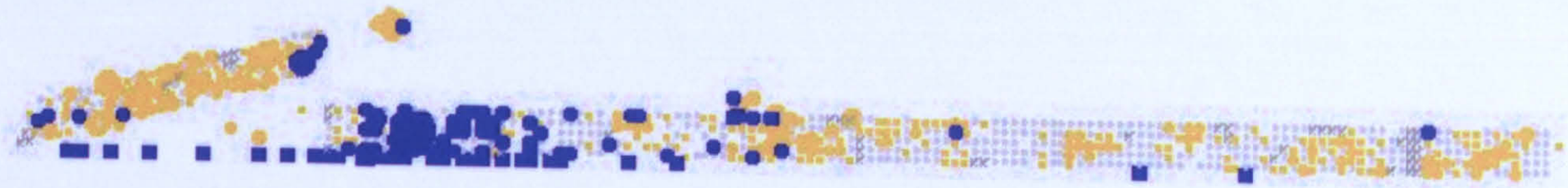


Figure 10. Transect 04. Debris distribution



Figure 11. Transect 04. Secondary flaking distribution

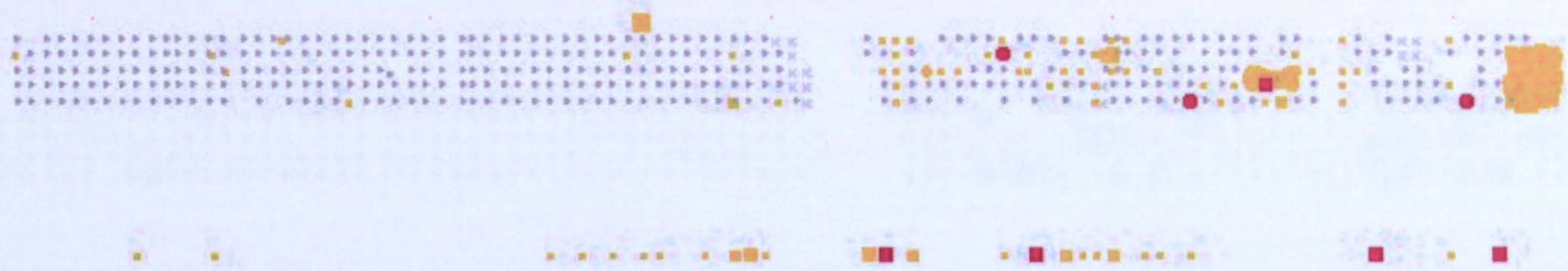


Figure 12. Transect 07. Pseudo artefacts distribution.

Figure 13. Transect 07. Primary flaking distribution



Figure 14. Transect 07. Debris distribution

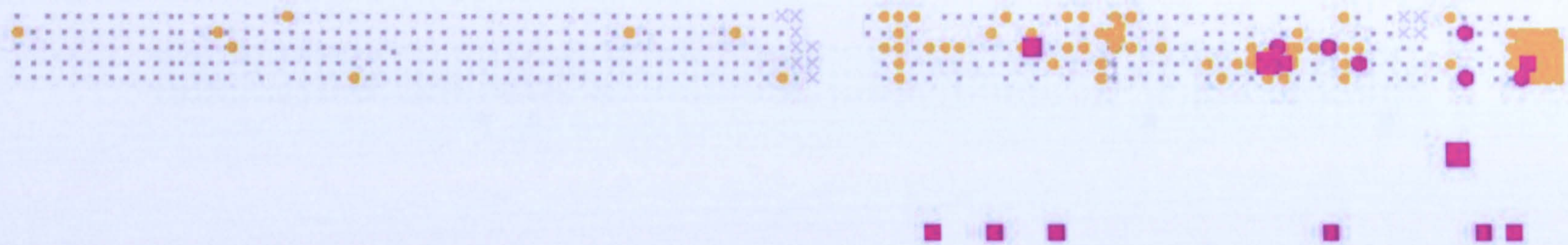


Figure 15. Transect 07. Secondary flaking distribution



Figure 16. Transect 09. Pseudo artefacts distribution



Figure 17. Transect 09. Primary flaking distribution

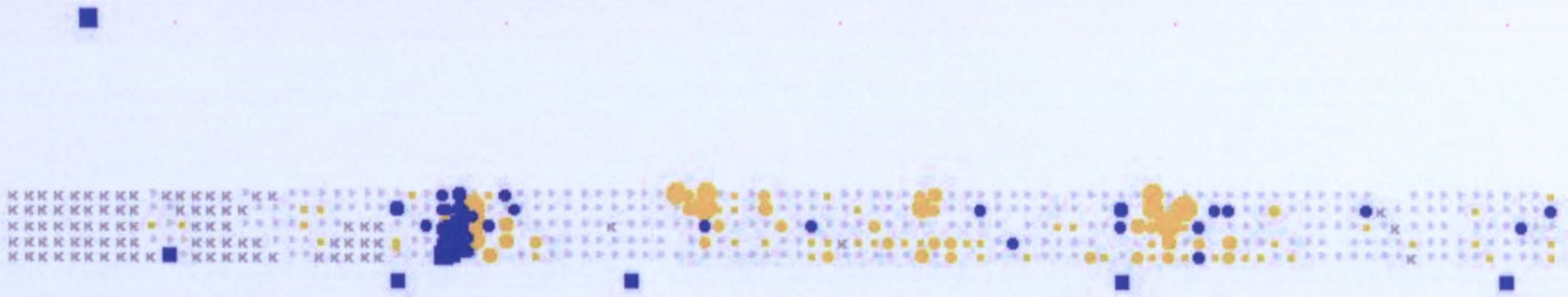


Figure 18. Transect 09. Debris distribution

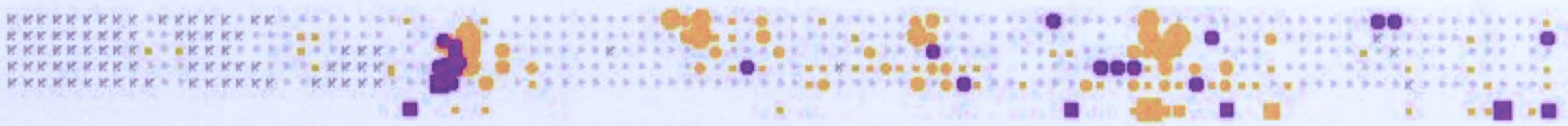


Figure 19. Transect 09. Secondary flaking distribution



Figure 20. Transect 23. Pseudo artefacts distribution

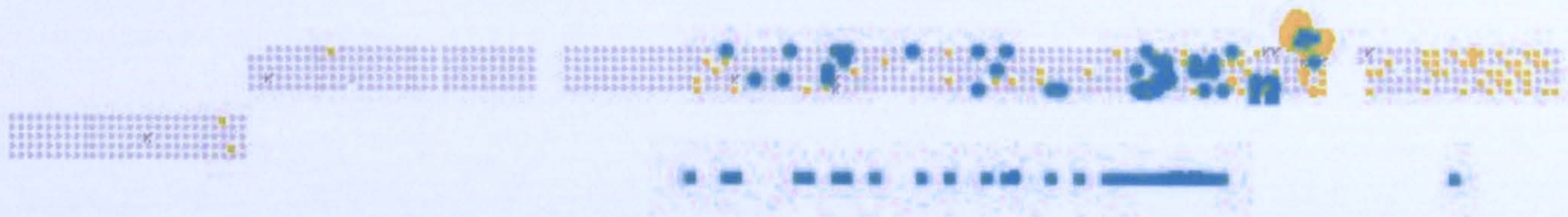


Figure 21. Transect 23. Primary flaking distribution

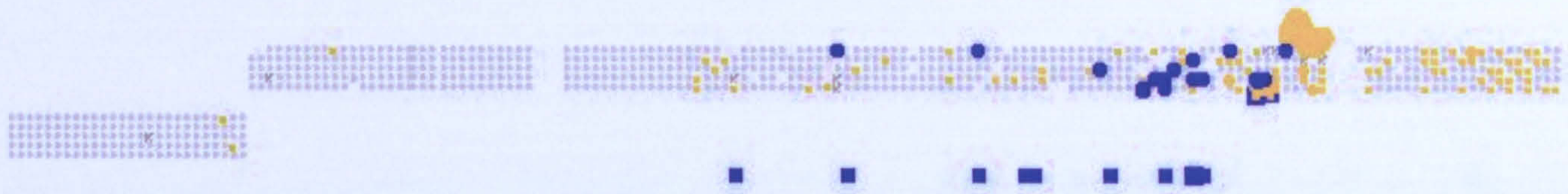


Figure 22. Transect 23. Debris distribution



Figure 23. Transect 23. Secondary flaking distribution



Figure 24. Transect 10. Pseudo artefacts distribution



Figure 25. Transect 10. Primary flaking distribution

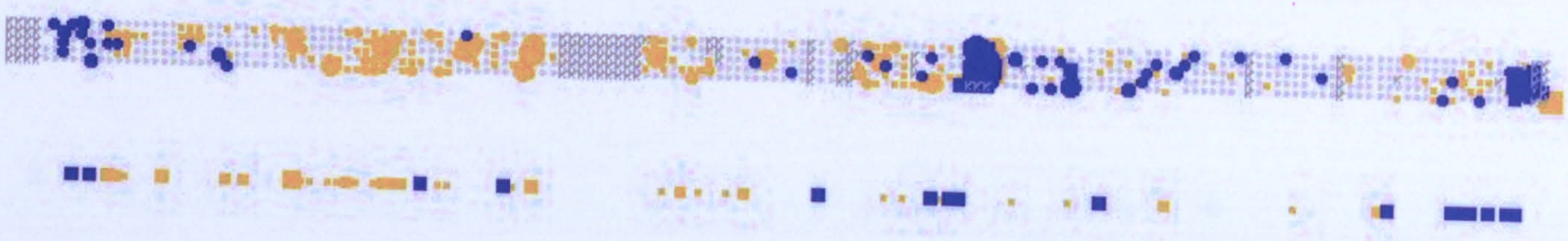


Figure 26. Transect 10. Debris distribution



Figure 27. Transect 10. Secondary flaking distribution

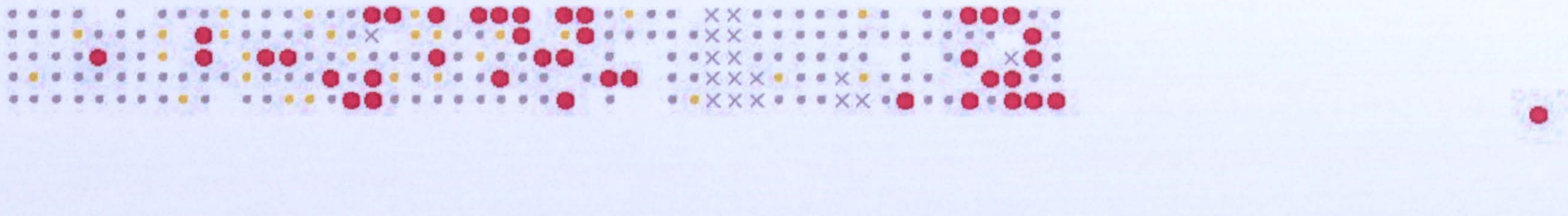


Figure 28. Transect 11. Pseudo artefacts distribution



Figure 29. Transect 11. Primary flaking distribution

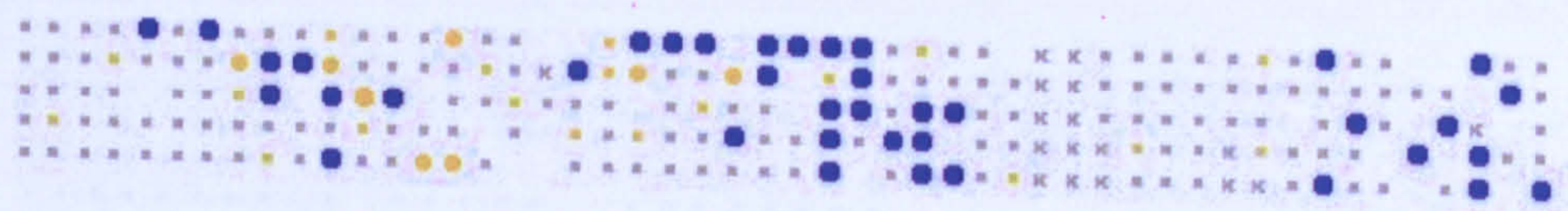


Figure 30. Transect 11. Debris distribution

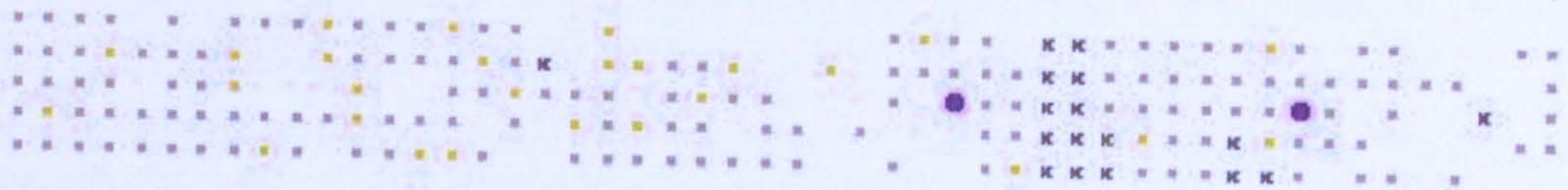


Figure 31. Transect 11. Secondary flaking distribution

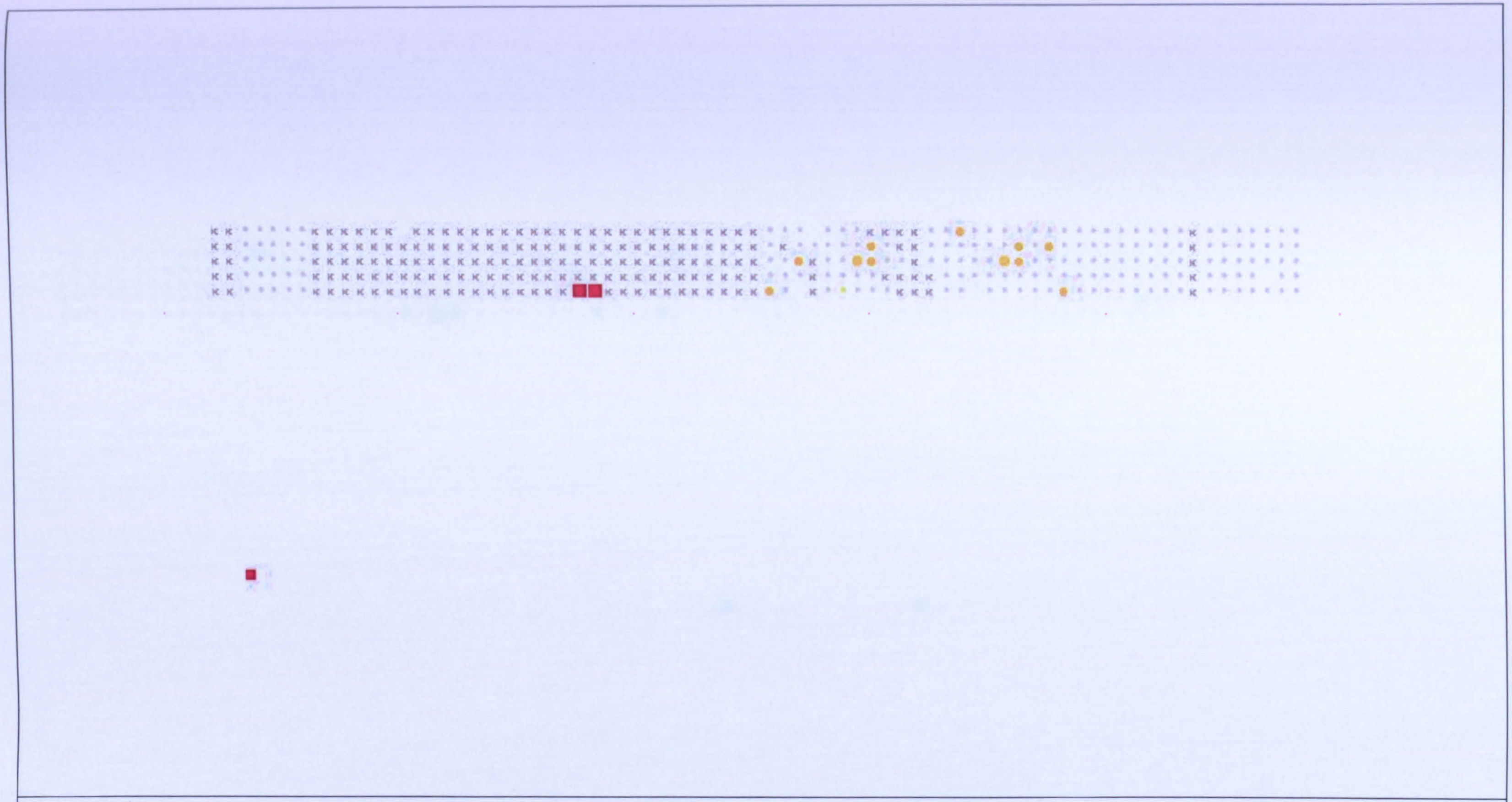


Figure 32. Transect 12. Pseudo artefacts distribution



Figure 33. Transect 12. Primary flaking distribution



Figure 34. Transect 12. Debris distribution

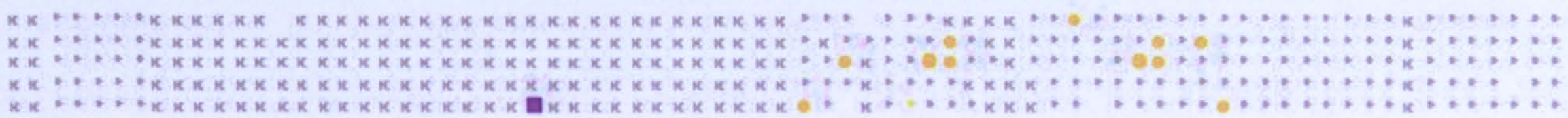


Figure 35. Transect 12. Secondary flaking distribution

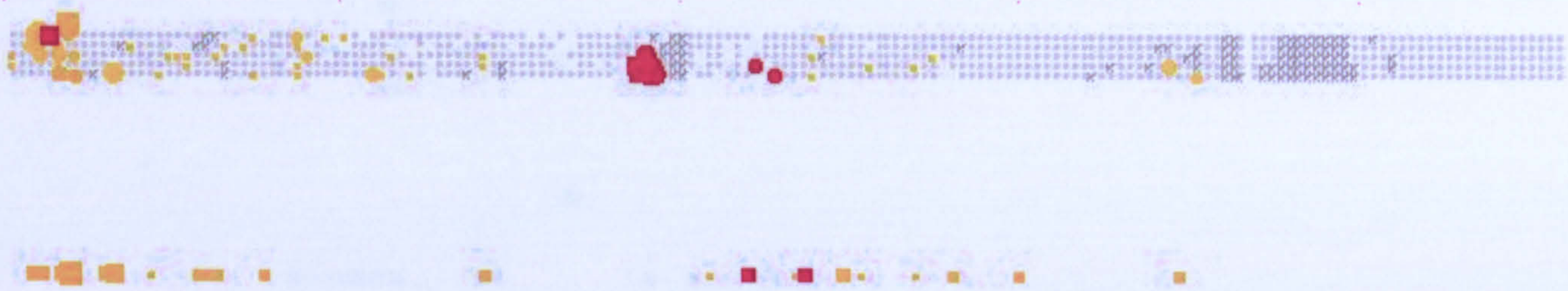


Figure 36. Transect 14. Pseudo artefacts distribution

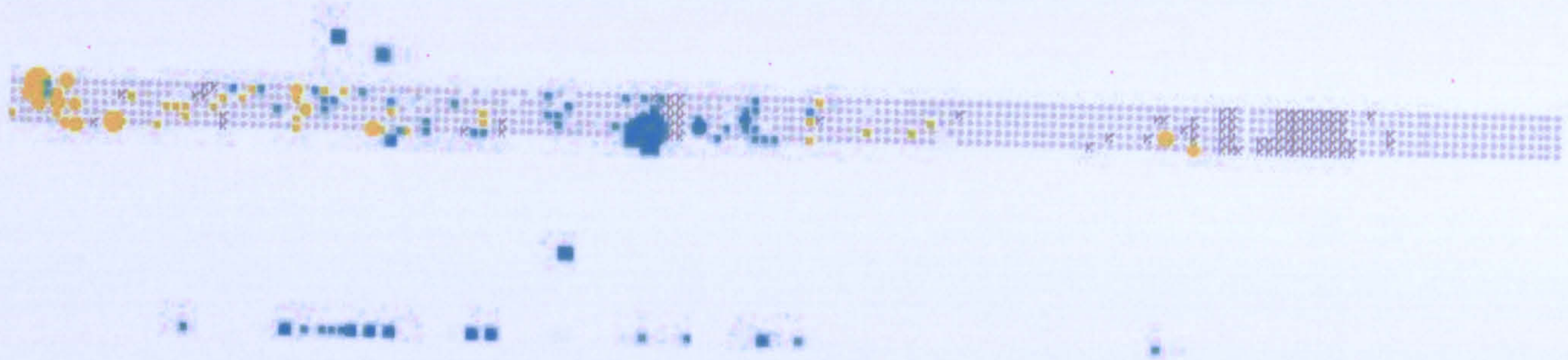


Figure 37. Transect 14. Primary flaking distribution

Figure 38. Transect 14. Debris distribution

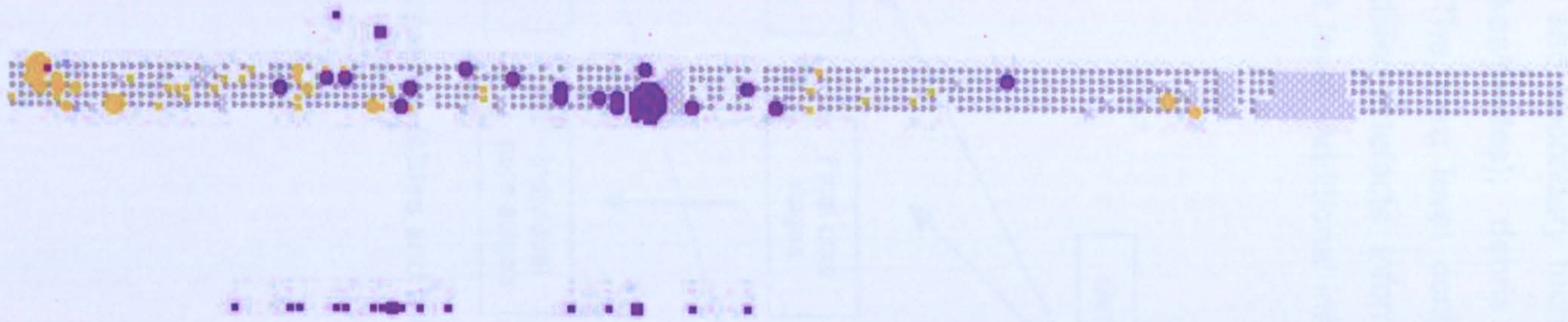


Figure 39. Transect 14. Secondary flaking distribution

APPENDIX 3.3.
Riu Mannu lithic recording system and database structure.

The lithic recording system consists of a relational Microsoft ACCESS 2000 database with three levels (Figure 1; Tables 1). All the tables are linked with the identification number; the *Riu Mannu* find number; as the primary key.

The first level contains the basic artefact information. The second level describes the basic primary and secondary technology characteristics and is subdivided into core; debitage (flakes/blades); debris (fragments and chunks) and bifacial pieces descriptions. The third level contains specific artefact information. For cores and unifacially modified artefacts; information is recorded at stage or work edge level; and not on artefact level. Additional information on tanged arrowhead is also recorded on this level.

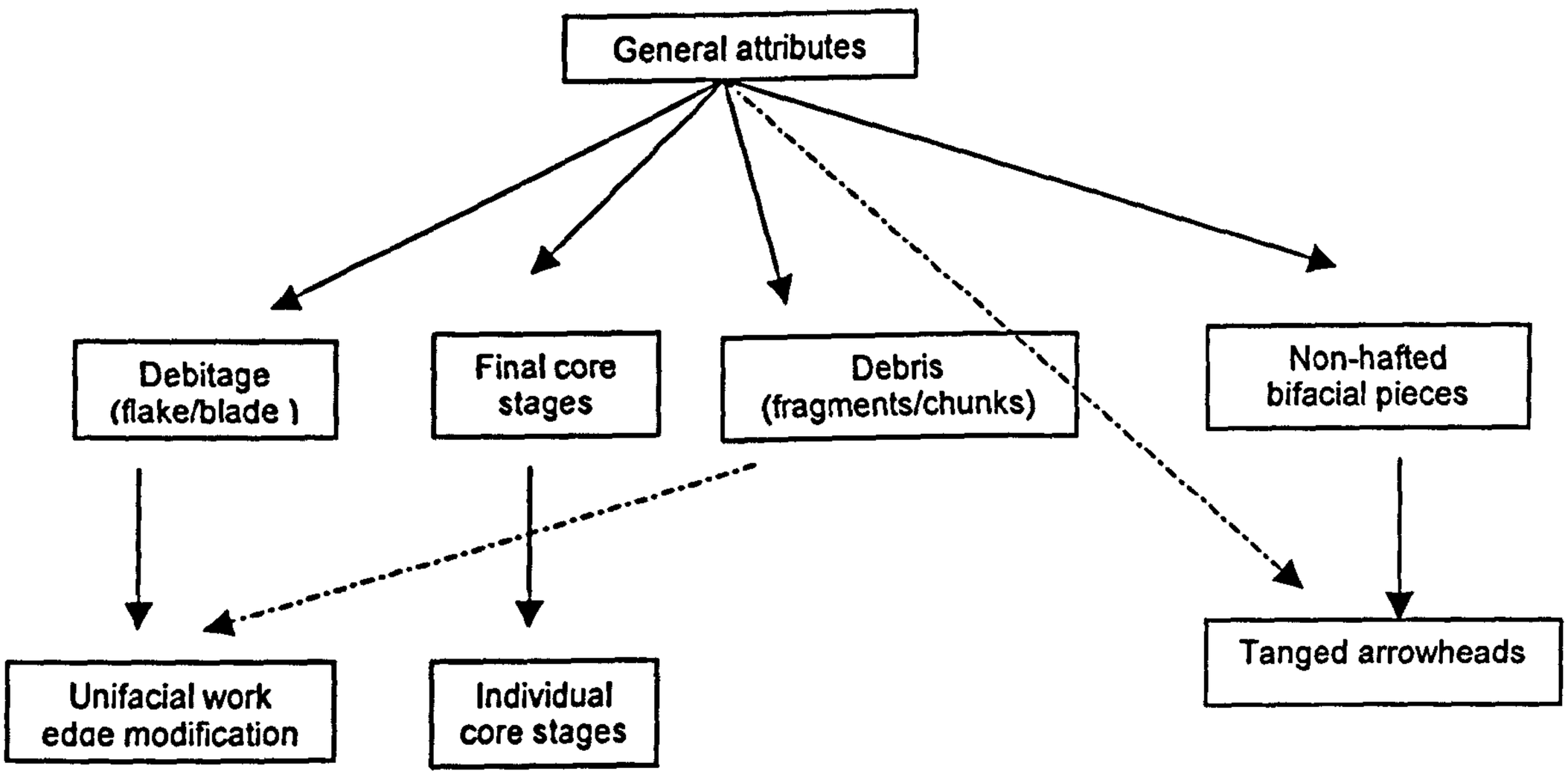


Figure 1. The database tables and their relationships of the *Riu Mannu* Survey Project lithic database.

GENERAL ARTEFACT INFORMATION	
ID	Combination of transect number; y-coordinate (two digit); x-coordinate (three digit); collection type [Punt (point); Vlak (square); Raai (line)] and artefact number.
Transect*	Transect number
y-coordinate*	Local *Riu Mannu* coordinate (randomly picked - runs between 0-100).
x-coordinate*	Local *Riu Mannu* coordinate (randomly picked - runs between 0-500).
Collection type*	Punt (point); Vlak (square); Raai (line)
Raw material	Obsidian; Flint; Rhyolite; Other; Indeterminate
Raw material characteristics*	Brief description of notable appearance of material i.e. translucency; glossiness; presence of banding.
Length	Length of artefact; in mm. For flakes/tools at 90° angle on flaking direction; for cores/chunks length = maximum length between two most opposite points; for bifacial tools 90° angle on retouch direction.
Width	Width of artefact; in mm. At 90° angle on length of artefact.
Thickness	Thickness of artefact. For flakes/tools on flakes: thickness of bulb of percussion; For proximal ends missing or other typologies thickness of thickest point of artefact.
Maximum dimension	Maximum length of artefact regardless of its flaking direction; in mm.
Weight	Weight of artefact; in grams.
Cortex Percentage	Percentage of cortex. For flakes /tools on flakes only dorsal surface for all other typologies all over: 0= none; 1= 0-25%; 2= 26-50%; 3= 51-75%; 4= 76-100%.
Cortex Type	0= none; 1= Coarse; grey coloured cortex; 2= Coarse; grey coloured; pitted and battered cortex; 3= Sandy or fine-grained; light (yellow/white) coloured cortex; 4= Glossy smooth patination
Cortex Location*	Description of location of cortex (for orientation see fragmentation below)
Artefact classification	1= flake/blade; 2= core; 3= core (rejuvenation) piece; 4= modified flake; 5= modified blade; 6= bifacial piece; 7=possible modification; 8=chunk; 9=fragment/shatter; 10= pseudo-artefact
Alternative classification*	Remarks on alternative classification possibilities if uncertainties exist on first classification
Condition	Presence or absence of signs of erosion/weathering of artefact; rounded features/ abraded ribs/ edges: 0= fresh; 1= abraded; 2= patinated
Remarks	General remarks on artefact

Table 1. Variables and attribute coding for general artefact information. *= Later additions

DEBITAGE (FLAKES/BLADES)	
ID	As above
Fragmentation	Combination of numbers, each representing one side of the artefact, held with proximal side to researcher and dorsal side up 1= proximal; 2= left side; 3= right side; 4= distal. Example: complete artefacts are coded 1234; proximal missing 234 etc).
Exterior platform angle#	Angle of platform and dorsal side: 1= < 30°; 2= 30-60°; 3= 60-80°; 4= 80-100°; 5=> 100°.
Eraillure flake / Bulbar scar	Visibility of scar: 0= none; 1= average; 2= very well; 999= indeterminate.
Bulb of percussion	Visibility/development of bulb of percussion: 0= poor; 1= average development; 2= well developed; 999= indeterminate.
Flaking ripples	Visibility/ development of flaking ripples: 0= poor; 1= average; 2= well visible; 999= indeterminate.
Distal ending	0= absent due to breakage 1= feathered; 2= stepped; 3 = hinged; 4= overshot; 999= indeterminate.
Numbers of dorsal scars	Not counting retouch and scars under 2 mm; 0= cortex dominant; 999= indeterminate.
Steps/hinges	Number of steps and/or hinges on the dorsal side; 999= indeterminate.
Dorsal pattern	Pattern of scars on dorsal side relating to the flaking direction;
	1= cortex; 2= plain; 3= simple; 4= convergent; 5= radial; 6= edge; 7= side; 8= opposed; 9= simple and opposed; 10= simple and side; 11= side and opposed; 999= indeterminate.
Platform typology	1= missing; 2= incomplete; 3= cortex; 4= plain; 5= complex (retouched); 6= dihedral; 7= abraded; 8= punctiform; 9= linear; 999= indeterminate.
Platform features	Extra features on platform:
	0= none; 1= incipient cones; 2= point of percussion
Platform length	Platform length; in mm.
Platform width	Platform width; 90° angle with length; in mm. 999= indeterminate.
Platform preparation	0= none; 1= abraded/grounded; 2= retouched; 3= not present due to breakage; 4= stacked steps; 999= indeterminate.
Artefact shape	1= square 2= rectangular 21= chequered; 3= triangle; 4= wider distal than proximal; 5= round/oval; 51= half moon; 6= polygonal; 7= irregular; 999= indeterminate.
Flake typology	1= flake; 2= blade; 3= modified flake; 4modified blade; 5= possible modification; 6= fragment/shatter; 7= (bifacial) thinning flake; 8= edge-bite flake; 9= overshot flake
Remarks	Remarks specifically for flakes

Table 2. Variables and attribute coding for debitage (flakes/blades). #= Not consistently recorded and thus discarded as a variable

NEW CORE RECORDING SYSTEM: FINAL CORE STAGES*	
ID	As above
Abandonment	0= indeterminate; 1= size; 2= flaws; 3= overshot; 4= stepping/hinging; 5= angle; 6= 4&5 combined
Pebble size	Estimation of size of original pebble; 0= indeterminate; 1= small; 2= medium (fist-sized); 3= large.
Angularity/sphericity	Determined on the shape of remaining cortex surfaces. 0= indeterminate; 1= angular (nodular); 2= sub-angular; 3= sub-rounded; 4= rounded
Number of stages	Number of changes in platform or type. 0= one stage; 1= possible more than one stage; n= number of stages
Platform area percentage	Estimation of the circumference of platform from which blanks have been removed.0= unclear; 1=0-25%; 2=c. 50%; 3= c.75%; 4= 100%
Remarks	Additional remarks on final stage of core

Table 3. Variables and attribute coding for new core recording system: final core stage. *= Later addition

NEW CORE RECORDING SYSTEM: INDIVIDUAL CORE STAGES*	
Stage ID	Individual number given to each stages (i.e. more stages can appear om same artefact)
RMSP ID	As ID above
Stage number	0= one stage; n= number of stages
Type	1= bipolar; 2= blade platform; 3= flake platform; 4= non specific platform; 5= amorphous (irregular knap
Platform type	1= Unprepared (bipolar cores); 2= simple preparation (platform created by single flake removal); 3= complex preparation (more than one remo
Average flake angle	Angle between platform and removal face. bipolar core are flat. 0= indeterminate; 1= flat; n= degrees
Angle between platform and removal face.	Bipolar core are flat. 0= indeterminate; 1= flat; n= degrees
Scars removed	Number of scars removed during this stage
Negative bulbs of percussion	0= not present; 1= marked; 2= diffuse
Length of maximum scar	Length of maximum scar i.e. not necessarily the last removal. 0 = indeterminate; n= length in mm
Width of maximum scar	0= indeterminate; n= width of maximum scar in mm
Abandonment	0= indeterminate; 1= size; 2= flaws; 3= overshot; 4= stepping/hinging; 5= angle; 6= 4&5 combined
Remarks	Additional information/remarks on core stage

Table 4. Variables and attribute coding for new core recording system: individual core stage. *= Later addition

OLD CORE RECORDING SYSTEM†	
ID	Combination of transect; x coordinate (two digit); y coordinate (three digit); clarification of type of collection Punt (point); Vlak (square) or Raai (line) and artefact number.
Number negatives/scars	Total number of negatives/sides of the whole artefact.
Platform preparation	0= none (overhang present); 1= grounded/abraded; 2=retouched; 8= unclear; 999= indeterminate.
Platform features	Extra features on the platform
	0= none 1= incipient cones; 2= point of percussion; 999= indeterminate.
Steps/hinges	number of steps and hinges present in scars.
Core typology	1= unidirectional; 11= prismatic; 12= microblade; 13= pyramidal; 2= multidirectional; 21= turtle shaped; 22= 2 platforms; 23= bipolar; 24= discoid 25= bi-piramidal; 26= 1 bifacial edge/platforms; 27= 2 bifacial edges/platforms; 28= multi-platformed; 3= irregular; 5= core rejuvenation piece; 6= pseudo-artefact/natural piece of stone.
Remarks	Remarks on cores

Table 5. Variables and attribute coding for old core recording system. † Later discarded in favour of new core recording system

DEBRIS (FRAGMENTS/CHUNKS)	
ID	As above
Scars/negatives	Total number of negatives/ sides; for flake fragments/shatter only dorsal side negatives; for all chunks / indeterminate typologies all sides / negatives.
Artefact shape	1= square 2= rectangular 21= chequered; 3= triangle; 4= wider distal than proximal; 5= round/oval; 51= half moon; 6= polygonal; 7= irregular; 999= indeterminate.
Remarks	Remarks / possible suggestions on type of artefact

Table 6. Variables and attribute coding for debris (fragments and chunks).

UNIFACIAL PIECES - WORK EDGE MODIFICATION	
ID1/work edge number	Automatically generated number.
ID	As ID above
blank Type*	Type of artefact selected for modification: 1= flake; 2= blade; 3= chunk; 4= core; 5= fragment; 6= overshot flake; 7= core rejuvenation flake; 8= pseudo=artefact; 9= overshot blade
Location retouch in relation to flaking direction	1= dorsal; 2= ventral; 3= bifacial marginal; 5= alternate (dorsal and ventral retouched in different locations); 6= lateral; 7= irregular.
Location of retouch on surface	1= left; 2= right; 3= left and right; 40= proximal; 41= proximal left; 42=proximal right; 50= medial; lateral; 51=lateral left; 52=lateral right; 60= distal; 61=distal left; 62= distal right; 7=3 to 4 edges; 8= irregular; 999= indeterminate.
Retouch edge angle	Angle of retouch: 1= 0-30°; 2= 30-60°; 3= 60-80°; 4= 80-100°; 5= >100°.
Edge shape	1= straight; 2= convex; 3= concave; 4= combination of 1, 2, and 3; 5= point /convergent; 6= denticulate; 7= irregular; 8= abraded; 999= indeterminate.
Retouch length	Length of retouch, in mm.
Retouch width	Width of retouch, 90° on length, in mm.
Type of retouch	Retouch types: 1= feathered marginal; 11= feathered profound; 2= step marginal; 22= step profound; 3= scalar; 4= use wea; 5= irregular, edge damage?; 6= notch; 7= burin; 8= fresh ret on patinated artefact; 9= possible retouch; 10= denticulates; 999= indeterminate
Retouch pattern along edge	1= marginal continue (unaltered artefact form); 2= profound continue (altered artefact form); 3= isolated marginal; 4= isolated profound; 5= irregular
Remarks	Remarks for work edges.

Table 7. Variables and attribute coding for unifacially modified artefacts.

BIFACIAL PIECES - NON-HAFTED ARROWHEADS	
ID	As above
Edge angle	Angle of edge and (imaginary middle line of artefact): 1= 0-30°; 2= 30-60°; 3= 60-80°; 4= 80-100°; 5= > 100°.
Location of edge	Location of edge in relation to middle of artefact: 1= above/below the middle; 2= in the middle; 999= indeterminate.
Edge shape	1= grounded/abraded; 2= saw like; 3= straight; 4= irregular; 999= indeterminate.
Edge specifics	Specific features on edge: 0= none; 1= platforms; 2= overshot/edge bite.
Portion of artefact	Absence of portions of artefact: 1= complete; 2= top; 3= lateral side; 4= base; 5= wings/overshot; 6= top and base; 7= more than one side missing; 8= side missing but location unclear; 999= indeterminate.
Type of breakage	1= lipped; 2= straight; 3= oblique; 4= overshoot; 5= perverse; 6= impact fluting; 7= impact burination; 8= crushing tip; 999= indeterminate.
Shape of section	1= triangle; 2= oval; 3= asymmetrical (1 side higher than other); 3= step/hinge plateau; 5= irregular; 999= indeterminate.
Retouch shape	1= long, thin and feathered; 2= thick, short and deep feathered; 3= scalar; 4= irregular; 999= indeterminate.
Bulb of percussion in retouch	Visibility of bulb of percussion in retouch 0= none; 1= average; 2=clear; 999= indeterminate.
Shape of non-hafted piece	1= round; 2= oval; 21= half moon; 3= triangle; 4= square; 5= rectangular; 6= irregular; 999= indeterminate.
Remarks	Specific remarks for non-hafted bifaces.

Table 8. Variables and attribute coding for bifacially retouched artefacts: non-hafted pieces.

BIFACIAL PIECES - TANGED ARROWHEADS	
ID	As above
Blade length	Length from top to shoulder; in mm.
Blade width	Width from shoulder to shoulder; in mm.
Haft length	Length from top of tanged element to base in mm (can equal neck height).
Neck height	Height of neck to base (can equal length of tanged element); in mm.
Neck width	Width of neck (can equal blade width); in mm.
Base width	Width from base edge to base edge; in mm.
Shoulder to corner	Length from shoulder to basal corner; in mm.
Tip thickness	Tip thickness; in mm
Typology	1= side notched; 2= lanceolate; 3= basal notched; 4= corner notched; 5= contracting stemmed.
Remarks	Remarks

Table 9. Variables and attribute coding for bifacially retouched artefacts: tanged arrowheads.

APPENDIX 4.1.

Overview of known geological locations on Monte Arci from characterisation studies

Source zone	Sampled ;ocations	Context	Extent/density/size	Archaeological finds	Comments	References
SA	Conca Cannas valley	*In situ* in soft perlite, rhyolite, trachyte matrices. In secondary contexts along streams in valley	Diffuse zone: unworkable material to the south and east, specks in matrix along river Cannas and more restricted area with 10-15cm nodules. Sub- to well-rounded nodules upto 10kg. Fist-sized nodules.	Present (Tykot samples 240-254)	Tested samples from abandoned perlite quarry	Poupeau *et al.* 2004; Puxeddu 1957; Tykot 1995
	Su Paris de Monte Bingias	Surface	Restricted area	Not known	-	Tykot 1995
	Canale Perdera Riu Solacera, Santa Suina, Punta Perda de Pani	Surface and *in situ* in perlite matrices (Canale Perdera)	Extensions of Su Paris de Monte Bingias. Nodules >10cm seen at Canale Perdera and Solacera	Not known	Tykot: low density, unworkable raw material at Canale Perdera and Riu Solacera, none at S. Suina or C. Pies	Assorgia *et al.* 1976, Beccaluva *et al.* 1974; Francaviglia 1984; Tykot 1995; Washington 1913
	Monte Sparau South	Surface	Nodules 10-20cm length	Not known	Tykot: unworkable raw material only	Tykot 1995
	Perda Arrubia	Surface?	Not known	Present	Tykot: no raw material	Tykot 1995
SB1 (Santa Maria Zuarbara zone)	Cuccuru Porcufurau	*In situ* in hard perlite, ryholite matrices	Large diffuse area. At 250-300 elevation blocks up to 30cm	Not known	-	Assorgia *et al.* 1976, Beccaluva *et al.* 1974; Tykot 1995
	Punta su Zippiri	*In situ* in hard perlite matrix	Large diffuse area. At 500m elevation high abundance of nodules 3-5cm,	Not known	-	Assorgia *et al.* 1976, Beccaluva *et al.* 1974; Tykot 1995
	Punta Nigola Pani	*In situ* in hard perlite matrix	At 350m elevation nodules 3-5cm (medium frequency), sub-rounded nodules upto 1kg weight	Not known	-	Assorgia *et al.* 1976, Beccaluva *et al.* 1974; Poupeau *et al.* 2004; Tykot 1995
	Monte Sparau North	Surface, specks in a perlite matrix	workable blocks along Riu Murus	Not known	exact locations unknown	Tykot 1995
	Campo dei Forestieri	Surface?	Limited availability	Present		Tykot 1995; Tykot 1995

	Punta Muroni	None	Not known	Present		Tykot 1995 appendix C1, samples 781-790
SB2	Brunca Perda Crobina	*In situ* in hard perlite matrix	At 100m elevation in the west to a 400m elevation to the northeast. 15-17cm nodules	Not known	-	Assorgia *et al.* 1976, Beccaluva *et al.* 1974; Tykot 1995
	Cucru Is Abis	*In situ* in hard perlite matrix	At 230m elevation down west to Funtana Figu. Mackey noted 1cm nodules *in situ*	Not known	Chemical close but not identical to SB type	Assorgia *et al.* 1976, Beccaluva *et al.* 1974; Tykot 1995
	Seddai	*In situ* in basalt with trachyte, rhyolite matrix	Blocks up to 1m, spheroid nodules upto 5 kg	Not known	Modern gravel quarry. Quartz quarry 1km to north revealed little obsidian	Poupeau *et al.* 2004; Tykot 1995
	Conca s'Ollastu	Surface, *in situ* in perlite matrix		Not known	Scatters of unworked obsidian are common in plain west of Conca s'Ollastu	Assorgia *et al.* 1976, Beccaluva 1974; Tykot 1995; Washington 1913
SC (Perdas Urias zone)	Punta Pizzighinu	In situ in perlite matrix (type SC1)	Ridge from Punta Pizziginu to Su Varongu contains obsidian. At 600m elevation blocks of up to 17cm	Not known	Plentiful redeposited obsidian along ridge at lower elevations	Poueau *et al.* 2004; Tykot 1995
	Santas Pinta	Surface	Nodules up to 30cm, upto 25 kg	Not known	Mixed SC1 and SC2 type obsidian	
	Mitza Truncheddu	Surface	Nodules up to 30cm, prismatic blocks, smooth cortex	Not known	-	
	Cazzighera	Surface	Nodules up to 30cm	Not known	-	
	Su Varongu, Truncheddu	Surface		Not known	Type SC2	
	Tanca sa Tellura	Surface	Not known	Not known	Only in appendix C1	Tykot 1995
	Riu Canali	Surface?	Not known	Present	Only in appendix C1	Tykot 1995
	Perdas Urias	Surface	Not known	Present	Correlation geological and archaeological material unclear due to imprecise information	Tykot 1995 appendix C1 samples 195-216 and 232-239 (different locations)
	Mitza Fustiolua	Surface? pyroclastics (pumice, perlite, obsidian)	Not known	Present	Only in appendix	Assorgia *et al.* 1976; Tykot 1995, appendix C1
	Mitza sa Tassa	Surface	Extensive	Present	Reduction centre	Puxeddu 1957; Tykot 1995
	Sennisceddu	Surface	Not known	Present	Reduction centre	Lugliè 2004a
Unknown	La Comende	Not known	Not known	Not known	Unworkable raw material	Tykot 1995

	Sant'Antioco	Not known	Not known	Not known	Unworkable raw material but one artefact found at Nuraghe Losa	Francaviglia 1984; Tykot 1995
	Monte Traessu	*In situ* in pumice matrix	Restricted to tiny beads	Not known	Unworkable raw material	Tykot 1995
	Scala Larga/ Acqua Marzana/ Riu Mattiabis, Gora de Capudaquas, Santa Maria Zuarbara, Riu Nieddu, Riu Ceddus	Not known	Not known	Not known	Reported and sourced by Herold 1986 not tested by Tykot	Tykot 1995 appendix A6
Ceca 1 &2	Pala sa Murta / Ceca Cave	*In situ* and surface	*In situ* nodules <1cm	Absent	Reported and sourced by Francaviglia but no scatters found by Tykot	Tykot 1995, appendix A5
Unclear	Tu Passetti, Pira Inferta, S' Allostiraxiu, Rio Acqua Bella, Punta Feuraxi, Laccu sa Vitella, Trebina Lada, Conca sa Mesu	Perlite (dacite for last location) matrices	Not known	Not known	Locations sampled by geologists. Most fall in the source areas but contain only specks of obsidian, unsuitable for flaking.	Tykot 1995 (Tu Pasetti and Trebina Lada were not revisited).

Table 1. The different Sardinian source zones on the Monte Arci with the sampled locations and available information on matrices, extent of sources, nodules sizes, and associated cultural material.

APPENDIX 4.2.

Geological and archaeological samples from the *Riu Mannu* Survey Project for chemical sourcing.

Bag number	Location	Sample number	Selected for analysis
15	04-B	1	Yes
16	04-B	2	Yes
39	04-B	4	Yes
40	04-B	3	Yes
43	04-B	5	Yes
35	17-400	1	Yes
36	17-403	1	Yes
37	17-460	1	Yes
38	17-469	1	Yes
5	23-Mannu	1	Yes
6	23-Mannu	2	Yes
7	23-Mannu	3	Yes
8	23-Mannu	4	Yes
9	23-Mannu	5	Yes
10	23-Mogoro	1	Yes
11	23-Mogoro	3	Yes
12	23-Mogoro	5	Yes
13	23-Mogoro	4	Yes
14	23-Mogoro	2	Yes
34	23-Terralba sand	1	No
17	Bau Ortu	1	No
18	Bau Ortu	1	Yes
19	Bau Ortu	2	Yes
24	Mogoro alluvial	1	No
25	Mogoro alluvial	2	No
26	Mogoro alluvial	2	No
27	Mogoro alluvial	3	No
22	Mògoro east before split	1	Yes
23	Mògoro east before split	2	Yes
20	Mògoro west after split	1	Yes
21	Mògoro west after split	2	Yes
33	Narboni Mannu	2	Yes
41	Narboni Mannu	1	Yes
42	Narboni Mannu	3	Yes
28	Nuraghe Arrubiu	1	No
29	Nuraghe Arrubiu	1	No
30	Nuraghe Arrubiu	2	No
31	Nuraghe Margianiali	1	No
32	Nuraghe Margianiali	2	No
1	Serra Pontis	1	No
2	Serra Pontis	1	Yes
3	Serra Pontis	2	Yes
4	Serra Pontis	3	Yes

Table 1. Geological samples from the secondary Mògoro source zone.

Bag number	Find number	Selected for analysis
44	04.09144.p.03	Yes
45	04.08228.p.00	No
46	04.06141.p.14	Yes
47	04.09139.p.10	Yes
48	04.09138.v.90	Yes
49	04.09144.p.07	Yes
50	04.11142.p.13	Yes
51	04.06140.p.00	No
52	04.11142.p.11	No
53	04.08142.v.11	No
54	0410142.v.12	Yes
55	04.10142.v.13	Yes
56	04.05144.p.08	No
57	04.05153.p.02	Yes
58	04.09138.v.53	Yes
59	04.09138.v.91	Yes
60	04.09144.p.00	Yes
61	04.08142.p.01	Yes
62	04.08142.p.04	Yes
63	04.09144.p.13	No
64	04.11144.p.02	Yes
65	04.05142.v.07	Yes
66	04.07142.p.08	No
67	04.09139.p.12	No
68	04.08144.p.08	No
69	04.07142.p.07	No
70	04.09138.v.39	Yes
71	04.09138.v.86	No
72	04.09144.p.06	Yes
73	04.09144.p.10	Yes

Table 2. Archaeological artefacts from site 04-B.

APPENDIX 4.3.

Summary of recorded data for all *Riu Mannu* pseudo artefacts

Transect	Collection type	N	% (of total assemblage)	Maximum Dimension (in mm)				Weight (in gr)				Cortex percentages*					Condition#		
				MAX	AVG	MIN	STDEV	MAX	AVG	MIN	STDEV	0	1	2	3	4	0	1	2
02	QT	7	8.9%	62.45	33.78	22.60	14.14	68.00	19.14	5.00	24.13	-	1	-	6	-	6	1	-
	QL	21	12.3%	85.20	31.49	14.40	16.63	82.00	12.05	1.00	18.83	7	1	1	4	1	11	4	6
04	QT	26	3.2%	61.58	27.85	6.92	15.46	71.00	14.14	1.00	18.36	8	4	3	10	3	10	16	-
	QL	33	3.6%	74.32	38.36	25.43	11.42	104.00	16.58	4.00	18.96	18	6	3	5	1	6	23	4
07	QT	3	2.9%	32.50	27.48	17.53	8.61	6.00	3.00	1.00	2.65	1	-	-	1	-	-	3	-
	QL	5	2.3%	37.71	29.09	20.89	7.73	16.00	9.60	3.00	5.41	3	1	-	1	-	1	1	3
09	QT	11	9%	59.85	24.72	14.41	12.41	15.00	4.82	2.00	3.76	6	1	1	1	2	1	8	2
	QL	16	11.6%	80.76	30.92	17.28	16.10	52.00	9.13	2.00	13.04	13	-	1	2	-	1	11	4
10	QT	28	9.1%	54.87	29.66	19.25	9.21	89.00	8.82	1.00	16.41	18	3	6	-	1	2	25	1
	QL	10	2.1%	66.42	29.58	19.89	13.60	111.00	14.80	2.00	33.83	4	1	2	2	1	5	4	1
11	QT	80	47%	57.30	23.98	13.14	7.05	30.00	4.31	1.00	4.04	47	17	10	6	-	5	54	21
	QL	2	50%	24.85	22.23	19.61	3.71	3.00	3.00	3.00	-	1	-	-	1	-	-	2	-
12	QL	5	10.4%	28.08	25.08	17.70	4.23	6.00	4.80	3.00	1.30	3	-	-	1	1	3	1	1
14	QT	29	2.6%	35.87	22.06	13.08	5.71	14.00	3.20	1.00	2.60	16	5	2	3	-	6	23	-
	QL	8	1.7%	87.91	39.36	14.38	24.64	212.00	50.14	1.00	77.19	3	2	2	1	-	3	5	-
23	QT	14	12.2%	43.59	27.45	15.37	8.94	31.00	6.71	1.00	7.57	5	2	2	4	-	1	4	9
	QL	1	0.6%	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1

Table 1. Summary of recorded data for all studied pseudo artefacts.

* coding for cortex percentage: 0= non-cortical. 1= 1-25%. 2= 26-50%. 3=51-75%. 4=76-100%.
# coding for condition: 0= fresh. 1= abraded/water-rolled. 2= patinated.

APPENDIX 4.4.
Cornelio Puxeddu's Monte Arci survey

Municipalities	*Giacimenti*	*Centri raccolta*	*Officine*	*Stazioni*	*Lame*	*Bulini*	*Raschiatoi*	*Frecce*	Total tools
Ales	1	-	5	21	16	16	30	2	64
Arbus	-	-	-	3	-	-	-	-	-
Baressa	-	-	1	-	2	-	1	-	3
Curcuris	-	-	1	3	6	-	2	-	8
Gonnoscodina	-	-	-	3	1	4	5	1	11
Gonnosnò	-	-	1	-	3	2	5	1	11
Gonnostramatza	-	1	4	2	7	-	11	2	20
Guspini	-	-	-	29	-	-	-	-	-
Lunamatrona	-	-	-	5	-	-	-	-	-
Masullas	2	2	8	12	10	7	13	274	33
Mogoro	-	3	10	23	536	75	130	84	1015
Morgongiori	-	-	7	12	15	1	22	7	45
Pau	-	1	6	12	6	2	3	1	12
Pompu	1	-	3	7	5	2	2	1	10
S.Gav. Monreale	-	-	-	1	-	-	-	-	-
S. Ant. Santadi	-	-	5	14	10	3	5	2	20
Sardara	-	-	1	3	2	4	3	1	10
Siddi	-	-	1	-	2	3	2	1	8
Simala	-	3	6	17	16	7	2	1	26
Siris	-	-	3	4	3	2	4	1	10
Terralba	-	-	5	-	10	-	-	-	10
Uras	-	-	7	7	4	1	9	2	16
Usellus	-	-	1	2	-	-	4	10	14
Ussaramanna	-	-	-	2	-	-	-	-	-
Villanovaforru	-	-	1	-	2	-	-	-	2
Villaverde	-	1	7	10	3	1	3	-	7
Zeppara	-	-	1	-	2	1	2	-	5
Cabras	-	-	2	5	-	-	-	-	5890
Fordongianus	-	-	1	-	-	-	-	-	-
Marrubiu	1	-	1	11	6	6	22	2	36
Oristano	-	-	-	4	-	-	-	-	-
Nurachi	-	-	-	1	-	-	-	-	-
Palmas Arborea	-	-	-	5	-	-	-	-	-
Riola	-	-	-	1	-	-	-	-	-
Santa Giusta	-	-	-	11	-	-	-	-	-
Sili	-	-	-	1	-	-	-	-	-
Simaxis	-	-	1	-	-	-	-	-	-
Villaurbana	-	-	-	1	-	-	-	-	-
Total	5	11	89	232	667	137	280	312	7286

Table 1. Overview of number of sites (first four columns) and tool types (last five columns) for Monte Arci municipalities (after Puxeddu 1957; 1975).

APPENDIX 4.5.

Riu Mannu Survey Project: Raw material nodule sizes and cortex information for geological samples from primary and secondary source zones

Source locality	Source type	ID	length (mm)	width	thickness	weight (gr)	nodule description	Cortex %	cortex discription
SM Zuarbara	Secondary	A	53	41	25	48	Fragment	30	Dull, lightly battered
		B	37	21	19	15	Fragment	70	Dull, lightly battered
		C	31	26	20	13	Half nodule	95	Dull, lightly battered
09.–400	Secondary	A	104	93	77	859	Half nodule	10	Coarse, battered, grey/black
		B	167	99	70	1282	Nodule	100	Coarse, battered, grey/black
		C	65	46	45	147	Fragment	10	Coarse, battered, grey/black
		D	95	62	50	337	Fragment	40	Coarse, battered, grey/black
		E	125	80	68	670	Half nodule	90	Coarse, battered, grey/black
		F	43	37	16	28	Fragment	30	Coarse, battered, grey/black
		G	33	21	17	10	Fragment	0	Patinated
		H	52	45	35	86	Fragment	5	Coarse, battered, grey/black
		I	60	53	20	60	Fragment	60	Coarse, battered, grey/black
		J	105	78	52	494	Nodule	90	Coarse, battered, grey/black
Serra Pontis	Secondary	A	96	76	61	513	Nodule	100	Very coarse, heavily battered, grey/yellow
		B	135	92	77	959	Nodule	100	Very coarse, heavily battered, grey/yellow
		C	145	89	67	1022	Nodule	100	Very coarse, heavily battered, grey/yellow, banded
		D	113	65	38	320	Nodule	100	Very coarse, heavily battered, grey/yellow, banded
		E	150	62	37	296	Fragment	50	Very coarse, heavily battered, grey/yellow, banded
		F	108	92	75	805	Nodule	100	Very coarse, heavily battered, grey/yellow
		G	112	83	41	459	Nodule	95	Very coarse, heavily battered, grey/yellow
		H	99	73	66	513	Nodule	100	Very coarse, heavily battered, grey/yellow, banded
		I	97	63	44	294	Half nodule	90	Very coarse, heavily battered, grey/yellow
		J	91	86	55	492	Half nodule	95	Very coarse, heavily battered, grey/yellow
		K	65	56	38	139	Fragment	40	Very coarse, heavily battered, grey/yellow, banded
		L	102	91	63	584	Fragment	70	Very coarse, heavily battered, grey/yellow, banded

PAGE NUMBERING AS ORIGINAL

		M	96	79	58	450	Half nodule	80	Very coarse, heavily battered, grey/yellow, banded
		N	51	59	22	65	Scraper	25	Coarse, battered
		O	41	36	24	39	Fragment	40	very coarse, heavily battered, grey/yellow, banded
		P	102	69	49	417	Nodule	100	very coarse, heavily battered, grey/yellow
12.--125	Secondary	A	118	113	81	836	Fragment	40	Sandy
Conca Cannas	*Insitu*		120	40	23	130	in perlite matrix	0	
	Primary	A	106	69	56	615	Nodule	100	None
		B	86	74	58	559	Nodule	100	None
		C	102	92	66	791	Nodule	100	None
		D	89	67	56	316	Nodule	100	None
		E	139	80	62	583	Nodule	100	None
		F	82	61	54	305	Nodule	100	None
		G	136	40	40	302	Nodule	100	None
		H	134	53	43	280	Nodule	100	None
		I	57	28	13	18	Fragment	10	None
		J	51	16	15	19	Fragment	20	None
		K	81	59	15	50	Fragment	0	
		M	94	51	40	216	Fragment	100	None
			111	81	61	558	Nodule	100	None, smooth (oily) appearance
Perdas Urias	Primary	A	133	82	31	458	Half nodule	95	Coarse, battered, grey/yellow, banded
		B	120	60	42	313	Nodule	100	Coarse, battered, grey/yellow, banded
		C	84	82	48	406	Half nodule	95	Fine-grained, dark grey, banded
		D	95	76	45	428	Half nodule	95	Fine-grained, dark grey
		E	84	55	43	134	Fragment	40	Fine-grained, dark grey
		F	111	93	55	532	Half nodule	90	Fine-grained, dark grey
		G	85	52	40	156	Nodule	100	Fine-grained, dark grey, banded
		J	62	59	42	129	Nodule	100	Light patina
		K	48	43	25	55	Fragment	75	Light patina
		L	124	63	47	427	Nodule	100	Fine-grained, dark grey
09.--070	Secondary	A	97	61	46	295	Nodule	100	Coarse, sandy, dark

		B	54	38	21	48	Nodule	100	Coarse, sandy, dark
		C	65	50	38	111	Half nodule	95	Coarse, sandy, dark
Cuccur Porcufurau	Primary	A	72	46	40	146	Fragment	40	Pitted, grey-brown
		B	44	33	22	35	Fragment	60	Fine-grained, dark grey
		C	34	27	22	15	Half nodule	90	Fine-grained, dark grey
		D	42	30	23	33	Half nodule	100	Fine-grained, dark grey
		E	38	23	22	23	Fragment	20	Smooth patinated, dull, banded
		F	46	29	13	15	Fragment	20	Pitted, grey-brown
		G	30	22	19	15	Half nodule	40	Fine-grained, dark grey

APPENDIX 4.6.
Primary and secondary source cortex data.

Transect	Count/ Percentage	Total obsidian	All cortex types	Primary source cortex (types 3-4)	Secondary source cortex (types 1-2)	Flaked material with secondary source cortex	Raw material with secondary source cortex
02	N	171	75	19	57	46	11
	%		44.5	**25**	**75**	80.7	19.3
04	N	913	377	98	279	271	9
	%		41.3	26.5	73.5	97.2	2.8
05	N	24	11	3	8	8	-
	%		45.8	**27.2**	**72.8**	100	-
07	N	216	71	26	45	44	1
	%		32.9	36.6	63.4	97.7	2.3
09	N	138	47	10	37	36	1
	%		34.1	12.3	78.7	97.3	2.7
10	N	463	190	23	167	162	5
	%		41	12.1	87.9	97	3
11	N	4	3	-	3	2	1
	%		75	-	100	75	25
12	N	48	17	15	2	2	-
	%		35.4	**88.1**	**11.9**	100	-
13	N	58	15	8	7	7	-
	%		25.7	**53.4**	**46.6**	100	-
14	N	474	155	75	80	77	3
	%		32.7	**48.4**	**51. 6**	96.2	3.8
23	N	154	53	10	43	43	-
	%		34.4	18.9	81.1	100	-

Table 1. Primary (Types 3-4) and secondary (Types 1-2) source cortex for all qualitative finds. Figures in bold are discussed in the main text; see Section 4.3.1.

Transect		Primary technology			Secondary technology		Total
		Flakes	Cores	Chunks/Fragments	Retouched	Possibly retouched	
02	N	20	2	20	1	3	46
	%	43.5	4.3	43.5	2.2	6.5	100
04	N	150	20	50	23	28	271
	%	55.4	7.4	18.5	8.5	10.3	100
05	N	7	1	-	-	-	8
	%	87.5	12.5	-	-	-	100
07	N	21	3	17	1	2	44
	%	47.7	6.8	38.6	2.3	4.5	100
09	N	18	3	6	4	5	36
	%	50	8.3	16.7	11.1	13.9	100
10	N	93	5	43	7	14	162
	%	57.4	3.1	26.5	4.3	8.6	100
11	N	-	-	2	-	-	2
	%	-	-	100	-	-	100
12	N	1	-	1	-	-	2
	%	50	-	50	-	-	100
13	N	-	1	2	1	3	7
	%	-	14.3	28.6	14.3	42.9	100
14	N	25	4	21	17	10	77
	%	32.5	5.2	27.3	22.1	13	100
23	N	32	1	6	2	2	43
	%	74.4	2.3	14	4.7	4.7	100
Total	N	632	50	401	89	120	1292

Table 2. Quantities and percentage for all qualitative artefacts with secondary source cortex per artefact class.

	09.070	09.400	Conca Cannas	12.125*	Serra Pontis	Perdas Urias	Porcufurau	S.M. Zuarbara	total	%
	SA	SA	SA	green obsidian'	SC	SC	SB1	SB1		
group 0	0	13	8	4	3	10	0	3	37	67.3
group 1	0	16	0	4	3	9	1	0	29	52.7
group 2	0	6	6	4	5	8	0	0	25	45.5
group 3	0	14	8	4	3	4	0	3	32	58.2
total	2	18	10	4	5	12	5	3	55	100%

	all SA	%	all SB1	%	all SC	%
group 0	21	70.0	3	37.5	13	76.5
group 1	16	53.3	1	12.5	12	70.6
group 2	12	40.0	0	0	13	76.5
group 3	22	73.3	3	37.5	7	41.2
average	16	54.4	1	16.7	13	74.5
total	30	100%	8	100%	17	100%

group 0	Josara de Lange and author
group 1	Heleen Knikman Stoetman and Yvette van Groenendael
group 2	Karianne Winthagen
group 3	derivation of groups 0-2 by author

12.125	green obsidian
09.070	not recognised
09.400	milky, glossy black (0), grey, dull, glassy with mica (1), grey wihtout mica (2) black/grey glossy, milky or glassy with mica (3)
Conca Cannas	glossy, cloudy internal pattern (0), watery blackgrey with internal flows (1), glossy black with internal cloudy flow directions (3)
Porcufurau	dull, uncommon light grey banding, rest category (1)
Zuarbara	dull blackgrey, (0), dull deep black (1)
Serra Pontis	glossy, grey black, clear banding (0), banded, dull (1), banded (2), banded (3)
Perdas Urias	glossy, fine banded with mica (0), blackgrey glossy with mica (0), dull deep black (1), black with banding and mica (2), indeterminate (3)

artefact number	nodule number	source	obsidian type	colour	trans-lucency	patterning	inclusions	source Tykot characteristics	Source *Riu Mannu* characteristics
128	1	9,400	SA	black/grey	virtually	swirling	none	SA	SA
133	3	Conca Cannas	SA	black/grey	marginally	none	none	SA	SA
153	1	9,400	SA	grey	virtually	none	dots	SA	SA
207	1	9,400	SA	grey/black	virtually	none	none	SA	SA
253	1	9,400	SA	grey/black	virtually	none	dots	SA	SA
267	1	9,400	SA	black/grey	virtually	none	none	SA	SA
310	0	9,070	SA	black/grey	marginally	none	phenocrists	SA/SB	SA
321	3	Conca Cannas	SA	black/grey	marginally	diffuse banding	mica	SA/SC	SA
363	3	Conca Cannas	SA	black/grey	marginally	diffuse banding	mica	SA/SC	SA
402	1	9,400	SA	black/grey	marginally	swirling	mica	SA/SC	SA
420	3	Conca Cannas	SA	grey/black	virtually	swirling	dots	SA/SC	SA
426	1	9,400	SA	black/grey	virtually	none	none	SA	SA
463	3	Conca Cannas	SA	black/grey	virtually	diffuse banding	none	SA	SA
477	1	9,400	SA	black/grey	virtually	none	mica	SA	SA
509	3	Conca Cannas	SA	black/grey	marginally	swirling	none	SA	SA/SC
545	3	Conca Cannas	SA	grey/black	virtually	diffuse banding	dots	SA	SA
577	3	Conca Cannas	SA	black/grey	marginally	none	dots	SA	SA
582	3	Conca Cannas	SA	black/grey	marginally	swirling	mica	SA/SC	SA
645	3	Conca Cannas	SA	black/grey	marginally	diffuse banding	none	SA/SB	SA
682	1	9,400	SA	grey/black	marginally	none	dots	SA	SA
698	1	9,400	SA	black/grey	virtually	none	dots	SA	SA
710	1	9,400	SA	black/grey	virtually	none	none	SA	SA
713	1	9,400	SA	black/grey	marginally	none	mica	SA	SA
753	1	9,400	SA	black/grey	virtually	none	mica	SA	SA
854	1	9,400	SA	grey/black	virtually	none	none	SA	SA
904	0	9,070	SA	black/grey	marginally	none	none	SA	SA
958	1	9,400	SA	grey/black	virtually	none	dots	SA	SA
988	1	9,400	SA	black/grey	marginally	none	none	SA	SA
997	1	9,400	SA	black/grey	virtually	none	mica	SA	SA
15	5	Porcufurau	SB1	black/grey	none	diffuse banding	none	SC	SC/SB
75	5	Porcufurau	SB1	black/grey	none	none	none	SB	SB
205	6	S.M. Zuarbara	SB1	black/grey	none	none	none	SB	SB
428	6	S.M. Zuarbara	SB1	black	none	none	phenocrists	SB	SC/SB

499	5	Porcufurau	SB1	black/grey	none	none	phenocrists	SB	SB
599	5	Porcufurau	SB1	black/grey	none	none	phenocrists	SB	SB
781	6	S.M. Zuarbara	SB1	black/grey	none	none	phenocrists	SB	SB
814	5	Porcufurau	SB1	grey	none	well defined banding	none	SC	SC
42	4	Perdas Urias	SC	black	none	diffuse banding	none	SC	SC/SB
134	1	9,400	SC	black	marginally	none	none	SA	SC/SA
153	4	Perdas Urias	SC	black/grey	none	none	phenocrists	SB	SB
223	4	Perdas Urias	SC	black	none	diffuse banding	mica	SC	SC
362	4	Perdas Urias	SC	black	marginally	none	none	SA	SC/SA
388	4	Perdas Urias	SC	black	none	diffuse banding	mica	SC	SC
516	4	Perdas Urias	SC	black/grey	marginally	well defined banding	none	SA/SC	SA
528	4	Perdas Urias	SC	black	none	none	none	SC/SB	SC/SB
531	4	Perdas Urias	SC	black	none	none	mica	SC/SB	SC/SB
644	4	Perdas Urias	SC	black	none	none	mica	SC/SB	SC/SB
804	4	Perdas Urias	SC	black	none	none	none	SC/SB	SC/SB
864	4	Perdas Urias	SC	black	none	none	none	SC/SB	SC/SB
893	4	Perdas Urias	SC	black	none	none	mica	SC/SB	SC/SB
65	7	Serra Pontis	SP	black	none	well defined banding	none	SC	SC
311	7	Serra Pontis	SP	black	none	well defined banding	none	SC	SC
438	7	Serra Pontis	SP	black	none	well defined banding	none	SC	SC
825	7	Serra Pontis	SP	black	none	well defined banding	phenocrists	SC/SB	SC
828	7	Serra Pontis	SP	black	none	well defined banding	none	SC	SC

Count of artefact	colour				
obsidian	black	black/grey	grey	grey/black	Grand Total
SA		21	1	7	29
SB1	1	6	1		8
SC	11	2			13
SP	5				5
Grand Total	17	29	2	7	55

Count of artefact	trans-			
obsidian	marginally	none	virtually	Grand Total
SA	13		16	29
SB1		8		8
SC	3	10		13
SP		5		5
Grand Total	16	23	16	55

Count of artefact	patterning				
obsidian	diffuse banding	none	swirling	well defined banding	Grand Total
SA	5	19	5		29
SB1	1	6		1	8
SC	3	9		1	13
SP				5	5
Grand Total	9	34	5	7	55

Count of artefact	inclusions				
obsidian	dots	mica	none	phenocrists	Grand Total
SA	8	8	12	1	29
SB1			4	4	8
SC		5	7	1	13
SP			4	1	5
Grand Total	8	13	27	7	55

Count of artefact	
obsidian	Total
SA	29
SB1	8
SC	13
SP	5
Grand Total	55

		SA	SB1	SC	SP
colour	black	0	1	11	5
	black/grey	28	6	2	0
	grey	1	1	0	0
transluceny	none	0	8	10	5
	marginal	13	0	3	0
	v. complete	16	0	0	0
patterning	none	19	6	9	0
	dffiuse banding	5	1	3	0
	swirling	5	0	0	0
	well defined banding	0	0	0	5
inclusions	none	12	4	7	4
	spotted/dotted	8	0	0	0
	mica*	8	0	5	0
	phenocrists	1	4	1	1

* note: mica later dropped as category, and internal banding added in inclusion category

Count of artefact		Source 2							
obsidian	source Tykot	SA	SA/SC	SB	SC	SC	SC/SA	SC/SB	Grand Total
SA	SA	21	1						22
	SA/SB	2							2
	SA/SC	5							5
SA Total		28	1						29
SB1	SB			5				1	6
	SC				1			1	2
SB1 Total				5	1			2	8
SC	SA						2		2
	SA/SC	1							1
	SB			1					1
	SC				2			1	3
	SC/SB							6	6
SC Total		1		1	2		2	7	13
SP	SC				3	1			4
	SC/SB				1				1
SP Total					4	1			5
Grand Total		29	1	6	7	1	2	9	55

APPENDIX 4.8.
Visual characterisation results for analysed *Riu Mannu* transects

Transect		Proposed obsidian types							Total
		SA	SA?	SA/SB2	SA/SB?	SC	SC?	SC/SB1	
02	Flaked	-	6	9	-	2		17	34
	Debris	-	4	10	-	2	3	6	25
	Unworked	-	4	-	-	2	1	-	7
02 Total		**-**	**14**	**19**	**-**	**6**	**4**	**23**	**66**
05	Flaked	-	5	5	-	1	-	3	14
	Debris	-	1	-	-	1	-	-	2
05 Total		**-**	**6**	**5**	**-**	**2**	**-**	**3**	**16**
04	Flaked	40	76	92	25	101	11	44	389
	Debris	30	42	37	12	29	5	48	203
	Unworked	-	11	1	1	1	2	3	19
04 Total		**70**	**129**	**130**	**38**	**131**	**18**	**95**	**611**
07	Flaked	-	15	10	-	3	2	14	44
	Debris	-	10	8	-	1	-	10	29
	Unworked	-	-	-	-	-	-	1	1
07 Total		**-**	**25**	**18**	**-**	**4**	**2**	**25**	**74**
09	Flaked	9	3	25	4	-	1	-	42
	Debris	6	4	15	1	2	-	-	28
	Unworked	-	1	-	-	-	-	-	1
09 Total		**15**	**8**	**40**	**5**	**2**	**1**	**-**	**71**
13	Flaked	-	-	-	-	-	-	1	1
13 Total		**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**
23	Flaked	16	12	7	5	14	-	10	64
	Debris	1	7	5	1	5	-	5	24
	Unworked	-	5	-	6	-	-	1	12
23 Total		17	24	12	12	19		16	100
10	Flaked	6	20	16	5	30	1	27	105
	Debris	7	23	13	6	31	-	31	111
	Unworked	-	6	-	-	3	-	3	12
10 Total		**13**	**49**	**29**	**11**	**64**	**1**	**61**	**228**
11	Flaked	2	1	5	-	4		2	14
	Debris	4	4	14	-	14	1	26	63
	Unworked	-	20	8	-	8	1	11	48
11 Total		**6**	**25**	**27**	**-**	**26**	**2**	**39**	**125**
12	Flaked	2	-	-	2	-	-	1	5
	Debris	1	-	-	-	1	-	-	2
12 Total		**3**	**-**	**-**	**2**	**1**	**-**	**1**	**7**
Total		124	280	280	68	255	28	264	1299

Table 1. Quantitative artefacts (divided into unworked, flaked and debris). Data transect 14 not available.

		SA	SA/SB	SC	SC/SB	Total
02	Flaked	17	12	11	19	59
	Debris	25	4	9	16	54
	Unworked	7	-	3	1	11
	Total N	49	16	23	36	124
	%	39.5	12.9	18.5	29.0	
05	Flaked	4	3	7	4	18
	Debris	1	-	-	1	2
	Total N	5	3	7	5	20
	%	25	15	35	25	
04	Flaked	115	198	229	76	618
	Debris	47	21	30	22	120
	Unworked	14	1	4	-	19
	Total N	176	220	263	98	757
	%	30.6	29.1	34.7	12.9	
07	Flaked	39	39	22	19	119
	Debris	20	5	8	11	44
	Unworked	4	-	-	-	4
	Total N	63	44	30	30	167
	%	37.7	26.3	18	18	
09	Flaked	25	40	1	2	68
	Debris	11	19	3	2	35
	Unworked	3	3	-	-	6
	Total N	39	62	4	4	109
	%	35.0	57.3	3.9	3.9	
13	Flaked	10	14	7	10	41
	Debris	-	-	1	3	4
	Total N	10	14	8	13	45
	%	22.2	31.1	17.8	28.9	
23	Flaked	38	28	31	13	110
	Debris	9	2	4	1	16
	Unworked	1	-	-	-	1
	Total N	48	30	35	14	127
	%	37.8	23.6	27.6	11	
10	Flaked	63	33	106	50	252
	Debris	34	15	47	50	146
	Unworked	2	3	-	1	6
	Total N	99	51	153	101	404
	%	24.4	12.3	38.4	25.1	
11	Debris	1	-	-	-	1
	Unworked	-	1	-	-	1
	Total N	1	1	-	-	2
	%	50	50	-	-	
12	Flaked	7	13	2	2	24
	Debris	12	5	-	2	19
	Unworked	1	4	-	-	5
	Total N	20	22	2	4	48
	%	44.2	46.3	4.7	9.3	
Total		510	463	525	305	1803

Table 2. Qualitative artefacts (divided into unworked, flaked and debris). Data transect 14 not available.

APPENDIX 5.1. Find quantities and contexts of all Riu Mannu cores

Transect	Associated with	Collection type	Raw material	Number of finds
02	02-A	QL	Obsidian	2
	02-a*	QL	Obsidian	1
	02-B	QT	Obsidian	1
	02-B off-site?	QL	Obsidian	1
	02-A-B off site?	QL	Obsidian	2
	02-D	QT	Obsidian	1
	Isolated find	QL	Obsidian	1
04	04-B	QL	Flint	2
	04-B	QL	Obsidian	15
	04-B (revisits)	QL	Obsidian	10
	04-B (revisits)	QL	Flint	1
	04-B	QT	Obsidian	8
	Off-site 04-B	QT	Obsidian	1
	04-C	QL	Obsidian	1
	04-c	QL	Flint / green obsidian	2
	04-c	QL	Obsidian	4
	Isolated find	QT	Obsidian	3
	Isolated find	QL	Obsidian	2
05	05-C	QL	Obsidian	1
	05-D	QL	Obsidian	1
07	07-B	QL	Obsidian	1
	07-B off site	QL	Obsidian	2
	07-B off site	QL	Flint	1
	07-D/E	QL	Obsidian	1
	07-D/E	QT	Obsidian	3
	07-F	QL	Obsidian	1
	07-J*	QL	Obsidian	1
09	09-A	QL	Obsidian	6
	09-A	QL	Flint	1
10	10-A	QT	Flint	1
	10-A	QL	Obsidian	1
	10-B	QL	Obsidian	3
	10-B	QT	Flint	1
	10-B	QT	Obsidian	1
	Isolated find	QT	Obsidian	3
	Isolated find	QL	Obsidian	1
	10-C	QL	Obsidian	2
	10-C	QL	Flint/quartz	1
13	13-A*	QL	Obsidian	1
	13-B*	QL	Obsidian	1
	13-C*	QL	Obsidian	2
	Isolated find	QL	Obsidian	1
14	14-a	QT	Obsidian	2
	14-B	QL	Obsidian	13
	14-B	QT	Obsidian	14
	Off-site 14-B?	QT	Obsidian	1
	14-b*	QL	Obsidian	1

	14-D*	QL	Obsidian	1
	14-E*	QL	Obsidian	1
	14-f	QT	Obsidian	2
	Isolated finds	QT	Obsidian	3
	Isolated finds	QL	Obsidian	2
23	23-C	QL	Obsidian	2
	Isolated finds	QT	Obsidian	2
	Isolated finds	QL	Obsidian	1

In red: Qualitative finds (QT)
In black: Quantitative finds (QL)
Asterix: Qualitative sites collected outside the main grid

APPENDIX 5.2.
Find quantities and contexts of all *Riu Mannu* core rejuvenation flakes

Transect	Associated with	Collection type	Raw material	Number
02	02-D off site	QT	Obsidian	1
	02-C-B off site	QT	Obsidian	2
	02-B	QL	Obsidian	1
	02-C	QL	Obsidian	1
	02-C-B off site	QL	Obsidian	1
	Isolated find	QL	Obsidian	1
04	04-b	QT	Obsidian	1
	04-B	QT	Obsidian	3
	04-c	QT	Obsidian	2
	04-B	QL	Obsidian	11
	04-B (revisit)	QL	Obsidian	1
	04-c	QL	Obsidian	5
	04-C	QL	Obsidian	1
07	Isolated find	QT	Obsidian	1
	07-J off site	QT	Obsidian	1
	07-D/E	QL	Obsidian	1
	07-J*	QL	Obsidian	1
	07-J off site	QL	Obsidian	1
09	09-b	QT	Obsidian	1
	09-A	QL	Obsidian	1
10	10-B	QT	Obsidian	1
	10-B	QL	Obsidian	1
12	12-a	QL	Flint	1
	12-a	QL	Obsidian	3
13	13-C*	QL	Obsidian	2
14	14-E off site	QT	Obsidian	1
	14-d	QT	Obsidian	2
	14-B	QT	Obsidian	13
	14-B off site	QT	Obsidian	1
	14-e	QT	Obsidian	1
	14-a	QL	Obsidian	1
	14-B off site	QL	Obsidian	1
	14-B	QL	Obsidian	6
	14-B revisit	QL	Obsidian	1
23	23-B	QL	Obsidian	1

In red: Qualitative finds (QT)
In black: Quantitative finds (QL)
Asterix: Qualitative sites collected outside the main grid

APPENDIX 5.3.

Find quantities and contexts of all *Riu Mannu* flakes and blades

Transect	Associated with	Collection type	Raw material	Flakes	Blades
02	02-A	QT	Obsidian	1	-
	02-B	QT	Obsidian	9	-
	02-A-B off site	QT	Obsidian	5	-
	02-C-B off site	QT	Obsidian	3	-
	Isolated find	QT	Obsidian	8	2
	02-A	QL	Obsidian	9	1
	02-a*	QL	Obsidian	-	1
	02-B	QL	Obsidian	11	-
	02-B	QL	Flint	1	-
	02-A-B off site?	QL	Obsidian	7	-
	02-C	QL	Obsidian	2	1
	02-C-B off site	QL	Obsidian	7	-
	02-C-B off site	QL	Other	1	-
	02-D	QL	Obsidian	1	-
	Isolated find	QL	Obsidian	13	2
04	04-B	QT	Obsidian	149	38
	04-B	QT	Flint	7	2
	Off-site 04-B	QT	Obsidian	34	3
	04-b	QT	Obsidian	7	1
	04-c	QT	Obsidian	25	6
	04-c	QT	Flint/quartz	4	-
	04-C	QT	Obsidian	5	2
	04-D	QT	Obsidian	8	2
	04-C-D off site	QT	Obsidian	3	1
	Isolated find	QT	Obsidian	41	4
	04-B	QL	Flint/Green 'obsidian'	8	1
	04-B	QL	Obsidian	114	60
	04-B off site	QL	Obsidian	33	5
	04-B off site	QL	Flint	8	-
	04-B (revisits)	QL	Obsidian	37	21
	04-B (revisits)	QL	Flint	1	2
	04-b	QL	Obsidian	3	-
	04-c	QL	Flint / green obsidian	5	-
	04-c	QL	Obsidian	92	22
	04-C	QL	Obsidian	10	1
	04-D	QL	Obsidian	5	1
	04-C-D off site	QL	Obsidian	1	-
	Isolated find	QL	Obsidian	26	6
	Isolated find	QL	Flint/quartz	2	-
05	05-D	QT	Obsidian	7	4
	05-D off site	QT	Obsidian	1	-
	Isolated find	QT	Obsidian	1	2
	05-A	QL	Obsidian	1	-
	05-C	QL	Obsidian	3	-
	05-C off site	QL	Obsidian	4	-
	05-C	QL	Flint	1	-

	05-D	QL	Obsidian	4	2
	Isolated find	QL	Obsidian	2	-
07	07-B	QT	Obsidian	2	-
	07-B off site	QT	Obsidian	5	-
	07-D/E	QT	Obsidian	9	2
	07-D/E off site	QT	Obsidian	8	-
	07-D/E	QT	Flint	2	-
	07-F	QT	Obsidian	4	1
	07-J off site	QT	Obsidian	7	1
	07-B	QL	Obsidian	6	2
	07-C	QL	Obsidian	1	1
	07-B off site	QL	Obsidian	10	-
	07-D/E	QL	Obsidian	22	-
	07-D/E off site	QL	Obsidian	4	1
	07-D/E off site	QL	Obsidian	4	1
	07-F	QL	Obsidian	2	2
	07-J*	QL	Obsidian	25	2
	07-J* (revisit)	QL	Obsidian	16	-
	07-J off site	QL	Obsidian	9	-
	Isolated find	QL	Obsidian	3	-
09	09-A	QT	Obsidian	17	-
	09-A off site	QT	Obsidian	1	-
	09-b	QT	Obsidian	10	1
	Isolated	QT	Obsidian	2	-
	09-a*	QL	Obsidian	8	-
	09-A	QL	Obsidian	20	3
	09-A off site	QL	Obsidian	2	-
	09-b	QL	Obsidian	5	-
	Isolated	QL	Obsidian	4	-
10	10-A*	QT	Flint/Quartz	1	-
	10-A	QT	Obsidian	6	
	10-a	QT	Obsidian	4	-
	10-B	QT	Flint/Quartz	8	-
	10-B	QT	Obsidian	42	-
	10-B off site	QT	Obsidian	7	-
	10-C	QT	Obsidian	23	1
	10-C	QT	Flint/Quartz	3	1
	10-C off site	QT	Obsidian	1	1
	10-C off site	QT	Flint/Quartz	1	-
	Isolated find	QT	Obsidian	8	-
	Isolated find	QT	Flint/Quartz	1	-
	10-a	QL	Obsidian	3	-
	10-A*	QL	Obsidian	12	-
	10-A	QL	Flint	1	-
	10-B	QL	Obsidian	121	3
	10-B	QL	Flint	15	-
	10-B off site	QL	Obsidian	13	1
	10-B off site	QL	Flint/Quartz	1	-
	10-C	QL	Obsidian	35	-
	10-C	QL	Flint/quartz	3	-
	10-C off site	QL	Obsidian	5	-

	Isolated find	QL	Obsidian	3	-
	Isolated Find	QL	Flint	2	-
11	11-a	QT	Obsidian	12	-
	11-b	QT	Obsidian	1	-
	11-b	QT	Flint	2	1
12	12-a	QL	Obsidian	9	6
	Isolated	QL	Obsidian	5	-
	Isolated	QL	Flint	1	-
	Isolated	QT	Obsidian	4	1
13	Isolated	QT	Obsidian	-	1
	13-a*	QL	Obsidian	3	-
	13-B*	QL	Obsidian	3	1
	13-C*	QL	Obsidian	16	6
	Isolated find	QL	Obsidian	2	-
14	14-a	QT	Obsidian	2	-
	14-B	QT	Obsidian	342	4
	Off-site 14-B?	QT	Obsidian	7	1
	14-d	QT	Obsidian	10	-
	14-e	QT	Obsidian	30	-
	14-f	QT	Obsidian	4	-
	Isolated finds	QT	Obsidian	4	1
	14-B	QT	Flint	2	-
	14-e	QT	Flint	1	-
	14-b*	QL	Obsidian	10	-
	14-c*	QL	Obsidian	9	-
	14-C*	QL	Obsidian	8	-
	14-D*	QL	Obsidian	10	-
	14-E*	QL	Obsidian	1	-
	14-a	QL	Obsidian	5	-
	14-B	QL	Obsidian	100	2
	14-B revisit	QL	Obsidian	2	-
	14-B	QL	Flint/Other	1	1
	14-D*	QL	Flint/Other	2	-
	14-d	QL	Obsidian	12	-
	14-e	QL	Flint/Other	3	-
	14-e	QL	Obsidian	3	-
	Isolated finds	QL	Obsidian	7	-
23	23-A	QT	Obsidian	2	1
	23-B	QT	Obsidian	5	5
	23-B	QT	Green 'obsidian'	1	-
	23-C	QT	Obsidian	7	1
	23-C off site	QT	Obsidian	10	-
	23-C off site	QT	Flint	1	-
	23-D	QT	Obsidian	10	-
	23-D off site	QT	Obsidian	7	-
	Isolated finds	QT	Obsidian	15	1
	23-A	QL	Obsidian	1	2
	23-B	QL	Obsidian	17	2
	23-C	QL	Obsidian	15	11
	23-C off site	QL	Obsidian	12	4
	23-D	QT	Obsidian	8	6

	23-D	QT	Flint	1	-
	23-D off site	QT	Obsidian	-	3
	Isolated finds	QL	Obsidian	21	3

In red: Qualitative finds (QT)
In black: Quantitative finds (QL)
Asterix: Qualitative sites collected outside the main grid

APPENDIX 5.4.
Find quantities and contexts of all *Riu Mannu* debris

Transect	Associated with	Collection Type	Raw material	Debris
02	02-A	QT	Obsidian	4
	02-B	QT	Obsidian	9
	02-C	QT	Obsidian	3
	02-B-C off site	QT	Obsidian	2
	02-D	QT	Obsidian	2
	Isolated find	QT	Obsidian	14
	02-a	QL	Obsidian	10
	02-A	QL	Obsidian	13
	02-A-B off site	QL	Obsidian	4
	02-B	QL	Obsidian	21
	02—B-C off site	QL	Obsidian	8
	02-C	QL	Obsidian	14
	Isolated find	QL	Obsidian	5
04	04-a	QT	Obsidian	9
	04-b	QT	Obsidian	13
	04-B	QT	Flint	2
	04-B	QT	Obsidian	217
	04-B off site	QT	Obsidian	39
	04-B off site	QT	Flint	2
	04-c	QT	Obsidian	26
	04-C	QT	Obsidian	1
	04-C-D off site	QT	Obsidian	2
	04-D	QT	Obsidian	2
	Isolated find	QT	Flint / quartz	2
	Isolated find	QT	Obsidian	14
	04-b	QL	Obsidian	8
	04-B	QL	Obsidian	98
	04-B	QL	Flint	1
	04-B revisit	QL	Obsidian	31
	04-B revisit	QL	Flint/ Quartz	2
	04-c	QL	Obsidian	19
	04-c	QL	Flint / quartz	3
	04-C	QL	Obsidian	2
	04-D	QL	Obsidian	1
	Isolated find	QL	Obsidian	19
	Isolated find	QL	Flint / quartz	1
05	05-A	QT	Obsidian	1
	05-C	QT	Obsidian	1
	05-C off site	QT	Obsidian	1
	05-C off site	QL	Obsidian	2
	05-D	QL	Obsidian	1
07	07-B	QT	Obsidian	1
	07-B off site	QT	Obsidian	6
	07-C off site	QT	Obsidian	3
	07-D/E	QT	Obsidian	4
	07-D/E off site	QT	Obsidian	16
	07-F	QT	Obsidian	9
	07-J off site	QT	Obsidian	9
	Isolated find	QT	Obsidian	3
	07-B	QL	Obsidian	2

	07-B off site	QL	Obsidian	15
	07-B off site	QL	Other	1
	07-C	QL	Obsidian	1
	07-D/E	QL	Obsidian	20
	07-D/E off site	QL	Obsidian	8
	07-F	QL	Obsidian	1
	07-G*	QL	Obsidian	1
	07-J*	QL	Obsidian	7
	07-J* revisit	QL	Obsidian	2
	07-J off site	QL	Obsidian	9
09	09-A	QT	Obsidian	39
	09-A off site	QT	Obsidian	6
	09-b	QT	Obsidian	11
	Isolated find	QT	Obsidian	4
	09-a*	QL	Obsidian	14
	09-A	QL	Obsidian	26
	09-A	QL	Flint/ quartz	1
	09-b	QL	Obsidian	4
	Isolated find	QL	Obsidian	3
10	10-a	QT	Flint	1
	10-a	QT	Obsidian	8
	10-A	QT	Obsidian	15
	10-B	QT	Obsidian	71
	10-B	QT	Flint / quartz	5
	10-B off site	QT	Obsidian	4
	10-B off site	QT	Flint	1
	10-C off site	QT	Obsidian	2
	10-C	QT	Obsidian	32
	Isolated find	QT	Obsidian	34
	Isolated find	QT	Flint / quartz	2
	10-a	QL	Obsidian	1
	10-A	QL	Obsidian	3
	10-B	QL	Obsidian	107
	10-B	QL	Flint / quartz	2
	10-B off site	QL	Obsidian	13
	10-B off site	QL	Flint / quartz	3
	10-C	QL	Obsidian	36
	10-C	QL	Flint / quartz	1
	10-C off site	QL	Obsidian	9
	Isolated find	QL	Obsidian	7
	Isolated find	QL	Flint / quartz	2
11	11-a	QT	Obsidian	35
	11-a	QT	Flint	1
	11-b	QT	Obsidian	19
	Isolated find	QT	Obsidian	20
	Isolated find	QT	Flint	1
	Isolated find	QL	Obsidian	2
12	Isolated find	QT	Obsidian	2
	12-a	QL	Obsidian	15
	Isolated find	QL	Obsidian	4
13	13-B*	QL	Obsidian	1
	13-C*	QL	Obsidian	7
	Isolated find	QL	Obsidian	1

14	14-a	QT	Obsidian	5
	14-a	QT	Other	1
	14-B	QT	Obsidian	461
	14-B	QT	Flint	1
	14-B off site	QT	Obsidian	9
	14-d	QT	Obsidian	11
	14-e	QT	Obsidian	30
	14-f	QT	Obsidian	17
	14-f	QT	Other	1
	Isolated find	QT	Obsidian	11
	14-a	QL	Obsidian	8
	14-B	QL	Obsidian	93
	14-B	QL	Flint / quartz	1
	14-B revisit	QL	Obsidian	2
	14-b*	QL	Obsidian	1
	14-c*	QL	Obsidian	6
	14-d	QL	Obsidian	6
	14-e	QL	Obsidian	12
	14-E*	QL	Obsidian	3
	14-f	QL	Obsidian	3
	Isolated find	QL	Obsidian	3
23	23-A	QT	Obsidian	1
	23-B	QT	Obsidian	5
	23-C	QT	Obsidian	14
	23-C off site	QT	Obsidian	4
	23-D	QT	Obsidian	5
	23-D off site	QT	Obsidian	1
	Isolated find	QT	Obsidian	3
	23-A	QL	Obsidian	1
	23-B	QL	Obsidian	4
	23-C	QL	Obsidian	11
	23-C off site	QL	Obsidian	6
	Isolated find	QL	Obsidian	6

In red: Qualitative finds (QT)
In black: Quantitative finds (QL)
Asterix: Qualitative sites collected outside the main grid

APPENDIX 5.5.
Quantities and find context for all blade and flake knapping strategies on cores.

Chaîne opératoire	Number	Finds context
SINGLE-STAGE CORES (n=24)		
Platform (1)	13	04-B (7), 10-a (1), 13-A (1), 13-B (1), 14-B (1), 23-C (1), 04-isolated (1)
Platform mixed flake/blade (2)	9	02-D (1), 04-B (6), 07-D/E (1), 07-F (1).
Bipolar (5)	2	04 isolated finds

Chaîne opératoire	Stage	Type of removals remaining stages*	Finds context
DOUBLE-STAGE CORES (n=7)			
Platform mixed flake/blade (2)	1	Stage 2: Bipolar flake (3)	07-J, 07-D/E, 09-A
Platform (3)	1-2	-	14-b
Bipolar (5)	1	Stage 2: Bipolar flake (3)	04 isolated find
Ad hoc mixed flake/blade (6)	1	Stage 2: Bipolar flake (3)	02 A-B off-site
Ad hoc (7)	1-2	-	10-B
MULTI-STAGE CORES (n=6)			
Platform (1)	2	Stage 1: Platform possible flake (3) Stage 3: Platform mixed flake/blade (2)	04-B
Platform (1)	5	Stage 1: Platform possible flake (2) Stage 2-4: Platform flake (9) Stage 6: Ad hoc possible flake (7)	10-B
Platform (1)	3	Stage 1, 6: Ad hoc possible flake (7) Stage 2, 4-5: Platform possible flake (2, 10)	23 isolated find
Platform (1)	3, 5	Stage 1: Platform flake (1) Stage 2: Platform possible flake (2) Stage 4, 6-7: Bipolar flake (3)	14-B
Platform (3)	1-2	Stage 3: Bipolar flake (3)	04-B
Platform (4)	2-3	Stage 1: Platform flake (1)	23 isolated find

Table 1: Knapping strategies for blade production

Chaîne opératoire	Number	Finds context
SINGLE-STAGE CORES (n=49)		
Platform (1)	8	04-B (3), 09-A (1), 10-B (2), 10-C (1), 10-isolated (1)
Platform possible flake (2)	1	13-C
Bipolar (3)	36	02-A (1), 02-a (1), 02-A/B off site (1), 02-B (1), 04-B (5), 04-c (4), 05-C (1), 07-B (2),)7-D/E (2), 09-A (2), 10-a (1), 10-B (1), 14-a (1), 14-B (7), 14-c (1), 14-e (1), isolated in 04, 10,13 14 (4).
Ad hoc flake (4)	4	04-B (3), 23-isolated (1)

Chaîne opératoire	Stage	N	Type of removals other stages*	Finds context
DOUBLE-STAGE CORES (n=25)#				
Platform (5)	1-2	2	-	14-B (1), 23-C (1)
Bipolar (6)	1-2	18	-	02-A (1), 02-isolated (1), 02-C/D off site (1), 04-B (6), 04-c (1), 04-C (1), 10-B (1), 14-B (6)
Platform (1)	1	3	Stage 2: bipolar flake (3)	04-B (1), 07-B (1), 10-isolated (1)
Bipolar (3)	1	1	Stage 2: platform flake (1)	13-C
Platform, possible flake (4)	1	1	Stage 2: Bipolar flake (3)	05-D (1)
MULTI-STAGE CORES (n=4)				
Platform flake (1)	1	1	Stage 2-3: bipolar (6)	04-B
Platform (1)	1	1	Stage 2: Ad hoc flake (4) Stage 3: Ad hoc possible flake (7)	09-A
Platform (5)	1-2	1	Stage 3: Ad hoc flake (4)	14-D
Ad hoc flake (4, 8)	1, 3-5	1	Stage 2: Ad hoc possible flake (7) Stage 6-7: Platform flake (5)	09-A

Table 2: Knapping strategies for flake production. *excluding cores with flake and blade strategies (see table 1).

Numbers in parenthesis in first column refer to knapping strategies, those in third column refer to knapping strategies for flake production.

Appendix 5.6.
Quantities and find context for all *chaîne opératoires*, variations and unique knapping strategies on *Riu Mannu* cores

Transect	Associated with	Type	n cores	Classification summary
02	02-A	Single-stage bipolar flake	1	Chaîne opératoire
	02-A	Double-stage bipolar flake	1	Chaîne opératoire
	02-a*	Single-stage bipolar flake	1	Chaîne opératoire
	02-A-B off site	Single-stage bipolar flake	1	Chaîne opératoire
	02-B	Single-stage bipolar flake	1	Chaîne opératoire
	02-C-D off site	Double-stage bipolar flake	1	Chaîne opératoire
	02-D	Single-stage platform mixed	1	Chaîne opératoire
	Isolated	Double-stage bipolar flake	1	Chaîne opératoire
	02-A-B off site	Double-stage bipolar flake & ad hoc mixed flake/blade	1	Unique knapping strategy
04	04-B	Single-stage bipolar flake	5	Chaîne opératoire
	04-B	Single-stage platform blade	7	Chaîne opératoire
	04-B	Single-stage platform mixed	5	Chaîne opératoire
	04-B	Single-stage platform flake	3	Chaîne opératoire
	04-B	Double-stage bipolar	5	Chaîne opératoire
	04-B off site	Double-stage bipolar	1	Chaîne opératoire
	04-c	Single-stage bipolar flake	4	Chaîne opératoire
	04-C	Double-stage bipolar	2	Chaîne opératoire
	Isolated	Single-stage bipolar flake	1	Chaîne opératoire
	Isolated	Single-stage platform blade	1	Chaîne opératoire
	04-B	Multi-stage: platform flake & double-stage bipolar flake	1	Unique knapping strategy
	04-B	Multi-stage: double-stage platform blade & one stage bipolar flake	1	Unique knapping strategy
	04-B	Multi-stage: platform possible flake, platform blade, platform mixed flake/blade	1	Unique knapping strategy
	04-B off site	Multi-stage: Double-stage platform flake & ad hoc flake	1	Unique knapping strategy
	Isolated	Single-stage bipolar blade	2	Unique knapping strategy
	Isolated	Double-stage bipolar flake and blade	1	Unique knapping strategy
	04-B	Single-stage ad hoc flake	3	Variation
	04-B	Double-stage platform flake & bipolar	1	Variation

05	05-C	Single-stage bipolar flake	1	Chaîne opératoire
	05-D	Double-stage platform possible flake & bipolar	1	Unique knapping strategy
07	07-B	Single-stage bipolar flake	1	Chaîne opératoire
	07-B off site	Single-stage bipolar flake	1	Chaîne opératoire
	07-D/E	Single-stage bipolar flake	2	Chaîne opératoire
	07-D/E	Single-stage platform mixed flake/blade	1	Chaîne opératoire
	07-F	Single-stage platform mixed flake/blade	1	Chaîne opératoire
	07-B off site	Double-stage platform flake & bipolar	1	Variation
	07-D/E	Double-stage platform mixed and bipolar	1	Variation
	07-J*	Double-stage platform flake and mixed flake/blade	1	Variation
09	09-A	Single-stage bipolar flake	2	Chaîne opératoire
	09-A	Single-stage platform flake	1	Chaîne opératoire
	09-A	Multi-stage: platform flake, ad hoc flake and possible flake	1	Unique knapping strategy
	09-A off site	Multi-stage: platform flake, ad hoc flake and possible flake	1	Unique knapping strategy
	09-A	Double-stage platform mixed and bipolar	1	Variation
10	10-a	Single-stage bipolar flake	1	Chaîne opératoire
	10-a	Single-stage platform blade	1	Chaîne opératoire
	10-B	Single-stage bipolar flake	1	Chaîne opératoire
	10-B	Single-stage platform flake	1	Chaîne opératoire
	10-B	Single-stage platform flake	1	Chaîne opératoire
	10-B	Double-stage bipolar flake	1	Chaîne opératoire
	10-C	Single-stage platform flake	1	Chaîne opératoire
	Isolated	Single-stage bipolar flake	1	Chaîne opératoire
	Isolated	Single-stage platform flake	1	Chaîne opératoire
	10-B	Multi-stage platform flake and blade, ad hoc possible flake, platform flake and possible flake	1	Unique knapping strategy
	10-B off site	Double-stage ad hoc blade	1	Unique knapping strategy
	Isolated	Double-stage platform flake & bipolar flake	1	Variation
13	13-A*	Single-stage platform blade	1	Chaîne opératoire
	13-B*	Single-stage platform blade	1	Chaîne opératoire
	Isolated	Single-stage bipolar flake	1	Chaîne opératoire
	13-C*	Single-stage platform possible flake	1	Unique knapping strategy
	13-C*	Double-stage platform flake & bipolar	1	Unique knapping strategy

14	14-a	Single-stage bipolar flake	1	Chaîne opératoire
	14-B	Single-stage bipolar flake	7	Chaîne opératoire
	14-B	Single-stage platform blade	1	Chaîne opératoire
	14-B	Double-stage bipolar flake	6	Chaîne opératoire
	14-c*	Single-stage bipolar flake	1	Chaîne opératoire
	14-e	Single-stage bipolar flake	1	Chaîne opératoire
	Isolated	Single-stage bipolar flake	1	Chaîne opératoire
	14-B	Double-stage platform flake	1	Unique knapping strategy
	14-B	Multi-stage: bipolar, platform blade, poss flake, flake	1	Unique knapping strategy
	14-b*	Double-stage platform blade	1	Unique knapping strategy
	14-D*	Multistage: platform flake (2) & ad hoc flake	1	Unique knapping strategy
23	23-C	Single-stage platform blade	1	Chaîne opératoire
	23-C	Double-stage platform flake	1	Unique knapping strategy
	Isolated	Possible flake (4 stages), platform blade, ad hoc possible flake	1	Unique knapping strategy
	Isolated	Multi-stage platform blade & platform flake	1	Unique knapping strategy
	Isolated	Single-stage ad hoc flake	1	Variation

APPENDIX 5.7.
Platform types for all primary technologies

	Unprepared platforms			Single flake platforms			Multi-flake platforms		
	SSC	*DSC*	*MSC*	*SSC*	*DSC*	*MSC*	*SSC*	*DSC*	*MSC*
Platform blade reduction	1	-	-	10	-	6	2	-	1
Platform flake reduction		1	1	7	3	3	1	1	2
Platform mixed/flake blade reduction	1	-	2	7	2	1	1	-	-
Bipolar flake reduction	36	45	-	-	-	1	-	-	-
Bipolar blade reduction	1	1	3	1	-	-	-	-	-
Irregular flake removal	1	-	-	3	-	2	-	-	-
Irregular blade removal	-	-	-	-	2	-		-	2
Irregular possible flake removal	-	-	-	1	-	3	-	-	
Total	40	47	6	29	7	16	4	1	5

Table 1: Recognised *Riu Mannu* core platform types for single-, double- and multi-stage cores per main *chaîne opératoire*.

	Blade production			Flake production		
	MNI	*R*	*PR*	*MNI*	*R*	*PR*
UNIDIRECTIONAL REMOVAL						
Incomplete/ shattered	18	1	2	150	7	6
Cortex	8	-	2	179	4	12
Plain	101	21	21	492	22	59
Complex	1	-	1	10	1	1
Dihedral	3	1	-	57	2	4
Ground	6	-	-	34	-	2
Punctiform	7	-	-	40	1	-
Linear	8	2	5	61	1	3
TWO-DIRECTIONAL REMOVAL						
Incomplete/ shattered	1	-	-	34	3	9
Cortex	1	-	1	51	2	8
Plain	8	1	-	102	2	51
Complex	-	-	-	3	-	1
Dihedral	-	-	-	17	-	4
Ground	-	-	-	8	-	-
Punctiform	1	-	-	12	-	1
Linear	1	-	-	14	-	1
MULTI-DIRECTIONAL REMOVAL						
Incomplete/ shattered	1	-	-	11	-	2
Cortex	-	-	-	14	-	-
Plain	1	-	-	26	-	1
Complex	-	-	-	1	-	-
Dihedral	-	-	-	3	1	1
Ground	-	-	-	1	-	-
Punctiform	-	-	-	2	-	-
Linear		-	-	9	-	-
NO RECOGNISABLE REMOVAL DIRECTION						
Incomplete/ shattered	2	-	-	20	1	-
Cortex	1	-	-	14	2	-
Plain	9	1	2	63	3	6
Complex	-	-	-	1	-	-
Dihedral	2	-	-	7	-	-
Ground	1	-	-	10	1	1
Punctiform	1	-	-	3	-	-
Linear	-	-	-	5	-	-
Total	**182**	**27**	**34**	**1455**	**53**	**173**

Table 2: Types of platforms for unretouched and retouched flakes and blades.

APPENDIX 5.8.

Bulb of percussion, flaking ripples and errailure flakes for all primary material

	Artefact class	Technology		Degree of development			
				Poor	*Average*	*Well*	*Total*
Bulb of percussion	*Cores*	*Blade*	N	26	22	17	65
			%	40	33.8	26.2	
		Flake	N	54	73	11	138
			%	39.1	52.9	8	
	Complete	*Blade*	N	28	37	76	141
			%	19.9	26.2	53.9	
		Flake	N	184	275	619	1078
			%	17.1	25.5	57.4	
	Fragments	*Blade*	N	43	19	27	89
			%	48.3	21.3	30.3	
		Flake	N	160	176	275	611
			%	26.2	28.8	45	
	Retouched	*Blade*	N	11	6	20	37
			%	29.7	16.2	54.1	
		Flake	N	15	42	82	139
			%	10.8	30.2	59	
	Possibly retouched	*Blade*	N	15	7	28	50
			%	30	14	56	
		Flake	N	30	63	131	224
			%	13.4	28.1	58.5	
Faking ripples	*Complete*	*Blade*	N	6	59	78	143
			%	4.2	41.3	54.5	
		Flake	N	57	524	531	1112
			%	5.1	47.1	47.8	
	Fragments	*Blade*	N	7	59	73	139
			%	5	42.4	52.5	
		Flake	N	79	439	309	827
			%	9.6	53.1	37.4	
	Retouched	*Blade*	N	2	27	20	49
			%	4.1	55.1	40.8	
		Flake	N	11	92	65	168
			%	6.5	54.8	38.7	
	Possibly retouched	*Blade*	N	5	22	27	54
			%	9.3	40.7	50	
		Flake	N	28	145	98	271
			%	10.3	53.5	36.2	
Errailure scar	*Complete*	*Blade*	N	73	10	54	137
			%	53.3	7.3	39.4	
		Flake	N	271	58	264	593
			%	45.7	9.8	44.5	
	Fragments	*Blade*	N	31	2	16	49
			%	63.3	4.1	32.7	
		Flake	N	288	34	99	421
			%	68.4	8.1	23.5	
	Retouched	*Blade*	N	9	1	20	30
			%	30	3.3	66.7	

		Flake	N	66	5	47	118
			%	55.9	4.2	39.8	
	Possibly retouched	*Blade*	N	17	2	21	40
			%	42.5	5	52.5	
		Flake	N	114	14	58	186
			%	61.3	7.5	31.2	

APPENDIX 5.9.
Dorsal scar negatives for all flake and blade material.

	Blade production				Flake production			
	MNI	*FRG*	*R*	*PR*	*MNI*	*FRG*	*R*	*PR*
UNIDIRECTIONAL REMOVAL								
0	4	2	-	1	139	22	10	11
1	18	2	2	5	246	73	15	28
2	52	29	16	17	373	126	17	47
3	58	29	18	17	6	59	13	27
4	13	7	6	7	13	14	6	12
5	6	4	3	1	2	2	1	2
6	2	1	1	1	4	1	-	-
7	-	-	-	-	-	1	-	-
11	-	-	-	-	1	-	-	-
TWO-DIRECTIONAL REMOVAL								
1	2	1	1	1	60	17	1	10
2	3	1	-	-	92	30	5	13
3	4	2	-	-	52	20	5	6
4	1	1	-	1	29	8	2	7
5	-	-	-	-	9	4	1	1
6	1	-	-	-	2	1	-	-
7	1	-	-	-	1	-	-	-
MULTI-DIRECTIONAL REMOVAL								
2	2	1	-	-	3	1	-	1
3	-	-	-	-	18	4	1	1
4	-	-	-	-	23	5	-	1
5	1	-	-	-	8	3	-	1
6	-	-	-	-	10	7	-	1
7	-	-	-	-	2	1	-	2
8	-	-	-	-	1	1	-	-
9	-	-	-	-	-	1	1	1
10	-	-	-	-	-	-	1	-
Total	**168**	**80**	**47**	**51**	**1094**	**401**	**79**	**172**

Table 1: Number of dorsal scars on unretouched and retouched flakes and blades.

MNI= minimum individual pieces (complete and proximal pieces),
FRG= fragments
R= retouched pieces
PR= probably retouched pieces

APPENDIX 5.10.

Artefact size

	02			04			05			07			09			23		
	N	*R*	*AV L/W*	*N*	*R*	*AV L/W*	*N*	*R*	*AV L/W*	*N*	*R*	*AV L/W*	*N*	*R*	*AV L/W*	*N*	*R*	*AV L/W*
Blade technology (blades)	-	-	-	8	53	29.2/ 11.2	-	-	-	-	-	-	-	-	-	1	7	17.9/9.4
Flake technology (flakes)	-	-	-	3	24	30.3/ 27.1	-	-	-	-	-	-	1	4	16.2/12.1	-	-	-
Mixed flake/blade technology (flakes/blades)	1	6	16.2/8.35	6	51	27.6/ 13.2	-	-	-	2	9	23.9/13.1	-	-	-	-	-	-
Bipolar technology (flakes)	4	5	14.9/5.6	10	22	19.8/ 19.3	1	3	12.5/ 0.1	4	6	14.4/ 5.6	2	3	22.1/11.6	-	-	-
Bipolar technology (blades)	-	-	-	2	6	21.2/9.9	-	-	-	-	-	-	-	-	-	-	-	-
Ad hoc knapping (flakes)	-	-	-	3	7	22.7/ 15.4	-	-	-	-	-	-	-	-	-	1	1	24.7/21.7

Table 1. Number and average length and width of previous removals on all single stage cores. N= number, R= number of previous removals, AV L/W = average length and width of previous removals in mm. First three rows cores with prepared platform for removal, bottom four rows cores with unprepared/unspecified platforms. In brackets produced debitage.

	10			13			14*		
	N	*RMs*	*AV L/W*	*N*	*RMs*	*AV L/W*	*N*	*RMs*	*AV L/W*
Blade technology (blades)	1	5	23.8 / 13.2	2	6	26.3 / 6.5	1	4	14.7 / 4.0
Flake technology (flakes	4	20	23.9 / 19.7	-	-	-	-	-	-
Bipolar technology (flakes)	3	7	19.7 / 21.1	1	4	11.5 / 11.8	11	15	16.5 / 16.4
Ad hoc knapping (indeterminate)	-	-	-	1	6	16.9 /10	-	-	-

Table 1. continued. * Note 18 artefacts only recorded as cores, not further info available.

	02 (n=4)			04 (n=10)			05 (n=1)			07 (n=3)			09 (n=1)			23 (n=1)		
	S	*R*	*AV L/W*	*S*	*R*	*AV L/W*	*S*	*R*	*AV L/W*	*S*	*R*	*AV L/W*	*S*	*R*	*AV L/W*	*S*	*R*	*AV L/W*
Blade technology	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flake technology	-	-	-	1	4	19.9/21.4	-	-	-	2	6	18.7/17.8	-	-	-	2	7	28.9/24.9
Mixed flake/blade technology	-	-	-	-	-	-	-	-	-	2	7	14.4/8.4	1	7	-/ 26.1	-	-	-
Bipolar technology (flakes)	7	8	12 / 16.6	18	33	19.2/18	1	1	15.6/ 26.9	2	3	6.6/8.7	1	2	23.6/19.3	-	-	-
Bipolar technology (blades)				1	1	22.4/6.2	-	-	-									
Ad hoc knapping	1	2	20.5/10.3	-	-	-	1	4	-/15.1	-	-	-	-	-	-	-	-	-

Table 2. Number and average length and width of previous removals on all double-stage cores. N= number, R= number of previous removals, S= flaking stages, AV L/W = average length and width of previous removals in mm

	10 (n=3)			13			14* (n=8)		
	S	*R*	*AV L/W*	*S*	*R*	*AV L/W*	*S*	*R*	*AV L/W*
Blade technology	-	-	-	-	-	-	2	3	25.8/9.2
Flake technology	1	3	18.7/15.2	1	4	14.7/11.4	2	6	23.5/22.4
Mixed flake / blade technology	-	-	-	-	-	-	-	-	-
Bipolar technology (flakes)	3	7	12.5/16.7	1	1	-/18.5	12	19	16.1/16.3
Ad hoc knapping (blades)	2	2	29.5/5.8	-	-	-	-	-	-

Table 2. continued.

	04 (n=4)			09 (n=2)			10 (n=1)			14 (n=2)			23 (n=)		
	S	*R*	*AV L/W*	*S*	*R*	*AV L/W*	*S*	*R*	*AV L/W*	*S*	*R*	*AC I/W*	*S*	*R*	*AV L/W*
Blade technology	3	10	35.4/13.3	-	-	-	1	6	16.1/25.1	2	5	33/11	3	10	27.6/12.8
Flake technology	3	7	25.5/23.9	4	5	13.9/17.4	3	5	31.1/19.4	3	11	24.2/23.1	1	1	-
Mixed flake/blade technology	1	3	12/11	-	-	-	-	-	-	-	-	-	-	-	-
Bipolar technology	3	7	19.5/23.3	-	-	-	-	-	-	3	3	20.2/12.7	-	-	-
Ad hoc knapping (flakes)	1	1	-/-	5	9	-/-	-	-	-	1	1	-/-	5	2	-/-
Ad hoc (indeterminate)	1	1	-/-	2	2	-/-	2	3	-/-	1	-	-/-	-	-	-

Table 3. Number and average length and width of previous removals on all multi-stage cores. N= number, R= number of previous removals, S= flaking stages, AV L/W = average length and width of previous removals in mm

Artefact class		Maximum	Average	Minimum	Mode	St Dev	C/V
Complete Blades	*L*	80.5	31.2	10.9	50.4	11.7	0.4
	W	43.1	17.7	6.6	20.7	6.1	0.3
	T	25.2	6	1.8	6.4	2.7	0.4
Complete Flakes	*L*	117	23.9	5	18.8	10.4	0.4
	W	76.4	21.3	2.1	14.5	8.6	0.4
	T	72.4	7	0.4	5	4.1	0.6
Probably retouched blades	*L*	86.1	40.1	18.2	24.8	15.7	0.4
	W	37.5	22.5	12.4	16.1	6.6	0.3
	T	14.6	8.1	3.9	6.4	2.5	0.3
Probably retouched flakes	*L*	88.7	28.3	12.8	28.9	10.2	0.4
	W	47.4	23.8	8.7	30.7	7.6	0.3
	T	27.4	8	2.2	6.7	3.3	0.4
Retouched Blades	*L*	95.4	43.6	16.8	44.1	15	0.3
	W	47.6	25.6	10.3	33.8	7.7	0.3
	T	19.3	8.7	4	8.9	3.1	0.4
Retouched Flakes	*L*	63.3	30.2	11.3	25.4	10.2	0.3
	W	63.3	26.5	11.8	25.1	9.2	0.3
	T	58.1	9	3.8	6.7	3.6	0.4

Table 4. Size comparisons for length (L), width (W) and thickness (T) measurements for unretouched and retouched flakes and blades.

		02	04	05	07	09	10	13	14	23	Total
Bipolar flake	N	4	11	1	4	2	4	1	11		38
	L	29.7	37.4	27.7	31.5	29	35.8	22.9	25.1		31.1
Bipolar blade	N		2								2
	L		29.8								29.8
Platform flake	N						2				2
	L						48.3				48.3
Platform flake	N		4			1	1				6
	L		32.8			25.8	38.5				32.6
Platform flake	N						2				2
	L						27.2				27.2
Platform blade	N		8				1		1	1	11
	L		36.9				26		20.6	29.1	33.7
Platform blade	N		1								1
	L		26.7								26.7
Platform blade	N							2			2
	L							28.6			28.6
Platform mixed	N		2		1						3
	L		41.2		30						37.5
Platform mixed	N		3								3
	L		54.1								54.5
Platform mixed	N	1	1		1						3
	L	14.8	35.4		21.9						24.0
Platform possible flake	N							1			1
	L							18.2			18.2
Ad hoc flake	N		3							1	4
	L		26.1							25.3	25.9

Table 5. Average maximum lengths (in mm) for all single stage cores.

		02	04	05	07	09	10	13	14	23	Total
Bipolar flake	N	7	21	1	4	3	3	1	12		52
	L	26.0	37. 6	24.9	29.3	32.6	30.2	20.5	26.5		31.5
Bipolar blade	N		1								1
	L		29								29
Platform blade	N								2		2
	L								40		40
Platform flake	N		1				1		1	1	4
	L		36.9				29.5		29.1	33.6	32.3
Platform flake	N				2		1	1	1	1	6
	L				29.0		22.3	20.5	29.1	33.6	27.2
Platform mixed	N					1					1
	L					33.4					33.4
Platform mixed	N				2						2
	L				30.5						30.5
Platform possible flake	N			1							1
	L			24.9							24.9
Ad hoc flake	N		1				1				2
	L		45.8				29.5				37.7
Ad hoc blade	N						2				2
	L						20.2				20.2
Ad hoc mixed	N	1									1
	L	26.9									26.9

Table 6. Average maximum lengths (in mm) for all double-stage cores.

		04	09	10	14	23	Total
Bipolar flake	N	3			3		6
	L	38.6			50.1		44.4
platform blade	N	2			2	3	7
	L	29.7			50.1	45.5	42.3
Platform blade	N			1			1
	L			34.9			34.9
Platform blade	N	1					1
	L	38.6					38.7
Platform flake	N	2	3	2			7
	L	46.2	57.3	34.9			47.7
Platform flake	N	1	1	1	3	1	7
	L	38.5	32.4	34.9	38.4	51.1	38.9
Platform mixed	N	1					1
	L	20.7					20.71
Platform possible flake	N	1		1	1	4	7
	L	20.7		34.9	50.1	34.3	34.7
Ad hoc possible flake	N		2	1		1	4
	L		44.8	34.9		34.3	39.7
Ad hoc flake	N	1	5		1		7
	L	46.2	52.3		32.6		48.6

Table 7. Average maximum lengths (in mm) for all multi-stage cores.

APPENDIX 5.11.

Cortex data

Type	%	Location	Platform blade		Platform mixed flake/blade			Platform Flake			Bipolar flake			Bipolar blade		Ad hoc flake		Ad hoc blade	Ad hoc possible flake			
			SSC	*MSC*	*SSC*	*DSC*	*MSC*	*SSC*	*DSC*	*MSC*	*SSC*	*DSC*	*MSC*	*SSC*	*DSC*	*SSC*	*MSC*	*DSC*	*SSC*	*DSC*	*MSC*	*Total*
1	1-25%	Side(s)	2	-	-	-	-	1	-	-	2	2	-	-	-	1	-	2	-	-	-	10
		Bottom	-	1	-	-	3	-	-	-	2	2	-	-	-	1	-	-	-	-	1	10
	26-50%	Side(s)	-	-	-	-	-	1	-	-	2	2	-	-	-	-	-	-	-	-	-	5
		Bottom	-	2	1	1	-	-	1	-	-	2	1	-	-	-	-	-	-	-	-	8
		Bottom and side(s)	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
2	1-25%	Platform	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
		Side(s)	1	-	-	-	-	-	1	-	3	2	-	1	-	-	-	-	-	-	-	8
		Bottom	-	2	-	-	-	1	-	1	-	1	-	-	-	-	-	-	-	1	-	6
		Bottom and side(s)	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	2
	26-50%	Side(s)	-	-	1	-	-	-	1	-	5	3	-	-	-	-	-	-	-	-	-	10
		Bottom	-	-	-	-	-	-	4	2	1	-	-	-	-	-	1	-	-	-	-	8
		Bottom and side(s)	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
3	1-25%	Side(s)	3	-	1	-	-	-	-	-	2	7	-	-	-	1	-	-	1	-	-	15
	26-50%	Side(s)	-	-	-	-	-	-	-	2	1	-	-	-	-	-	1	-	-	-	-	4
4	1-25%	Platform	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
		Side(s)	1	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	4
		Bottom	-	-	-	-	-			-	-	2	-	-	-	-	-	-	-	-	-	2
		Bottom and side(s)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	26-50%	Bottom core	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
		Bottom and side(s)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Total			8	5	5	1	3	4	7	5	21	26	1	1	1	4	2	2	1	1	1	99

Table 1. Cortex types, percentages and position of cortex on all *Riu Mannu* cores represented in stages. SSC= single-stage cores (n=44), DSC double-stage cores (n=19), MSC= multi-stage cores (n=5).

Type	Percentage	Location	Complete blades	Broken blades	Retouched blades	Possibly blades
Type 1	1-25%	Platform	3	-	-	-
		Lateral side(s)	3	2	1	1
		Distal	2	6	2	3
		Platform and lateral	2	-	-	-
	26-50%	Lateral side(s)	1	-	1	1
		Distal	-	1	-	-
	76-100%	All but proximal & lateral	-	-	-	1
		All dorsal	2	1	-	-
Type 2	1-25%	Platform	3	-	-	-
		Lateral side(s)	4	1	-	-
		Middle	-	1	-	-
		Distal	1	-	-	-
		Platform & distal	1	-	-	-
	26-50%	Lateral side(s)	2	1	-	1
		Distal	-	1	-	-
		Distal & lateral	-	1	-	-
		Platform, lateral & distal	1	-	-	-
	51-75%	Lateral side(s)	1	-	-	-
		Middle	-	-	-	1
		Distal	-	1	-	-
		Distal & lateral	1	-	-	-
		All but lateral	1	-	-	-
	76-100%	All but lateral side(s)	2	-	-	-
Total			30	16	4	8

Table 2. Percentages and location for cortex types 1-2, associated with Mògoro secondary raw material sources for unretouched and retouched cortical blades.

Type	Percentage	Location	Complete blades	Broken blades	Retouched blades	Possibly blades
Type 3	1-25%	Distal	2	2	-	-
		Distal & lateral	1	-	-	-
		Lateral side(s)	4	3	-	1
		Platform	3	-	-	-
	26-50%	Lateral side(s)	3	2	-	-
		Platform	-	1	-	-
		Platform & lateral	1	-	-	-
	51-75%	All but lateral	1	-	-	-
		All but proximal	-	1	-	-
		Lateral (side(s)	1	-	-	-
	76-100%	All but middle	-	1	-	-
		All but proximal	1	-	-	-
		All dorsal	-	1	-	-
		Distal	1	-	-	-
Type 4	1-25%	Distal	1	-	-	1
		Distal & lateral	-	-	-	1
		Lateral side(s)	3	2	1	1
		Platform	-	-	-	1
	26-50%	Distal	-	-	-	1
		Distal & lateral	1	-	-	-
		Lateral side(s)	2	-	1	3

	51-75%	Lateral side(s)	-	-	1	-
	76-100%	All dorsal	1	1	-	-
Total			26	14	3	9

Table 3. Percentages and location for cortex types 3-4, associated with Monte Arci primary raw material sources for unretouched and retouched cortical blades.

Type	Percentage	Location	Complete flakes	Broken flakes	Retouched flakes	Possibly retouched flakes
Type 1	1-25%	Platform	22	7	1	2
		Proximal	1	3	-	-
		Lateral side(s)	21	21	2	4
		Middle	2	3	1	2
		Distal	19	8	-	4
		Platform & lateral	17	6	1	2
		Platform & distal	2	-	-	-
		Distal & lateral	3	1	-	1
		Proximal & lateral	-	-	1	2
		Proximal & distal	2	-	-	-
		Platform, lateral & distal	2	-	-	-
	26-50%	Proximal	1	1	-	-
		Lateral side(s)	25	10	1	2
		Middle	1	-	-	-
		Distal	5	3	-	-
		Platform & lateral	1	2	-	-
		Middle & Distal	1	-	-	-
		Distal & lateral	3	-	-	1
		Platform, lateral & distal	2	-	-	1
	51-75%	Lateral side(s)	4	3	-	-
		Middle	1	-	-	-
		Lateral & distal	1	-	1	1
		Platform & lateral	2	-	-	-
		All but proximal	2	-	1	1
		All but lateral	2	1	-	1
		All but middle	-	1	-	-
		All but distal	1	-	-	-
	76-100%	All but proximal	6	-	1	1
		All but lateral side(s)	4	-	2	2
		All but distal	1	-	-	-
		All but proximal & lateral	1	-	-	1
		All dorsal	32	12	1	4
Type 2	1-25%	Platform	15	6	2	6
		Proximal	-	1	-	1
		Lateral side(s)	4	15	8	11
		Middle	1	1	1	3
		Distal	16	10	1	4
		Platform & lateral	12	-	-	1
		Platform & distal	2	-	-	1
		Proximal & lateral	1	2	-	-
		Distal & lateral	5	-	-	2
	26-50%	Lateral side(s)	18	5	3	6
		Middle	2	1	1	3
		Distal	6	2	-	1
		Middle & lateral	-	1	-	-

		Middle & Distal	1	-	-	-
		Distal & lateral	2	1	1	1
		Platform & lateral	1	1	-	-
		Platform, lateral & distal	1	-	-	-
		All but middle	1	-	-	-
		All but proximal & lateral	-	1	-	-
	51-75%	Lateral side(s)	5	2	1	2
		Middle	2	1	3	5
		Distal	1	-	-	-
		Distal & lateral	2	-	-	-
		All but proximal	-	1	-	1
		All but lateral	5	-	-	1
		All but distal	-	1	-	-
	76-100%	All but proximal	5	-	-	-
		All but lateral side(s)	7	1	4	9
		All but middle	-	1	-	-
		All but distal	1	1	-	-
		All dorsal	39	10	3	5
Total			**342**	**147**	**41**	**95**

Table 4. Percentages and location for cortex types 1-2, associated with Mògoro secondary raw material sources for unretouched and retouched cortical flakes.

Type	Percentage	Location	Complete flakes	Broken lakes	Retouched flakes	Possibly retouched flakes
Type 3	1-25%	Platform	6	2	1	1
		Proximal	1	-	-	-
		Lateral side(s)	9	7	2	2
		Middle	2	1	-	-
		Distal	4	6	-	1
		Platform & lateral	3	1	-	1
		Distal & lateral	1	1	-	1
	26-50%	Platform	-	2	-	-
		Lateral side(s)	-	-	1	1
		Middle	-	2	1	1
		Distal	-	1	-	1
		Platform & lateral	1	-	-	-
		Distal & lateral	3	1	-	-
	51-75%	Lateral (side(s)	2	1	-	-
		Middle	1	-	-	-
		Distal & lateral	1	-	-	-
		All but proximal	1	-	-	-
		All but lateral	1	1	-	1
		All but middle	-	1	-	-
		All but distal	1	-	-	-
	76-100%	All but lateral	-	2	-	-
		All dorsal	13	5	-	-
Type 4	1-25%	Platform	-	1	-	-
		Proximal	-	-	1	1
		Lateral side(s)	7	2	1	-
		Middle	-	1	-	-
		Distal	1	1	-	2
	26-50%	Proximal	3	-	-	-
		Lateral side(s)	6	5	1	2

		Middle	1	-	-	-
		Distal	2	-	-	1
		Distal & lateral	1	-	-	2
		All dorsal	1	1	-	-
	51-75%	Lateral side(s)	-	2	-	-
		All but lateral	3	-	1	-
		All but proximal & lateral	1	-	-	-
		All but proximal	1	-	-	-
		All but distal	-	1	-	-
	76-100%	All but lateral	1	-	-	-
		All dorsal	15	9	-	1
Total			**93**	**57**	**9**	**19**

Table 5. Percentages and location for cortex types 3-4, associated with Monte Arci primary raw material sources for unretouched and retouched cortical flakes.

APPENDIX 5.12.
Cortex and visual characterisation data all blade production

				02					05	
Artefact Class	**Cortex Types**	**Source Types**	**Material Characteristics**	**02-A**	**02-C**	**02-D**	**02-a**	**Isolated**	**05-D**	**Isolated**
SS platform core	Non-cortical	SA	Glossy Black/Grey	-	-	-	-	1#	-	-
DS irregular cores	Non-cortical	SC	Grey/Black Banding	-	-	1#	-	-	-	-
Complete blades	Non-cortical	SA	Glossy Black/Grey	1	-	-	-	-	2	-
		SC/SB?	Opaque Black/Grey	-	-	-	-	1	-	-
		SA/SB?	Translucent	-	-	-	-	1	-	-
		SA/SB?	Marginally Translucent with Internal Patterning	-	-	-	-	-	-	1
		Indeterminate	Indeterminate	-	1	-	-	-	1	-
	Types 1-2 <50%	SC/SB?	Opaque Black/Grey	-	-	-	-	-	-	1
	Types 3-4 >50%	Indeterminate	Indeterminate	-	-	-	-	1	-	-
Blade fragments	Non-cortical	SA/SB?	Marginally Translucent	-	-	-	-	1	-	-
		SA/SB?	Marginally Translucent with Internal Patterning	-	-	-	-	-	1	-
		SA/SB?	Translucent with Internal Patterning	-	-	-	-	-	1	-
		Indeterminate	Indeterminate	-	-	-	1	-	-	-
	Types 1-2 >50%	SC	Grey/Black Banding	-	-	-	-	-	1	-
Possible tools on blades	Non-cortical	SA	Glossy Black/Grey	-	-	-	-	-	1	1
	Types 1-2 <50%	SA	Glossy Black/Grey	-	-	-	-	-	1	-
Tools on blades	Non-cortical	SC/SB?	Opaque Black/Grey	1	-	-	-	-	-	-
Total				2	1	1	1	5	8	3

Table 1. Arborèa. # mixed flak/blade removal.

					04				
				04-b	04-B	04-c	04-C	04-D	Isolated
Single stage bipolar core	*Non-cortical*	SC/SB?	Opaque Black/Grey	-	-	-	-	-	1
	Types 1-2 <50%	SA	Glossy Black/Grey	-	-	-	-	-	1
Single-stage platform core	*Non-cortical*	SA	Glossy Black/Grey	-	1	-	-	-	-
		SA/SB?	Glossy Black/Grey and Translucent	-	2	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	-	-	1
	Types 1-2 <50%	SC	Grey/Black Banding	-	2	-	-	-	-
		SA	Glossy Black/Grey	-	1	-	-	-	-
	Types 3-4 <50%	SA/SB?	Grey/Black Banding	-	1	-	-	-	-
		SA/SB?	Glossy Black/Grey with Banding	-	-	-	-	-	1
Single-stage mixed flake/blade platform core	*Non-cortical*	SA	Glossy Black/Grey	-	1	-	-	-	-
		-	Indeterminate	-	1	-	-	-	-
	Types 1-2 <50%	SA	Glossy Black/Grey	-	1	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	-	1	-	-	-	-
	Types 3-4 <50%	SA	Glossy Black/Grey	-	1	-	-	-	-
		SA/SB?	Glossy Black/Grey + Translucent	-	1	-	-	-	-
Double-stage bipolar core	*Types 3-4 <50%*	SC	Grey/Black Banding	-	-	-	-	-	1
Multi-stage platform core	*Types 1-2 <50%*	SC	Grey/Black Banding	-	1	-	-	-	-
		SA	Glossy Black/Grey	-	1	-	-	-	-
Multi-stage mixed flake/blade platform core	*Types 1-2 <50%*	SC	Grey/Black Banding	-	1	-	-	-	-
Blade core rejuvenation flakes	Types 1-2 <50%	SC/SB?	Opaque Black/Grey	-	-	1	-	-	-
Complete blades	*Non-cortical*	SC	Grey/Black Banding	-	7	1	-	-	4
		SC/SB?	Opaque Black/Grey	-	5	1	-	-	-
		SA	Glossy Black/Grey	-	2	1	-	-	1
		SA/SB?	Marginally Translucent with Internal Patterning	-	1	-	-	-	-
		SA/SB?	Translucent with Internal Patterning	-	15	1	-	-	1
		SA	Completely Translucent with Internal Patterning	-	3	1	1	-	-
		SC	Possible Banding	-	2	2	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	1
		SC	Red/Black Banded	-	-	-	1	-	-
		-	Indeterminate	-	4	-	-	-	-
	Types 1-2 <50%	SC	Grey/Black Banding	-	5	3	-	-	-
		SC	Red/Black Banding	-	1	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	2	1	-	-	-

	Types 1-2 >50%	SC	Grey/Black Banding	-	3	1	-	-	-
		SA/SB?	Marginally Translucent with Internal Patterning	-	1	-	-	-	-
	Types 3-4 <50%	SC	Grey/black Banding	-	3	-	-	-	-
		SA/SB?	Marginally Translucent with Internal Patterning	-	3	-	-	-	-
		SA/SB?	Translucent with Internal Patterning	-	4	-	-	-	-
		SA/SB?	Glossy Black/Grey with Banding	-	-	1	-	-	-
		SA	Completely Translucent with Internal Patterning	-	1	-	-	-	1
		SC/SB?	Opaque Black/Grey	-	-	-	-	-	1
	Types 3-4 >50%	SA	Glossy Black/Grey	-	1	-	-	-	-
		SA/SB?	Marginally Translucent with Internal Patterning	-	2	-	-	-	-
		SA/SB?	Translucent with Internal Patterning	-	1	-	-	-	-
Blade fragments	*Non-cortical*	SC	Grey/Black Banding	-	9	4	-	-	-
		SA	Glossy Black	-	1	-	-	-	-
		SA/SB?	Glossy Black and Translucent	-	2	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	3	1	-	2	-
		SA/SB?	Marginally Translucent	-	1	-	-	-	-
		SA/SB?	Translucent	-	1	-	1	-	-
		SA/SB?	Marginally Translucent with Internal Patterning	-	2	1	-	-	-
		SA	Translucent with Internal Patterning	1	14	5	1	-	1
		SA	Completely Translucent with Internal Patterning	-	9	-	-	-	-
		SC	Possible Banding	-	-	1	-	-	-
		-	Indeterminate	-	2	-	-	-	-
	Types 1-2 <50%	SC	Grey/Black Banding	-	7	-	-	-	-
		SA	Glossy Black/Grey	-	1	-	-	-	-
		SC	Red/Black Banding	-	1	-	-	-	-
		SA/SB?	Translucent with Internal Patterning	-	-	1	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	-	-	1
		SA/SB?	Marginally Translucent	-	-	-	-	1	-
		-	Indeterminate	-	1	-	-	-	-
	Types 3-4 <50%	SC	Grey/black Banding	-	1	-	-	-	-
		SA/SB?	Marginally Translucent with Internal Patterning	-	2	-	-	-	-
		SA/SB?	Translucent with Internal Patterning		2	1			
		SA	Completely Translucent with Internal Patterning	-	-	-	-	-	1
		SC	Grey/Black Banding	-	1	-	-	-	-
		SA/SB?	Glossy Black/Grey and Translucent	-	1	-	-	-	-
Possible tools on blades	*Non-cortical*	SC	Grey/Black Banding	1	1	1	-	-	-
		SA	Glossy Black/Grey	1	5	-	-	-	-
		SA/SB?	Glossy Black/Grey with Banding	-	2	-	-	-	-
		SA/SB?	Glossy Black/Grey and Translucent	-	1	-	-	-	-

		SA/SB?	Translucent with Internal Patterning	-	6	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	1	-	-	-	-
		SC	Possible Banding	-	1	-	-	-	-
		-	Indeterminate	-	4	-	-	-	-
	Types 1-2 <50%	SC	Grey/Black Banding	-	4	-	-	-	-
	Types 3-4 <50%	SA/SB?	Glossy/Black with Banding	-	1	-	-	-	-
		SA/SB?	Marginally Translucent	-	1	-	-	-	-
		SA/SB?	Marginally Translucent with Internal Patterning	-	3	-	-	-	-
		SA/SB?	Translucent with Internal Patterning	-	1	-	-	-	-
	Types 3-4 >50%	SA/SB?	Translucent with Internal Patterning	-	1	-	-	-	-
Tools on blades	*Non-cortical*	SA/SB?	Completely Translucent with Internal Patterning	-	4	-	-	-	-
		SA/SB?	Translucent with Internal Patterning	1	5	-	-	-	-
		SC	Grey/Black Banding	-	10	-	-	-	-
		SA	Glossy Black	-	3	-	-	-	-
		SA/SB?	Glossy Black/Grey with Banding	-	1	-	-	-	-
		SA/SB?	Glossy Black/Grey and Translucent	-	1	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	3	-	-	-	-
		SA/SB?	Marginally Translucent with Internal Patterning	-	3	-	-	-	-
		-	Indeterminate	-	3	-	-	-	-
	Types 1-2 <50%	SC	Grey/Black Banding	-	3	-	-	-	-
		SA/SB?	Translucent with Internal Patterning	-	1	-	-	-	-
	Types 3-4 <50%	SA/SB?	Marginally Translucent with Internal Patterning	-	1	-	-	-	-
		SA/SB?	Translucent with Internal Patterning	-	1	-	-	-	-
	Types 3-4 >50%	SA/SB?	Glossy Black/Grey and Translucent	-	1	-	-	-	-
Total				4	217	29	4	3	17

Table 2. Campidano (transect 04).

				07					09		13				23				
				07-B	07-C	07-D/E	07-F	07-J	09-A	09-b	13-A	13-B	13-C	Isolated	23-A	23-B	23-C	23-D	Isolated
Single-stage platform cores	*Non-cortical*	-	Indeterminate	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	-	-	1#	-	-	-	-	-	-	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Types 3-4 <50%	SA	Glossy Black/Grey	-	-	-	1#	-	-	-	-	1	1	-	-	-	-	-	-
Double-stage platform core	*Non-cortical*	SC	Possible Banding	-	-	1#	-	1#	-	-	-	-	-	-	-	-	-	-	-
	Types 1-2 <50%	SA	Glossy Black/Grey	-	-	-	-	-	1#	-	-	-	-	-	-	-	-	-	-
Multi-stage platform core	*Non-cortical*	SA	Glossy Black/Grey	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Types 1-2 <50%	SC	Grey/Black Banding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Core rejuvenation flakes†	*Non-cortical*	SA/SB?	Marginally Translucent with Internal patterning	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Complete blades	*Non-cortical*	SA/SB?	Translucent with Internal patterning	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Translucent	-	-	-	-	-	-	-	-	-	-	-	-	-		1	-
		SA/SB?	Marginally Translucent with Internal patterning	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
		SA	Completely Translucent with Internal patterning	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-
		SC/SB?	Opaque Black/Grey	1	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		SC	Possible Banding	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
		-	Indeterminate	-	-	1	-	1	-	-	-	-	-	-	-	-	1	-	-
		SA	Glossy Black/Grey	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
		SC	Red/Black Banding	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
		SC	Grey/Black Banding	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
	Types 1-2 <50%	SA	Glossy Black	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent with Internal Patterning	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
		SC	Grey/Black Banding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Types 1-2 >50%	SC/SB?	Opaque Black/Grey	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	
		SA/SB?	Glossy Black/Grey With Banding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1

	Types 3-4 <50%	SA/SB?	Glossy Black/Grey and Translucent	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Translucent	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
		-	Indeterminate	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
		SA	Completely Translucent with Internal Patterning	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
Blade fragments	*NC*	SA/SB?	Marginally Translucent	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
		SC	Grey/Black Banding	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	1	-	-	-	-	-	-	1	1	1	-	2	-
		SA	Completely Translucent with Internal Patterning	-	-	-	-	-	-	-	-	-	-	-	1	1	2	1	1
		SA/SB?	Translucent	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Translucent with Internal Patterning	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
		SA/SB?	Glossy Black/Grey with Banding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
		SA/SB?	Glossy Black/Grey and Translucent	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
		SA/SB?	Marginally Translucent with Internal Patterning	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-
		-	Indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
	Types 1-2 <50%	SA	Glossy Black	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
		-	Indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Types 1-2 >50%	SA	Completely Translucent	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
	Types 3-4 <50%	SA	Completely translucent with Internal patterning	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-
		SC	Black/Grey Banding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Possible tools on blades	*NC*	SA	Completely Translucent with Internal Patterning	-	-	-	-	-	1	-	-	-	-	-	-	-	2	-	-
		-	Indeterminate	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
		SA	Glossy Black/Grey	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-
		SC	Grey/Black Banding	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-
		SA/SB?	Translucent with Internal Patterning	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Translucent	-		1	-	-		-	-	-	-	-	-	-	-	-	-
	Types 1-2 <50%	SA	Glossy Black/Grey	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	Types 3-4< 50%	SA	Completely Translucent with Internal Patterning	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Tools on blades	*NC*	SA/SB?	Marginally Translucent	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-

		SA	Completely Translucent with Internal Patterning	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
		SA	Glossy Black/Grey	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Total				3	1	6	4	10	6	2	2	1	8	1	3	9	23	10	5

Table 3. Campidano (excluding transect 04). # mixed flake/blade cores. † rejuvenation flakes for blade cores only.

				10				12		14*	
				10-B	10-a	10-C	Isolated	12-a	Isolated	14-b	14-B
Single-stage platform cores	*Types 3-4 <50%*	SA/SB?	Marginally Translucent	-	1	-	-	-	-	-	-
		SA	Glossy Black/Grey	-	-	-	-	-	-	-	1
Double-stage platform core	*NC*	SC	Grey/Black Banding	-	-	-	-	-	-	1	-
Double-stage irregular core	*Types 1-2 <50%*	SA/SB?	Glossy Black/Grey with Banding	1	-	-	-	-	-	-	-
Multi-stage platform core	*NC*	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-
		SC	Grey/black Banding	-	-	-	-	-	-	-	1
Blade core rejuvenation flakes	*Types 3-4 <50%*	SA	Completely Translucent with Internal Patterning	-	-	-	-	1	-	-	-
Complete blades	*NC*	SC	Grey/Black Banding	1	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	1	-	-	-	-	-
		SA/SB?	Glossy Black/Grey with Banding	-	-	-	-	1	-	-	-
		SA/SB?	Glossy Black/Grey and Translucent	-	-	-	-	-	1	-	-
	Types 1-2 <50%	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-
	Types 3-4 <50%	SA/SB?	Translucent with Internal Patterning	-	-	-	-	1	-	-	-
Blade fragments	*Non-cortical*	SC	Grey/Black Banding	1	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	1	-	-	-	-
		SA/SB?	Glossy Black/Grey with Banding	-	-	-	-	1	-	-	-
		SA	Completely Translucent with Internal Patterning	-	-	-	-	1	-	-	-
		SA/SB?	Translucent with Internal Patterning		-	-	-	1	-	-	-
	Types 3-4 >50%	SA	Completely Translucent	1	-	-	-	-	-	-	-
		SA/SB?	Translucent with Internal Patterning			-	-	1	-	-	-
Possible tools on blades	*NC*	SC	Grey/Black Banding	1	-	-	-	-	-	-	-
	Types 3-4 <50%	SA/SB?	Translucent with Internal Patterning	1	-	-	-	-	-	-	-
Tools on blades	*NC*	SA/SB?	Completely Translucent with Internal Patterning	1	-	-	-	-	-	-	-
	Types 3-4 <50%	SA	Glossy Black/Grey	-	1	-	-	-	-	-	-
Total				9	2	1	1	7	1	1	3

Table 4. Marmilla * only core data available for transect 14).

APPENDIX 5.13.
Cortex and visual characterisation data all flake production

				02 (n=93)								05 (n=24)			
Artefact Class	**Cortex types**	**Source**	**Material Characteristics**	02-A	02-B	A/B halo	02-a	C/B halo	02-C	02-D	Isolated	05-A	05-C	05-D	Isolated
Single stage bipolar core	*Non-cortical*	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-
		SC	Possible Banding	-	-	-	1	-	-	-	-	-	-	-	-
		-	Indeterminate	-	1	-	-	-	-	-	-	-	-	-	-
	1-2 <50%	SA	Glossy Black/Grey	-	-	1	-	-	-	-	-	-	-	-	-
	3-4 <50%	SA	Glossy Black/Grey	-	-	-	-	-	-	-	-	-	1	-	-
Double-stage bipolar core	*Non-cortical*	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Translucent + Internal Patterning	-	-	-	-	-	-	-	1	-	-	-	-
	1-2 <50%	SA	Glossy Black/Grey	-	-	1	-	1	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	-	-	-	-	-	-	-	1#	-
Double-stage platform core	*1-2 <50%*	SC/SB?	Opaque Black/Grey	-	-	-	-	-	-	-	-	-	-	1#	-
Core platform rejuvenation	*Non-cortical*	SA/SB?	Marginally Translucent	-	-	-	-	-	-	1	-	-	-	-	-
		SA	Glossy Black/Grey	-	-	-	-	-	-	-	1	-	-	-	-
	3-4 <50%	SC/SB?	Opaque Black/Grey	-	-	-	-	1	-	-	-	-	-	-	-
		-	Indeterminate	-	-	-	-	1	-	-	-	-	-	-	-
Complete flakes	*Non-cortical*	SC	Grey/Black Banding	-	1	-	-	-	-	-	-	-	1	-	-
		SC/SB?	Opaque Black/Grey	-	3	-	-	1	-	-	1	-	1	-	-
		SA	Glossy Black/Grey	-	-	2	-	-	-	-	-	-	-	2	-
		SA/SB?	Marginally Translucent + Internal Patterning	-	-	-	-	-	-	-	3	-	-	-	-
		SA/SB?	Translucent	-	2	-	-	-	-	-	1	-	-	-	-
		SA/SB?	Translucent + Internal Patterning	-	1	-	-	-	-	-	-	-	-	1	-
		SC	Possible Banding	-	-	-	-	-	-	-	-	-	1	-	1
		SA/SB?	Marginally Translucent	-	1	-	-	-	-	-	1	-	-	-	-
		-	Indeterminate	1	2	1	-	1	-	-	2	-	1	-	-
		SA	Glossy Black/Grey	-	-	-	-	2	-	-	1	-	-	-	-

	1-2 <50%	SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	1	-	-
		SC/SB?	Opaque Black/Grey	1	-	-	-	-	1	-	-	-	-	1	-
		SA/SB?	Marginally Translucent + Internal Patterning	-	-	-	-	-	-	-	-	-	-	-	1
		SC	Possible Banding	-	-	-	-	-		-	-	-	-	1	-
		SA/SB?	Translucent + Internal Patterning	-	-	-	-	-	-	1	-	-	-	-	-
		-	Indeterminate	-	-	-	-	-	-	-	2	-	-	-	1
	1-2 >50%	SC	Grey/Black Banding	1	-	1	-	-	-	-	1		-	-	-
		SA	Glossy Black/Grey	-	2	-	-	-	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	1	3	-	1	-	-	-	-	-	1	-
		SC	Possible Banding	-	-	-	-	-	-	-	1	-	-	1	-
		-	Indeterminate	-	1	1	-	-	-	-	-	1	-	-	-
	3-4 <50%	SC	Grey/black Banding	-	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent + Internal Patterning	-	-	-	-	-	-	-	-	-	-	1	-
		SA/SB?	Translucent + Internal Patterning	-	-	-	-	-	-	-	-	-	1	-	-
		SA	Glossy Black/Grey	-	1	1	-	-	-	-	-	-	-	-	-
	3-4 >50%	SC/SB?	Opaque Black/Grey	-	1	-	-	-	-	-	-	-	-	-	-
		SC	Possible Banding	-	-	-	-	1	-	-	-	-	-	-	-
		SA/SB?	Translucent + Internal Patterning	-	-	-	-	-	-	-	1	-	-	-	-
Flake fragments	*Non-cortical*	SC	Grey/Black Banding	-	-	-	-	-	-	-	1	-	-	1	-
		SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	1	-
		SC/SB?	Opaque Black/Grey	2	3	3	-	-	-	-	1	-	-	-	-
		SA/SB?	Translucent + Internal Patterning	-	-	-	-	1	-	-	-	-	-	-	-
		-	Indeterminate	1	-	-	-	-	-	-	-	-	-	-	-
	1-2 <50%	SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	1	1	-	-	-	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	-	1	-	-	-	-			
	1-2 >50%	SA	Glossy Black/Grey	-	-	-	-	-	-	-	1	-	-	-	-
	3-4 <50%	SA	Glossy Black/Grey	-	-	-	-	1	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	-	-	-	1	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	-	1	-	-	-	-	-	1	-

		-	Indeterminate	-	-	-	-	-	-	-	1	-	-	1	-
	3-4 >50%	SC/SB?	Opaque Black/Grey	-	-	1	-	-	-	-	1	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	-	1	-	-	-	-
Possible tools on flakes	*Non-cortical*	SC/SB?	Opaque Black/Grey	-	1	-	-	-	-	-	-	-	-	-	-
	1-2 <50%	SC/SB?	Opaque Black/Grey	-	-	1	-	-	-	-	-	-	-	-	-
		-	Indeterminate	-	-	1	-	-	-	-	-	-	-	-	-
	3-4 <50%	SA	Glossy/Black	-	-	1	-	-	-	-	-	-	-	-	-
Tools on flakes	*Non-cortical*	SA/SB?	Translucent + Internal Patterning	-	-	-	-	-	-	-	1	-	-	-	-
	1-2 <50%	SC/SB?	Opaque Black/Grey	-	-	-	-	-	1	-	-	-	-	-	-
Total				12	22	18	1	13	2	2	23	1	8	12	3

Table 1. Arborèa

Artefact Class	Cortex Types	Source	Material Characteristics	07						09				13			
				07-B	07-C	07-D/E	07-F	07-J	Isolated	09-A	09-b	09-a	Isolated	13-B	13-C	Isolated	13-a
SS bipolar cores	*Non-cortical*	-	Indeterminate	1	-	-	-	-	-	1	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	-	-	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	1-2 <50%	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-	1	-
		SC	Grey/Black Banding	-	-	1	-	-	-	-	-	-	-	-	-	-	-
SS platform core	*1-2 < 50%*	SA	Glossy Black/Grey	-	-	-	-	-	-	1	-	-	-	-	-	-	-
SS platform core#	*3-4 <50%*	SA	Glossy Black/Grey	-	-	-	-	-	-	-	-	-	-	-	1	-	-
DS platform core (flake & mixed flake/blade	*Non-cortical*	SC	Possible Banding	-	-	-	-	1	-	-	-	-	-	-	-	-	-
DS core (bipolar & platform#)	*Non-cortical*	SA	Glossy Black/Grey	-	-	-	-	-	-	-	-		-	-	1	-	-
	1-2 <50%	-	Indeterminate	1	-	-	-	-	-	-	-	-	-	-	-	-	-
DS core (bipolar & platform*)	*Non-cortical*	SC	Possible Banding	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	1-2 <50%	SA	Glossy Black/Grey	-	-	-	-	-	-	1	-	-	-	-	-	-	-
MS core platform blade & flake & irregular# removal	*Non-cortical*	SA	Glossy Black/Grey	-	-	-	-	-	-	1	-	-	-	-	-	-	-
MS core platform flake & irregular†	*1-2 <50%*	SA	Glossy Black/Grey	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Core rejuvenation	*Non-cortical*	-	Indeterminate	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Complete flakes	*Non-cortical*	SA/SB?	Translucent +Internal patterning	2	-	4	-	9	1	-	-	-	-	-	2	-	-
		SA/SB?	Translucent	-	-	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent +Internal patterning	-	-	-	-	-	-	-	-	1	-	-	-	-	-
		SA	Completely Translucent +Internal patterning	-	-	-	-	-	-	2	3	1	2	-	-	-	-
		SC/SB?	Opaque Black/Grey	3	-	4	1	3	-	-	-	-	-	1	1	-	1
		SA/SB?	Marginally Translucent	1		3	-	2	-	5	2	1	-	-	-	-	-
		SC	Possible Banding	1	-	-	1	1	-	-	-	-	-	-	1	-	-
		-	Indeterminate	1	-	4	1	4	-	1	-	-	-	-	1	-	-
		SA	Glossy Black/Grey	-	-	10	-	6	-	-	-	-	-	-	1	-	-

		SC	Grey/Black Banding	-	-	-	1	-	1	-	-	-	-	-	2	-	-
	1-2 <50%	SA	Glossy Black	1	-	1	-	2	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	1	1	-	-	-	-	-	-
		SA/SB?	Marginally Translucent +Internal patterning	-	-	-	-	-	-	1	-	-	-	-	-	-	-
		SC	Grey/Black Banding	-	-	1	-	1	-	-	-	-	-	-	-	-	-
		SA/SB?	Translucent +Internal patterning	-	-	-	-	-	-	2	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	1	-	2	-	-	-	-	-	-	-	-	-	-	-
		SC	Possible Banding	1	-	-	-	1	-	1	-	-	-	-	-	-	-
		-	Indeterminate	-	-	1	-	2	-	1	-	-	-	-	-	-	-
	1-2 >50%	SC/SB?	Opaque Black/Grey	-	-	-	-	1	-	-	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	1	-	1	-	1	-	3	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Translucent	-	-	-	-	-	-	-	-	-	1	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	-	-	-	-	-	-	-	-	1	1	-	-	-	-
		SA/SB?	Marginally Translucent	-	1	-	-	-	-	2	1	-	-	-	-	-	-
		SA	Completely Translucent +Internal patterning	-	-	-	-	-	-	1	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent +Internal patterning	-	-	-	-	-	-	-	4	-	-	-	-	-	-
		SA/SB?	Translucent +Internal patterning	-	-	-	-	-	-	1	-	-	-	-	-	-	-
		SC	Grey/Black Banding	-	-	-	-	2	-	-	-	-	-	-	-	-	-
		-	Indeterminate	-	-	-	-	1	-	-	-	-	-	-	-	-	-
	3-4 <50%	SA	Glossy Black/Grey	-	-	-	-	-	-	1	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	-	1	1	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	1	1	-	-	-	-	-	-	-
		SA/SB?	Translucent +Internal Patterning	-	-	-	-	2	-	2	-	-	-	-	-	-	-
		-	Indeterminate	-	-	1	-	2	-	-	-	-	-	-	-	-	-
	3-4 >50%	SA/SB?	Translucent +Internal Patterning	-	-	-	-	1	-	-	-	-	-	1	-	-	-
		-	Indeterminate	-	-	-	-	2	-	-	-	-	-	-	1	-	-
Flake fragments	*Non-cortical*	SA/SB?	Marginally Translucent	-	-	-	-	1	-	1	-	1	2	-	-	1	-

		SA	Glossy Black/Grey	1	-	2	1	3	-	-	-	2	-	-	-	-	-
		SC	Grey/Black Banding	-	-	2	-	1	-	-	-	-	-	-	-	-	-
		SC	Possible Banding	2	-	1	-	-	-	-	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	3	-	3	1	2	-	-	-	-	-	-	-	-	1
		SA	Completely Translucent +Internal Patterning	-	-	-	-	-	-	5	-	-	-	-	-	-	-
		SA/SB?	Translucent	-	-	-	-	-	-	-	-	-	-	1	-	-	-
		SA/SB?	Translucent +Internal Patterning	-	-	-	-	2	-	1	-	1	-	-	1	1	1
		SA/SB?	Marginally Translucent +Internal Patterning	-	-	-	-	-	-	1	-	-	-	-	3	-	-
		-	Indeterminate	-	-	-	-	2	-	-	-	-	-	-	1	-	-
	1-2 <50%	SA	Glossy Black/Grey	3	-	-	-	-	-	-	1	-	-	-	-	-	-
		SA	Completely translucent +Internal patterning	-	-	-	-	-	-	-	1	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	2	-	-	-	-	-	-	-
		SC	Possible Banding	-	-	1	-	-	-	-	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	-	-	-	-	-	1	-	-	-	-	-
		-	Indeterminate	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	1-2 >50%	SA/SB?	Glossy Black/Grey + Translucent	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	3-4 <50%	SA	Completely translucent + Internal patterning	-	-	-	-	-	-	1	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	2	-	-	-	-	-	-	-	-	-	-	1	-	-
		SA/SB?	Marginally Translucent	-	-	1	-	-	-	1	-	-	-	-	-	-	-
		SC	Possible Banding	-	-	-	-	1	-	-	1	-	-	-	-	-	-
		-	Indeterminate	-	-	-	-	1	-	-	-	-	-	-	-	-	-
	3-4 <50%	SA/SB?	Translucent + Internal patterning	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Possible tools on flakes	*NC*	SA	Glossy Black/Grey	-	-	-	-	2	-	2	-	-	-	-	1	-	-
		-	Indeterminate	2	-	-	-	-	-	2	1	-	-	-	-	-	-
		SA/SB?	Translucent +Internal Patterning	-	-	-	-	-	-	2	1	1	1	-	-	-	-
		SA/SB?	Translucent	-	-	-	-	1	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	1	3	-	1	-	-	-	-

		SA/SB?	Marginally Translucent +Internal Patterning	-	-	-	-	-	-	-	3	-	-	-	1	-	-
		SA/SB?	Glossy Black/Grey + Translucent	-	-	-	-	-	-	-	-	1	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	1	-	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	1-2 <50%	SA	Glossy Black/Grey	-	-	1	-	-	-	1	-	-	-	-	1	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	1	1	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	1	-	-	-	-	-	-	-	-	1	-	-
		SC	Possible Banding	-	-	-	-	-	-	-	-	-	-	-	1	-	-
		-	Indeterminate	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	1-2 >50%	SA	Glossy Black/Grey	-	-	-	-	-	-	1	-	-	-	-	-	-	-
		-	Indeterminate	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	3-4< 50%	SA	Glossy Black/Grey	-	-	-	-	1	-	-	1	-	-	-	-	-	-
	3-4< 50%	SA/SB?	Marginally Translucent	-	-	1	1	-	-	-	-	-	-	-	-	-	-
Tools on flakes	*NC*	SA/SB?	Marginally Translucent	-	-	1	-	1	-	1	-	-	1	-	-	-	-
		SA/SB?	Translucent +Internal Patterning	-	-	-	-	1	-	-	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	-	-	-	-	-	-	-	1	-	-	-	-	-	-
		-	Indeterminate	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	1-2 <50%	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	1-2 >50%	SA	Glossy Black/Grey	-	-	-	-	-	-	-	-	-	1	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	1	-	-	-	-	-	-	-
		SC	Possible Banding	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	3-4 <50%	SA	Glossy Black/Grey	-	-	-	-	1	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	-	1	-	-	-	-	-	-
		SC	Grey/Black Banding	-	-	-	-	1	-	-	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Total				29	1	51	8	63	5	58	29	11	10	3	25	3	2

Table 2. Campidano excluding transect 04 and 23. # Possible flake removal, * mixed flake/blade removal, † flake and possible flake removal.

Artefact Class	Cortex Types	Source	Material Characteristics	04							23				
				04-B	04-C	04-D	04-C-D halo	04-b	04-c	Isolated	23-A	23-B	23-C	23-D	Isolated
SS bipolar cores	*Non-cortical*	-	Indeterminate	-	-	-	-	-	1	-	-	-	-	-	-
	1-2 <50%	SA	Glossy Black/Grey	1	-	-	-	-	1	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	1	-	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	1	-	-	-	-	2	1	-	-	-	-	-
		SC/SB?	Opaque Grey/Black	1	-	-	-	-	-	-	-	-	-	-	-
		-	Indeterminate	1	-	-	-	-	-	-	-	-	-	-	-
SS platform core	*Non-cortical*	SA/SB?	Glossy Black/Grey + Translucent	1	-	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-	-
	1-2 < 50%	SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-	-
SS irregular core	*1-2 < 50%*	SA	Glossy Black/Grey	-	-	-	-	-	-	-	-	-	-	-	1
		SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-	-
		-	Indeterminate	1	-	-	-	-	-	-	-	-	-	-	-
	3-4 <50%	SA/SB?	Marginally Translucent +Internal patterning	1	-	-	-	-	-	-	-	-	-	-	-
DS bipolar cores	*Non-cortical*	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent +Internal patterning	1	-	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-	-
	1-2 < 50%	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	-	-	-	-	-	2	-	-	-	-	-	-
		-	Indeterminate	-	1	-	-	-	-	-	-	-	-	-	-
	3-4 <50%	SC/SB?	Opaque Grey/Black	1	-	-	-	-	-	-	-	-	-	-	-
DS platform core	*1-2 < 50%*	SA	Glossy Black/Grey	-	-	-	-	-	-	-	-	-	1	-	-
Double-stage core (bipolar & platform)	*1-2 <50%*	SA/SB?	Marginally Translucent	1	-	-	-	-	-	-	-	-	-	-	-
Double-stage core (bipolar flake & blade)	*3-4 <50%*	SC	Grey/Black Banding	-	-	-	-	-	1	-	-	-	-	-	-
MS core platform flake &double-stage bipolar	*Non-cortical*	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-
MS core platform blade & bipolar flake	*1-2 <50%*	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-

MS core platform blade, mixed flake/blade and possible flake	*1-2 <50%*	SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-	-
MS core platform blade & flake	*1-2 <50%*	SC	Grey/Black Banding	-	-	-	-	-	-	-	-	-	-	-	1
MS core platform flake and irregular flake	*1-2 <50%*	SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-	-
MS platform blade, flake† & irregular flake†	*Non-cortical*	SC	Possible Banding	-	-	-	-	-	-	-	-	-	-	-	1
Core platform rejuvenation	*Non-cortical*	SA	Completely Translucent + Internal Patterning	1	-	-	-	-	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent +Internal patterning	-	-	-	-	-	1	-	-	-	-	-	-
		SC	Grey/Black Banding	4	-	-	-	-	2	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	-	-	1	-	-	-	-	-	-
		-	Indeterminate	-	-	-	-	-	1	-	-	-	-	-	-
	1-2 <50%	SA/SB?	Translucent +Internal patterning	1	-	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	-	-	-	-	-	1	-	-	-	-	-	-
Complete flakes	*Non-cortical*	SA	Completely Translucent +Internal patterning	5	-	-	-	-	-	-	-	1	2	4	2
		SA	Completely Translucent	2	-	-	-	-	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	7	-	-	-	-	2	2	-	4	1	1	-
		SA/SB?	Translucent	5	-	-	-	-	1	-	-	-	-	-	-
		SA/SB?	Translucent +Internal patterning	23	1	-	-	3	7	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	1	-	1	-	-	1	-	-	-	1	-	-
		SA/SB?	Marginally Translucent +Internal patterning	4	-	-	-	1	-	1	-	-	1	-	1
		SA/SB?	Glossy Black/Grey + Translucent	7	-	-	-	-	-	-	-	1	1	-	1
		SA/SB?	Glossy Black/Grey + Banding	-	-	-	-	-	-	-	1	-	1	-	-
		SC	Possible Banding	3	-	-	1	1	8	-	-	-	-	1	-
		SC	Grey/Black Banding	12	1	-	-	-	12	2	-	1	3	-	2
		SC/SB?	Opaque Black/Grey	3	-	-	-	-	8	7	-	1	-	3	-
		-	Indeterminate	15	-	-	-	-	5	2	-	2	-	-	-
	1-2 <50%	SA	Glossy Black	5	2	-	-	-	2	1	-	1	2	-	1
		SA/SB?	Marginally Translucent	1	-	-	-	-	-	-	-	1	-	-	-
		SA/SB?	Glossy Black/Grey + Translucent	-	-	1	-	-	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	-	-	-	-	-	-	1	-	-	-	-	-
		SA/SB?	Marginally Translucent +Internal patterning	1	-	-	-	-	-	-	-	-	-	-	-

		SA/SB?	Translucent +Internal patterning	5	-	-	-	-	1	-	-	-	-	-	-
		SC	Grey/Black Banding	25	1	1	1	-	10	4	-	-	3	2	3
		SC	Possible Banding	2	1	-	-	-	1	1	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	8	1	1	-	1	5	1	-	2	1	1	3
		-	Indeterminate	5	-	-	-	-	1	1	-	1	-	-	-
	1-2 >50%	SA	Glossy Black/Grey	3	-	2	-	-	3	4	-	-	1	-	2
		SA/SB?	Glossy Black/Grey + Banding	-	-	-	-	-	-	-	-	-	1	-	1
		SA/SB?	Marginally Translucent +Internal patterning	1	-	-	-	-	-	1	-	-	-	-	-
		SA/SB?	Translucent +Internal patterning	-	-	-	-	-	-	1	-	-	-	-	-
		SC	Grey/Black Banding	13	-	-	-	-	5	2	-	-	1	1	-
		SC	Possible Banding	2	-	-	-	-	2	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	5	-	-	-	-	5	-	-	1	-	1	-
		-	Indeterminate	6	1	-	-	-	-	-	1	-	-	-	2
	3-4 <50%	SA	Glossy Black/Grey	2	-	-	-	-	-	-	1	-	-	-	-
		SA/SB?	Glossy Black/Grey + Translucent	2	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	1	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent +Internal Patterning	4	-	2	-	-	-	-	-	-	-	-	1
		SA/SB?	Translucent +Internal Patterning	5	-	-	-	-	-	1	-	-	-	-	-
		SC	Grey/Black Banding	-	1	-	-	-	1	1					
		SC/SB?	Opaque Black/Grey	1	-	-	-	-	-	-	-	-	-	-	1
	3-4 >50%	SA	Glossy Black/Grey	2	-	1	-	1	-	1	-	-	-	-	1
		SA	Completely Translucent	-	-	-	-	-	-	1	-	-	-	-	-
		SA	Completely Translucent +Internal Patterning	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Translucent	1	-	-	-	-	-	1	-	-	-	-	1
		SA/SB?	Translucent	-	-	-	-	-	-	1	-	-	-	-	-
		SA/SB?	Marginally Translucent +Internal Patterning	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Translucent +Internal Patterning	8	-	-	-	1	-	2	-	-	-	-	-
		SC	Grey/Black Banding	1	-	-	-	-	-	1	-	-	-	-	-
		-	Indeterminate	1	-	-	-	-	-	-	-	-	-	-	-
Flake fragments	*Non-cortical*	SA	Completely Translucent +Internal Patterning	12	-	-	-	-	-	-	-	2	1	1	1
		SA	Completely Translucent	6	-	-	-	-	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	18	-	-	-	-	-	2	-	1	3	1	1
		SA/SB?	Marginally Translucent	5	-	1	-	-	-	1	-	-	-	-	1
		SA/SB?	Marginally Translucent +Internal Patterning	3	-	-	-	-	-	-	-	-	1	1	1
		SA/SB?	Translucent +Internal Patterning	17	1	-	1	1	3	3	-	-	2	-	-

		SA/SB?	Glossy Black/Grey and Translucent	6	-	-	-	-	-	-	-	-	1	-	1
		SC	Possible Banding	2	-	-	-	-	5	-	-	-	-	-	-
		SC	Grey/Black Banding	13	2	-	1	-	9	1	-	1	3	2	1
		SC/SB?	Opaque Black/Grey	18	-	-	1	-	2	-	-	-	2	-	1
		-	Indeterminate	16	1	-	-	-	1	4	-	-	3	-	1
	1-2 <50%	SA	Glossy Black/Grey	4	-	-	-	-	-	-	-	-	1	1	2
		SA	Completely translucent +Internal patterning	-	-	-	-	-	-	-	-	-	-	-	1
		SA/SB?	Marginally Translucent +Internal patterning	-	-	-	-	-	1	2	-	-	-	-	-
		SA/SB?	Translucent +Internal patterning	-	1	-	-	-	-	1	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	1	-	-	-	-	-	1	-	-	-	-	-
		SC	Grey/Black Banding	11	-	-	-	-	3	1	-	-	4	1	1
		SC	Red/Black Banding	-	-	-	-	-	-	1	-	-	-	-	-
		SC	Possible Banding	-	-	-	-	-	-	-	-	-	-	-	1
		SC/SB?	Opaque Black/Grey	5	1	-	-	-	-	1	-	-	1	2	1
		-	Indeterminate	6	-	-	-	-	2	-	-	-	1	-	2
	1-2 >50%	SA	Glossy Black/Grey	4	-	1	-	-	2	2	-	-	1	-	-
		SA/SB?	Glossy Black/Grey + Translucent	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	-	-	-	-	-	1	-	-	-	-	-	-
		SA/SB?	Translucent + Internal patterning	-	-	-	-	-	-	1	-	-	-	-	-
		SC	Grey/Black Banding	4	-	-	-	-	-	1	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	2	-	-	-	-	1	-	-	-	-	-	-
		-	Indeterminate	2	-	-	-	-	-	1	-	-	-	-	-
	3-4 <50%	SA	Completely translucent + Internal patterning	1	-	-	-	-	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	2	-	-	-	-	-	1	-	-	-	-	-
		SA/SB?	Marginally Translucent	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent + Internal patterning	3	-	-	-	-	-	-	-	-	-	1	-
		SA/SB?	Translucent + Internal patterning	1	-	-	-	-	1	-	-	-	-	-	-
		SC	Grey/Black Banding	2	-	-	-	-	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	-	-	1	-	-	-	1	-	-
		-	Indeterminate	-	-	-	-	-	-	-	1	-	-	-	-
	3-4 >50%	SA	Glossy Black/Grey	1	-	-	-	-	-	2	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	1	-	-	-	-	-
		SA/SB?	Marginally Translucent + Internal patterning	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Translucent + Internal patterning	2	-	-	-	-	1	-	-	-	-	-	-
		SC	Grey/Black Banding	-	-	-	-	-	1	2	-	-	-	-	-

		-	Indeterminate	1	-	-	-	-	-	-	-	-		-	-
Possible tools on flakes	*NC*	SA	Completely Translucent +Internal Patterning	-	-	-	-	-	-	-	-	-	-	-	2
		SA	Completely Translucent	1	-	-	-	-	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	10	-	-	-	-	2	2	-	-	-	-	-
		SA/SB?	Translucent +Internal Patterning	2	-	-	-	-	-	-	-	-	1	-	-
		SA/SB?	Marginally Translucent	1	-	-	-	-	1	-	-	-	-	-	-
		SA/SB?	Marginally Translucent +Internal Patterning	7	-	-	-	-	1	1	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Translucent	4	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	1	-	-	-	-	-	-	-	-	-	-	-
		SC	Possible Banding	2	-	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	5	-	-	-	-	-		-	-	-	1	-
		SC/SB?	Opaque Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-
		-	Indeterminate	9	-	1	-	-	2	1	-	-	-	-	1
	1-2 <50%	SA	Glossy Black/Grey	4	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Translucent	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Translucent +Internal Patterning	1	-	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	2	-	-	-	-	-	-	-	-	-	-	-
		SC	Red//Black Banding	1	-	-	-	-	-	-	-	-	-	-	-
		SC	Possible Banding	1	1	-	-	-	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-
		-	Indeterminate	1	-	-	-	-	2	1	-	-	-	-	-
	1-2 >50%	SA	Glossy Black/Grey	1	-	-	-	-	2	1	-	-	-	-	-
		SC	Grey/Black Banding	4	-	-	-	-	1	-	-	-	-	-	-
		SC	Possible Banding	1	-	-	-	-	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-
		-	Indeterminate	1	-	-	-	-	-	-	-	-	-	-	1
	3-4 <50%	SA/SB?	Marginally Translucent	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent + Internal Patterning	1	-	-	-	-	-	1	-	-	-	-	-
		-	Indeterminate	1	-	-	-	-	-	-	-	-	-	-	-
Tools on flakes	*NC*	SA	Completely Translucent + Internal Patterning	2	-	-	-	-	-	-	-	-	-	-	-
		SA	Glossy Black/Grey	5	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Translucent	3	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	3	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent +Internal Patterning	3	-	-	-	-	-	-	-	-	-	1	-

		SA/SB?	Translucent +Internal Patterning	3	-	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	6	-	-	-	-	-	1	-	-	-	-	1
		SC/SB?	Opaque Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-
		-	Indeterminate	2	-	-	-	-	-	-	-	-	-	-	1
	1-2 <50%	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	1	-	-	-	-	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	-	-	-	-	-	1
		SC	Grey/Black Banding	4	-	-	-	-	1	2	-	-	-	-	-
		SC	Possible Banding	1	-	-	-	-	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	-	-	-	-	-	-	-	-	-	1	-
		-	Indeterminate	1	-	-	-	-	-	-	-	-	-	-	-
	1-2 >50%	SA	Glossy Black/Grey	4	-	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	1	-	-	-	-	-	1	-	-	-	-	-
		-	Indeterminate	-	-	-	-	-	-	1	-	-	-	-	-
	3-4 <50%	SA/SB?	Translucent +Internal Patterning	1	-	-	-	-	-	-	-	-	-	-	-
		-	Indeterminate	1	-	-	-	-	-	-	-	-	-	-	-
Total				508	18	12	5	9	139	82	4	21	46	27	48

Table 3. Campidano. Transect 04 and 23. †=possible flake removal

				10					11		12	
Artefact Class	**Cortex Types**	**Source**	**Material Characteristics**	**10-A**	**10-B**	**10-C**	**10-a**	**Isolated**	**11-a**	**11-b**	**12-a**	**Isolated**
SS bipolar cores	*Non-cortical*	SC	Grey/Black Banding	-	-	-	-	1	-	-	-	-
	1-2 <50%	SC	Grey/Black Banding	-	1	-	-	-	-	-	-	-
SS platform core	*Non-cortical*	SA	Glossy Black/Grey	-	-	-	-	1	-	-	-	-
		-	Indeterminate	-	1	-	-	-	-	-	-	-
	1-2 < 50%	SC	Possible Banding	-	-	1	-	-	-	-	-	-
		SC	Grey/Black Banding	-	1	-	-	-	-	-	-	-
		-	Indeterminate	-	-	-	1	-	-	-	-	-
	1-2 < 50%	SC	Grey/Black Banding	-	1	-	-	-	-	-	-	-
Double-stage core (bipolar & platform)	*1-2 <50%*	SC	Possible Banding	-	-	-	-	1	-	-	-	-
MS core platform flake possible flake, & irregular flake	*Non-cortical*	SC	Grey/Black Banding	-	1	-	-	-	-	-	-	-
Core platform rejuvenation	*Non-cortical*	SA	Completely Translucent + Internal Patterning	-	1	-	-	-	-	-	1	-
		SA/SB?	Translucent +Internal patterning	-	-	-	-	-	-	-	1	-
	3-4<50%	SC	Grey/Black Banding	-	1	-	-	-	-	-	-	-
	Non-cortical	SA	Completely Translucent +Internal patterning	2	1	1	-	-	-	-	2	-
		SA	Completely Translucent	1	1	-	-	2	1	-	1	-
		SA	Glossy Black/Grey	1	-	3	-	-	-	-	-	-
		SA/SB?	Translucent	-	2	-	-	-	-	-	-	-
		SA/SB?	Translucent +Internal patterning	-	2	1	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	1	5	-	-	-	1	-	-	-
		SA/SB?	Marginally Translucent +Internal patterning	1	-	-	-	-	1	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	-	-	1	-	-	-	-	-	-
		SC	Possible Banding	-	1	-	-	-	-	-	1	-
		SC	Grey/Black Banding	2	15	5	-	-	1	-	-	-
		SC	Red/Black Banding	-	-	-	-	-	1	-	-	-
		SC/SB?	Opaque Black/Grey	-	12	3	1	1	-	-	1	-
		-	Indeterminate	-	3	-	-	-	-	-	-	-
	1-2 <50%	SA	Glossy Black	-	8	1	-	-	-	-	-	-
		SA/SB?	Marginally Translucent + Internal Patterning	-	1	1	-	-	-	-	-	-

		SA/SB?	Glossy Black/Grey + Banding	-	1	1	-	-	-	-	-	-
		SA/SB?	Translucent +Internal patterning	1	1	1	-	-	-	-	-	-
		SC	Grey/Black Banding	-	11	13	-	2	1	-	-	-
		SC	Red/Black Banding	-	1	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	1	13	6	2	-	-	-	-	-
		-	Indeterminate	1	5	-	-	-	-	-	-	-
	1-2 >50%	SA	Glossy Black/Grey	-	2	2	-	-	-	-	-	-
		SA	Completely Translucent + Internal patterning	-	-	-	-	-	-	-	1	-
		SA/SB?	Glossy Black/Grey + Banding	-	1	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	—	1	-	-	-
		SA/SB?	Marginally Translucent +Internal patterning	-	1	-	-	-	-	-	-	-
		SC	Grey/Black Banding	-	2	1	1	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	1	1	-	-	-	-	-	-	-
		-	Indeterminate	1	2	-	-	-	-	-	-	-
	3-4 <50%	SA	Glossy Black/Grey	-	2	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Translucent	-	-	-	-	-	-	-	1	-
		SA/SB?	Marginally Translucent	-	-	-	-	-	-	-	1	-
		SA/SB?	Marginally Translucent +Internal Patterning	-	1	-	-	-	-	-	-	-
		SA/SB?	Translucent +Internal Patterning	-	-	-	-	-	-	-	1	-
		SA/SB?	Translucent	-	1	-	-	-	-	-	-	-
		SC	Grey/Black Banding	-	4	1	-	-	-	-	-	-
	3-4 >50%	SA	Glossy Black/Grey	-	1	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Translucent	-	1	1	-	-	-	-	-	1
		SA/SB?	Marginally Translucent	1	-	-	-	-	-	-	-	1
		SA/SB?	Translucent +Internal Patterning	-	-	-	-	-	-	-	1	-
		SC/SB	Opaque Black/Grey	-	-	-	-	-	-	-	1	-
Flake fragments	*Non-cortical*	SA	Completely Translucent +Internal Patterning	-	1	1	-	-	-	-	-	1
		SA	Completely Translucent	-	1	-	-	-	1	-	-	-
		SA	Glossy Black/Grey	-	9	2	-	-	1	-	-	-
		SA/SB?	Marginally Translucent	-	1	-	-	2	2	-	1	-
		SA/SB?	Marginally Translucent +Internal Patterning	-	1	-	-	-	-	-	-	-
		SA/SB?	Translucent +Internal Patterning	-	1	-	-	-	-	-	-	-
		SA/SB?	Translucent	-	1	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	-	2	-	-	-	-	-	-	-
		SC	Possible Banding	-	-	1	-	-	-	-	-	-

		SC	Grey/Black Banding	1	11	7	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	15	5	-	-	-	1	-	1
		-	Indeterminate	-	3	1	-	1	-	-	-	-
	1-2 <50%	SA	Glossy Black/Grey	-	4	1	-	1	-	-	-	-
		SA/SB?	Translucent +Internal patterning	-	1	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Banding	-	1	-	-	-	-	-	-	-
		SC	Grey/Black Banding	-	11	4	1	-	-	-	-	-
		SC	Possible Banding	-	3	1	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	6	-	-	1	1	-	-	-
		-	Indeterminate	1	2	-	-	1	-	-	-	-
	1-2 >50%	SA	Glossy Black/Grey	1	1	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent + Internal patterning	-	1	-	-	-	-	-	-	-
		SC	Grey/Black Banding	-	3	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	1	1	-	-	-	-	-	-	-
		SC	Possible Banding	-	1	-	-	-	-	-	-	-
	3-4 <50%	SA	Completely translucent + Internal patterning	-	-	-	-	-	-	-	1	-
		SA	Glossy Black/Grey	-	2	-	-	-	-	-	-	-
		SA/SB?	Glossy Black/Grey + Translucent	-	-	-	-	1	-	-	-	-
	3-4 >50%	SA/SB?	Marginally Translucent	-	1	1	-	1	-	-	-	-
		SA/SB?	Translucent + Internal patterning	-	-	-	-	-	-	-	1	-
		SC	Grey/Black Banding	-	1	-	-	-	-	-	-	-
Possible tools on flakes	*NC*	SA	Completely Translucent +Internal Patterning	-	-	-	-	1	-	-	-	-
		SA	Glossy Black/Grey	-	6	2	-	1	-	-	-	-
		SA/SB?	Marginally Translucent	1	-	1	2	-	-	-	1	-
		SA/SB?	Glossy Black/Grey + Translucent	-	2	-	-	-	-	-	-	-
		SC	Red/Black Banding	-	-	-	-	1	-	-	-	-
		SC	Grey/Black Banding	-	3	-	-	1	-	-	-	-
		SC/SB?	Opaque Black/Grey	1	6	1	-	-	-	-	-	-
		-	Indeterminate	1	-	1	-	2	-	-	-	-
	1-2 <50%	SA	Glossy Black/Grey	-	2	1	1	-	-	-	-	-
		SC	Grey/Black Banding	-	2	1	1	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	1	-	1	-	-	-	-	-	-
	1-2 >50%	SA	Glossy Black/Grey	-	-	-	-	1	-	-	-	-
		SC	Grey/Black Banding	-	2	-	-	-	-	-	-	-
		-	Indeterminate	-	1	-	-	-	-	-	-	-

	3-4 <50%	SA	Glossy Black/Grey	-	-	-	-	1	-	-	-	-
Tools on flakes	*NC*	SA	Glossy Black/Grey	-	1	-	-	-	-	-	-	-
		SA/SB?	Marginally Translucent	-	-	-	-	1	-	-	-	-
		SA/SB?	Marginally Translucent +Internal Patterning	-	-	1	-	-	-	-	-	-
		SC	Grey/Black Banding	-	4	1	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	2	1	-	-	-	-	-	-
	1-2 <50%	SA/SB?	Glossy Black/Grey + Banding	-	-	1	-	-	-	-	-	-
		SC	Grey/Black Banding	-	1	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	1	-	-	-	-	-	-	-
	1-2 >50%	SA	Glossy Black/Grey	-	1	-	-	-	-	-	-	-
		SC	Grey/Black Banding	-	1	-	-	-	-	-	-	-
		SC	Possible Banding	1	-	-	-	-	-	-	-	-
		SC/SB?	Opaque Black/Grey	-	1	-	-	-	-	-	-	-
Total				23	230	79	10	25	12	1	17	4

Table 4. Marmilla, excluding transect 14.

				14										
Artefact Class	**Cortex Types**	**Source**	**Material Characteristics**	**14-B**	**14-C**	**14-D**	**14-E**	**14-a**	**14-b**	**14-c**	**14-d**	**14-e**	**14-f**	**Isolated**
SS bipolar cores	*Non-cortical*	SA/SB	Glossy Black/Grey + Translucent	1	-	-	-	-	-	-	-	-	-	1
		SA/SB	Glossy Black/Grey + Banding	1	-	-	-	-	-	-	-	-	-	-
		SC/SB	Opaque Black/Grey	2	-	-	-	-	-	-	-	-	-	-
	1-2 <50%	SC	Possible Banding	-	-	1	-	-	-	-	-	-	-	-
	3-4 <50%	SA	Glossy Black/Grey	1	-	-	-	-	-	1	-	-	-	-
		SA/SB	Marginally Translucent	-	-	-	-	-	-	-	-	-	-	1
		SC	Grey/Black Banding	-	-	-	-	1	-	-	-	-	-	-
		SC/SB	Opaque Black/Grey	1	-	-	-	-	-	-	-	-	-	-
DS bipolar cores	*Non-cortical*	SA	Glossy Black/Grey	2	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-
	3-4< 50%	SA/SB?	Glossy Black/Grey + Translucent	1	-	-	-	-	-	-	-	-	-	-
		SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-
		SC/SB	Opaque Black/Grey	1	-	-	-	-	-	-	-	-	-	-
DS platform core	*1-2 <50%*	SA	Glossy Black/Grey	1	-	-	-	-	-	-	-	-	-	-
MS platform flake, possible flake & bipolar	*Non-cortical*	SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-
Ms platform flake & irregular flake	*1-2 <50%*	SA	Glossy Black/Grey	-	-	1	-	-	-	-	-	-	-	-
Core platform rejuvenation	*3-4<50%*	-	N/A	-	-	-	-	-	-	-	1	-	-	-
Complete flakes	*Non-cortical*	-	N/A	135	3	3	1	1	3	5	1	12	3	5
	1-2 <50%	-	N/A	17	2	2	-	-	3	2	3	4	-	2
	1-2 >50%	-	N/A	14	-	-	-	-	-	1	-	1	-	-
	3-4 <50%	-	N/A	28	2	-	-	-	1	-	1	1	-	-
	3-4 >50%	-	N/A	13	-	-	-	-	-	-	-	-	-	-
Flake fragments	*Non-cortical*	-	N/A	174	1	5	-	2	3	2	6	11	1	2
	1-2 <50%	-	N/A	27	-	-	-	-	-	-	2	2	-	1
	1-2 >50%	-	N/A	8	-	-	-	-	-	-	-	-	-	-
	3-4 <50%	-	N/A	24	-	-	-	-	-	1	-	2	-	-
	3-4 >50%	-	N/A	13	-	-	-	1	-	-	-	-	-	1
	Non-cortical	-	N/A	34	-	-	-	1	-	-	3	2	2	3
	1-2 <50%	-	N/A	11	-	-	-	1	-	-	3	-	1	-

	1-2 >50%	SA/SB?	Glossy Black/Grey + Translucent	-	-	-	-	-	-	-	1	-	-	-
		-	N/A	3	-	-	-	-	-	-	-	-	-	-
	3-4 < 50%	-	N/A	13	-	-	-	-	-	-	-	-	-	-
	3-4 >50%	-	N/A	3	-	-	-	-	-	-	-	-	-	-
Tools on flakes	*Non-cortical*	-	N/A	36	-	-	-	1	-	-	1	2	1	1
	1-2 <50%	SC	Grey/Black Banding	1	-	-	-	-	-	-	-	-	-	-
		-	N/A	7	-	-	-	-	1	-	1	-	-	-
	1-2 >50%	-	N/A	2	-	-	-	-	-	-	-	-	-	-
	3-4 <50%	-	N/A	13	-	-	-	-	-	-	-	-	-	-
	3-4 >50%	-	N/A	3	-	-	-	-	-	-	-	-	-	-
Total				593	8	12	1	8	11	12	23	37	8	17

Table 5. Marmilla. Transect 14.

APPENDIX 6.1.

Quantities and find contexts all secondary technology

Transect	Associated with	Collection type	Retouched unifacial	Retouched bifacial	Probably retouched
02	02-B	QT	-	1	1
	02-A-B off site	QT	-	-	1
	02-C-B off site	QT	-	1	-
	Isolated find	QT	-	1	-
	02-A	QL	1	-	-
	02-B	QL	-	-	1
	02-A-B off site	QL	-	-	2
	02-C	QL	1	-	-
	02-C-B off site	QL	-	1	-
	02-D	QL	1	-	-
	Isolated find	QL	1	-	1
04	04-B	QT	24	4	43
	Off-site 04-B	QT	2	-	6
	04-b	QT	1	-	3
	04-c	QT	-	-	14
	04-C-D off site	QT	1	-	2
	Isolated find	QT	2	1	4
	04-B	QL	42	5	54
	04-B off site	QL	7	-	12
	04-B (revisits)	QL	28	1	18
	04-c	QL	8	-	17
	04-C-D off site	QL	-	-	1
	Isolated find	QL	2	3	4
05	05-D	QT	-	-	1
	05-C	QL	-	1	
	05-D	QL	-	-	1
	Isolated find	QL	-	-	1
07	07-D/E	QT	-	-	1
	07-D/E off site	QT	1	-	1
	07-F	QT	1	-	-
	07-J off site	QT	-	-	3
	07-B	QL	-	1	2
	07-B off site	QL	1	-	1
	07-D/E	QL	1	-	3
	07-D/E off site	QL	-	1	-
	07-F	QL	1	-	1
	07-J*	QL	9	-	8
09	09-A	QT	-	-	6
	09-b	QT	4	-	8
	09-a*	QL	-	-	2
	09-A	QL	6	-	9
	09-b	QL	2	-	5
	Isolated	QL	1	-	-
10	10-A	QT	2	-	4
	10-a	QT	-	-	1

	10-B	QT	3	-	5
	10-C	QT	1	-	4
	10-C off site	QT	1	-	-
	Isolated find	QT	1	-	3
	10-a	QL	-	-	3
	10-A*	QL	2	-	-
	10-B	QL	11	2	26
	10-B off site	QL	4	2	4
	10-C	QL	2	-	8
	10-C off site	QL	1	-	1
	Isolated Find	QL	1	-	6
11	11-b	QT	-	1	-
12	12-a	QL			1
13	13-a*	QL	-	1	-
	13-B*	QL	-	-	1
	13-C*	QL	1	1	7
14	14-a	QT	-	-	2
	14-B	QT	39	15	52
	Off-site 14-B?	QT	1	-	2
	14-d	QT	1	-	3
	14-e	QT	1	-	1
	14-f	QT	1	-	5
	Isolated finds	QT	1	-	4
	14-b*	QL	1	-	-
	14-E*	QL	-	-	1
	14-a	QL	1	-	1
	14-B	QL	48	25	37
	14-B revisit	QL	1	-	1
	14-B off site	QL	2	-	-
	14-D*	QL	-	-	2
	14-d	QL	4	3	4
	14-f	QL	1	-	-
	Isolated finds	QL	-	-	1
23	23-B	QT	-	-	1
	23-C	QT	1	-	-
	23-C off site	QT	1	-	-
	Isolated finds	QT	1	-	1
	23-C	QL	1	-	3
	23-C off site	QL	-	-	1
	23-D	QT	-	-	2
	23-D off site	QT	2	-	-
	Isolated finds	QL	2	1	6
Total QT			**91**	**24**	**182**
Total QL			**197**	**48**	**259**

In red: Qualitative finds (QT)
In black: Quantitative finds (QL)
Asterix: Qualitative sites collected outside the main grid

APPENDIX 6.2.

Secondary modification data

Retouch Type	Retouch pattern	Modified			Unmodified						
		RET?	RET BL	Ret FL	Rejuv	CH	CO	FL	FRG	BIF	Total
Irregular	Irregular	83	2	13			1				99
	Marginal continuous	19		4				1			24
	Marginal isolated	8									8
	Profound continuous	12		5							17
	Profound isolated	6						1			7
Total		*128*	*2*	*22*			*1*	*2*			*155*
Probable retouch	Irregular	7		3							10
	Marginal continuous	2									2
	Marginal isolated	4		1							5
	Profound continuous	22		5		2		2			31
	Profound isolated	2									2
Total		*37*	-	*9*	-	*2*	-	*2*	-	-	*50*
Probably usewear	Irregular	29		2							31
	Marginal continuous	16	4	3							23
	Profound continuous	1									1
	Profound isolated	2									2
Total		*48*	*4*	*5*	-	-	-	-	-	-	*57*
Fresh retouch	Irregular	21									21
	Marginal continuous	10	2	5							17
	Marginal isolated	5		1							6
	Profound continuous	10		2							12
	Profound isolated	3									3
Total		*49*	*2*	*8*	-	-	-	-	-	-	*59*
Burin	Irregular	2									2
	Marginal continuous	1									1
	Profound isolated	1		1							2
Total		*4*	-	*1*	-	-	-	-	-	-	*5*
Denticulated	Irregular	5		1							6
	Marginal continuous	1		1							2
	Profound continuous			1							1
	Profound isolated	1									1
Total		*7*	-	*3*	-	-	-	-	-	-	*10*
Notch	Irregular	10		3							13
	Marginal continuous	3									3
	Marginal isolated	20	1	3							24
	Profound continuous	6	1	2							9
	Profound isolated	12	4	4							20
Total		*51*	*6*	*12*	-	-	-	-	-	-	*69*
Step marginal	Irregular	3		1							4
	Marginal continuous	56	19	57	1		3	1	1		138
	Marginal isolated	4									4
	Profound continuous	10	5	13							28
	Profound isolated	4		1							5
Total		77	24	72	1	-	3	1	1	-	179
Step profound	Irregular	2									2
	Marginal continuous	6	4	5			1				16
	Marginal isolated	2									2

	Profound continuous	9	1	16							26
	Profound isolated	2	1	3							6
Total		*21*	*6*	*24*	-	-	*1*	-	-	-	*51*
Feathered marginal	Irregular	1		4							5
	Marginal continuous	22	7	42		1				1	73
	Marginal isolated	1		2							3
	Profound continuous	8	2	11							21
	Profound isolated			1							1
Total		*32*	*9*	*60*	-	*1*	-	-	-	*1*	*103*
Feathered profound	Irregular	3	1								4
	Marginal continuous	13		20			1	1		3	38
	Marginal isolated	2									2
	Profound continuous	26	5	56			2				89
	Profound isolated	3		5							8
Total		*47*	*6*	*81*	-	-	*3*	*1*	-	*3*	*141*
Scalar	Irregular		1								1
	Marginal continuous	5	2	8							15
	Marginal isolated		1								1
	Profound continuous	3	1	8			1				13
	Profound isolated	1		1							2
Total		*9*	*5*	*17*	-	-	*1*	-	-	-	*32*
Grand Total		**510**	**64**	**314**	**1**	**3**	**9**	**6**	**1**	**4**	**912**

Table 1. Retouch types and patterns for per basic artefact classification. Recorded per work edge.

Retouch type	Retouch pattern	Average Length	Average Width	N
Scalar	Marginal continuous	29.6	20.2	15
	Profound continuous	38.4	38.1	14
	Marginal isolated	40.9	20.2	1
	Profound isolated	34.7	24.7	2
	Irregular	35.7	18.1	1
Feathered profound	Marginal continuous	27.6	22.9	38
	Profound continuous	38.1	30.5	90
	Marginal isolated	28.6	24.3	2
	Profound isolated	42	35.6	8
	Irregular	37.4	24.9	4
Stepped profound	Marginal continuous	30.6	23.3	16
	Profound continuous	31.9	29.8	25
	Marginal isolated	0	0	2
	Profound isolated	35.8	32.5	6
	Irregular	27.2	31.1	2
Feathered marginal	Marginal continuous	26.7	22.1	73
	Profound continuous	30.7	29.5	23
	Marginal isolated	46.9	32.5	3
	Profound isolated	31	25.1	1
	Irregular	34.4	21.7	5
Step marginal	Marginal continuous	30.5	24	138
	Profound continuous	30.7	23.7	28
	Marginal isolated	42.7	28.9	4
	Profound isolated	27.1	23.7	3
	Irregular	24.6	25.5	6
Notch	Marginal continuous	39.7	20.8	3
	Profound continuous	36.3	34.5	9
	Marginal isolated	36.7	22.7	23
	Profound isolated	41.8	28.8	20
	Irregular	28.3	26.6	13
Burin	Marginal continuous	36.7	24.4	1
	Profound isolated	43.2	30.1	2
	Irregular	35	26.7	2
Denticulated	Marginal continuous	29.1	24	2
	Profound continuous	38.4	27.5	1
	Profound isolated	36.6	27.9	1
	Irregular	28.2	29.2	6
Fresh retouch	Marginal continuous	31.3	24.3	17
	Profound continuous	35	25.8	12
	Marginal isolated	30.4	26	6
	Profound isolated	38.2	28.6	3
	Irregular	32.2	23.9	21
Probable retouch	Marginal continuous	48.6	36.2	2
	Profound continuous	25.9	23.3	31
	Marginal isolated	29.4	22.7	6
	Profound isolated	35.6	28.5	2
	Irregular	36.7	33.7	10
Probable usewear	Marginal continuous	36.1	22.3	23
	Profound continuous	0	0	1
	Profound isolated	30.3	17.7	2
	Irregular	37.6	23.4	32

Irregular	Marginal continuous	31.6	27.4	24
	Profound continuous	25.1	20	28
	Marginal isolated	22.6	19.6	13
	Profound isolated	27.4	24.7	7
	Irregular	30.8	23.6	103
Total				936

Table 2. Artefact length for all retouch types and patterns.

Retouch type	Retouch pattern	Average Retouch Length	Average Retouch Width	N
Scalar	Marginal continuous	20.6	4.0	15
	Profound continuous	28.3	7.3	14
	Marginal isolated	10.6	5.1	1
	Profound isolated	18.5	6.6	2
	Irregular	-	-	1
Feathered profound	Marginal continuous	20.1	6.0	38
	Profound continuous	29.3	10.1	90
	Marginal isolated	14.9	7.7	2
	Profound isolated	23.7	8.0	8
	Irregular	21.4	8.6	4
Stepped profound	Marginal continuous	23.0	4.1	16
	Profound continuous	25.6	5.2	25
	Marginal isolated		4.4	2
	Profound isolated	25.3	6.1	6
	Irregular	23.6	4.5	2
Feathered marginal	Marginal continuous	16.2	3.3	73
	Profound continuous	20.7	4.4	23
	Marginal isolated	19.5	5.2	3
	Profound isolated	-	6.3	1
	Irregular	16.4	2.4	5
Step marginal	Marginal continuous	19.6	3.4	138
	Profound continuous	21.7	3.7	28
	Marginal isolated	11.8	3.2	4
	Profound isolated	19.9	2.6	3
	Irregular	18.8	3.2	6
Notch	Marginal continuous	22.7	8.5	3
	Profound continuous	24.4	11.4	9
	Marginal isolated	20.8	10.0	23
	Profound isolated	18.4	11.3	20
	Irregular	27.7	6.4	13
Burin	Marginal continuous	16.4	2.9	1
	Profound isolated	3.6	25.7	2
	Irregular	-	-	2
Denticulated	Marginal continuous	29.9	3.0	2
	Profound continuous	36.7	4.8	1
	Profound isolated	26.8	12.9	1
	Irregular	22.8	4.6	6
Fresh retouch	Marginal continuous	18.8	4.0	17
	Profound continuous	27.2	5.5	12
	Marginal isolated	15.7	6.6	6
	Profound isolated	18.9	5.3	3
	Irregular	21.3	4.8	21
Probable retouch	Marginal continuous	29.8	3.0	2

	Profound continuous	13.3	4.6	31
	Marginal isolated	18.7	10.4	6
	Profound isolated	17.2	7.0	2
	Irregular	22.8	5.4	10
Probable usewear	Marginal continuous	22.5	1.9	23
	Profound continuous	-	5.5	1
	Profound isolated	19.0	1.4	2
	Irregular	18.5	2.6	32
Irregular	Marginal continuous	21.1	3.7	24
	Profound continuous	13.2	4.4	28
	Marginal isolated	7.9	6.0	13
	Profound isolated	22.9	3.4	7
	Irregular	22.6	6.9	102
Total				**935**

Table 3. Average retouch length and width for all work edges.

APPENDIX 6.3.
Modification location and position

Location	Position	Arborèa			Campidano												Marmilla				
		02		05	04			07		09		13		23			10		12	14	
		F	B	B	F	B	-	F	B	F	B	F	B	F	B		F	B	F	-	Total
SINGLE WORK EDGES																					
Dorsal	Proximal	-	-	-	9	1	-	1	-	1	-	1	-	-	-		4	-	-	6	23
	Medial	-	-	-	1	3	-	-	-	1	-	-	-	-	1		-	-	-	2	8
	Lateral left	-	-	1	8	7	1	1	-	2	-	-	1	1	-		8	-	-	13	43
	Lateral right	-	-	1	15	10	1	-	2	5	-	-	-	-	2		9	-	-	11	56
	Distal	2	-	-	19	3	7	2	-	6	1	1	-	2	-		13	-	-	17	73
Ventral	Proximal	-	-	-	2	1	1	1	-	1	-	-	-	2	-		2	-	-	3	13
	Medial	-	-	-	1	5	-	-	-	-	-	-	-	-	2		-	-	-	2	10
	Lateral left	1	-	-	8	6	1	-	1	1	-	1	-	2	1		3	1	-	9	35
	Lateral right	1	-	1	8	7	-	3	1	-	-	-	-	-	-		3	-	1	10	35
	Distal	1	-	-	16	6	3	6	-	1	-	-	-	-	-		2	-	-	8	43
Bifacial / Alternating	Proximal	-	-	-	2	1	1	-	-	-	-	-	-	-	-		1	-	-	3	8
	Lateral right	-	-	-	2	2	-	-	-	-	-	-	-	-	-		-	-	-	2	6
	Lateral left	-	-	-	-	-	1	-	-	-	-	-	-	-	-		3	-	-	-	4
	Distal	-	-	-	2	-	1	-	-	2	-	-	-	-	-		-	-	-	6	11
Other	Proximal	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	1	1
	Lateral right	-	-	-	1	-	-	-	-	-	-	-	-	-	-		-	-	-	-	1
	Distal	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	4	4
DOUBLE WORK EDGES																					
Dorsal	Lateral left & right	-	-	-	5	8	-	1	1	1	-	1	-	-	-		8	1	-	8	34
	Proximal & distal	-	-	-	4	2	-	-	-	2	-	1	-	1	1		1	-	-	1	13
	Lateral left & proximal	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	1	4
	Distal & lateral left	-	-	-	1	1	-	-	-	1	-	-	-	-	-		1	-	-	1	5
	Distal & lateral right	-	-	-	1	-	-	-	-	1	-	-	-	-	-		1	1	-	1	5
	Distal & medial	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	2	2

Ventral	Lateral left & right	-	-	-	1	3	1	-	-	-	-	1	-	-	-	1	-	-	5	12
	Medial & distal	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Lateral left & proximal	-	-	-	2	-	-	-	-	1	-	-	-	1	-	-	-	-	1	5
	Lateral right & distal	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-	-	1	4
	Distal & proximal	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Bifacial / Alternating	Lateral left & right	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	1	-	1	4
Ventral / Dorsal	Proximal / distal	-	-	-	1	-	-	2	-	1	-	-	-	-	-	-	-	-	3	7
	Proximal / lateral right	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
	Proximal / lateral left	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	Lateral right/ lateral left	-	1	-	3	4	-	1	-	-	-	-	-	-	-	1	-	-	2	12
	Lateral left / lateral right	-	-	-	2	1	-	1	-	-	-	-	-	1	-	-	-	-	2	7
	Lateral right / distal	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2
	Distal / lateral right	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-	-	1	4
	Distal / lateral left	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	3
	Distal / medial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	Distal / proximal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Dorsal / Bifacial	Lateral left / proximal	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Lateral left / distal	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Lateral right / lateral left	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2	3
	Distal / medial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Dorsal / Alternating	Lateral left / lateral right	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Ventral / Bifacial	lateral left / distal	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2
	Medial / proximal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Ventral / Other	Proximal / proximal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
MULTI WORK EDGES																				
Dorsal	Continuous 3-4 edges	1	-	-	10	3	-	3	-	6	-	-	-	1	-	7	-	-	23	54
	Distal, lateral left & right	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Ventral	Continuous 3-4 edges	-	-	-	3	-	2	3	-	-	-	-	-	-	-	1	-	-	6	15
Alternating	Continuous 3-4 edges	-	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	6
Bifacial	Continuous 3-4 edges	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Ventral / Dorsal	Lateral right & proximal / lateral left	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1

	Continuous 3-4 edges / lateral left & right	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-		1
	Distal & proximal / distal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	Lateral left & proximal / lateral right	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	Proximal / distal & medial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Dorsal / Bifacial	Continuous 3-4 edges / proximal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Dorsal / Alternating	Distal / continuous 3-4 edges	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-		1
Ventral / Dorsal / Other	Lateral right & proximal / lateral left / proximal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
		7	1	3	140	77	20	25	7	34	2	7	1	12	7	72	4	1	180	600

Table 1. Retouch location and position on all flake (F) and blade (B) blanks.

Location	Position	Arborèa	Campidano											Marmilla					
		02	09		04					07		13	23	10	14				Total
		FR	FR	CH	FR	C	CH	OF	SCP	FR	OF	FR	FR	FR	CH	FR	C	CH	
SINGLE WORK EDGES																			
Dorsal	Lateral right	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
	Lateral left	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
	Distal	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Other	Lateral right	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Alternating	Medial	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Bifacial	Lateral left	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
DOUBLE WORK EDGES-																			
Dorsal	Lateral left & right	-	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	3
Ventral	Distal	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
	Lateral left	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Ventral / Dorsal	Proximal / distal	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Dorsal / Alternating	Proximal / lateral left	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-		1
MULTI WORK EDGES																			
Alternating	Continuous 3-4 edges	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
Dorsal	Continuous 3-4 edges	-	-	-	7	-	-	-	-	4	-	-	-	4	-	1	-	-	16
Ventral	Continuous 3-4 edges	1	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Ventral / Dorsal	Lateral left / distal & proximal	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Dorsal	N/R	-	5	-	12	-	1	-	-	1	-	1	3	6	-	2	-	-	31
Ventral	N/R	-	-	-	6	1	-	-	-	-	-	-	-	3	-	-	-	-	10
Dorsal /Bifacial	N/R	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Ventral / dorsal Bifacial	N/R	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
N/R	N/R	-	-	2	3	3	2	-	-	1	-	-	-	-	1	-	4	7	23
		2	5	2	37	5	4	3	3	7	1	1	3	15	1	3	4	7	103

Table 2. Retouch location and position on all other blanks. C= cores, Ch=chunks, FR= fragments, OF= overshot flakes, SCP= side-struck core platform rejuvenation flake. NR= not recorded

APPENDIX 6.4.
Modification location and angle, retouch type and work edge shape

		02		05	04							07				09				13			23			10				12	14					Total
Position	Angle	FL	FR	BL	BL	CH	C	FL	FR	NR	SCP	BL	FL	FR	OF	BL	CH	FL	FRG	BL	FL	FR	BL	FL	FR	BL	CH	FL	FR	FL	CH	C	FL	FR	NR	
Distal	30-60	-	-	-	4	-	-	10	-	4	-	-	2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	6	28
	60-80	-	-	-	-	-	-	11	-	3	-	-	2	-	-	-	-	4	-	-	-	-	-	2	-	-	-	5	1	-	-	-	-	-	8	36
	>80	2	1	-	6	-	-	14	2	1	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	12	49
Total		*2*	*1*	-	*10*	-	-	*35*	*2*	*8*	-	-	*4*	-	-	*1*	-	*6*	-	-	*1*	-	-	*2*	-	-	-	*14*	*1*	-	-	-	-	-	*26*	*113*
Lateral left	0-30	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	30-60	1	-	1	3	-	-	3	-	1	-	1	1	-	1	-	-	-	-	-	-	-	1	1	-	1	-	4	-	-	-	-	-	-	10	29
	60-80	-	-	-	7	-	-	6	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	6	-	-	-	-	-	-	5	27
	>80	-	-	-	2	-	-	7	-	2	-	-	-	-	-	-	-	1	-	1	1	-	-	-	-	-	-	3	1	-	-	-	-	-	6	24
Total		*1*	-	*1*	*13*	-	-	*16*	-	*3*	-	*1*	*1*	-	*1*	-	-	*3*	-	*1*	*1*	-	*1*	*2*	-	*1*	-	*13*	*1*	-	-	-	-	-	*21*	*81*
Lateral right	0-30	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3
	30-60	1	-	1	8	-	-	7	-	-	-	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	12	36
	60-80	-	-	1	7	-	-	9	-	-	1	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	2	27
	>80	-	-	-	1	-	-	8	-	1	-	1	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	2	-	-	-	-	-	-	4	19
Total		*1*	-	*2*	*18*	-	-	*24*	-	*1*	*1*	*3*	*3*	-	-	-	-	*3*	-	-	-	-	*1*	-	-	-	-	*8*	-	*1*	-	-	-	-	*19*	*85*
Medial	0-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2
	30-60	-	-	-	3	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	8
	60-80	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3
	>80	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4
Total		-	-	-	*6*	-	-	2	-	-	*1*	-	-	-	-	-	-	*1*	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	*4*	*17*
Proximal	0-30	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	30-60	-	-	-	-	-	-	5	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	-	3	12
	60-80	-	-	-	1	-	-	2	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	8
	>80	-	-	-	1	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	2	-	-	-	-	-	-	5	16
Total		-	-	-	*2*	-	-	*13*	-	*1*	-	-	2	-	-	-	-	*1*	-	-	-	*1*	-	2	-	-	-	*4*	-	-	-	-	*1*	-	*10*	*37*
Indeter-minate	0-30	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	3
	30-60	-	-	-	-	-	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	1	-	-	7	14

	60-80	-	-	-	1	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	1	1	-	1	10	23
	>80	1	-	-	1	3	3	4	13	1	-	-	-	1	-	-	1	-	3	-	-	1	-	-	2	-	-	1	5	-	1	1	1	1	5	49
Total		*1*	-	-	*3*	*3*	*3*	*8*	*16*	*2*	-	-	-	*2*	-	-	*1*	-	*3*	-	-	*1*	-	-	*3*	-	*1*	*2*	*6*	-	*5*	*4*	*1*	*2*	*22*	*89*
Total		5	1	3	52	3	3	98	18	15	2	4	10	2	1	1	1	14	3	1	3	1	5	6	3	1	1	41	8	1	5	4	2	2	102	422

Table 1. Retouch angle and retouch location for all blanks with a single work edges. *Blank type not recorded. BL= blades C= cores, CH=chunks, FL= flakes, FR= fragments, N/R= not recorded OF= overshot flakes, SCP= side-struck core platform rejuvenation flake.

		02			04								07			09				23		13	10			14				Total
Location	**Angle**	**BL**	**FL**	**FR**	**BL**	**CH**	**C**	**FL**	**FR**	**N/R**	**OF**	**SCP**	**BL**	**FL**	**FR**	**BL**	**CH**	**FL**	**FR**	**BL**	**FL**	**FL**	**BL**	**FL**	**FR**	**CH**	**FL**	**FR**	**N/R**	
Distal	0-30	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					2
	30-60	-	-	-	-	-	-	5	-	-	-	-	-	1	-	-	-	3	-	-	-	-	-	1	-				7	17
	60-80	-	1	-	1	-	-	4	-	-	-	-	-	5	-	-	-	1	-	-	-	-	1	2	-				11	26
	>80	-	-	-	2	-	-	7	-	-	2	-	-	-	-	-	-	4	-	1	1	1	-	3	-				12	33
Total		-	*1*	-	*3*	-	-	*16*	-	*2*	*2*	-	-	*6*	-	-	-	*8*	-	*1*	*1*	*1*	*1*	*6*	-				*30*	*78*
Lateral left	0-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				1	1
	30-60	-	1	-	2	-	-	1	-	-	1	-	-	1	-	-	-	1	-	-	-	-	-	1	-				11	19
	60-80	1	-	-	8	-	-	4	2	-	-	-	1	1	-	-	-	1	-	-	1	-	-	1	-				8	28
	>80	-	-	-	2	-	-	6	-	-	1	1	-	-	-	1	-	1	-	-	1	2	-	3	-				11	29
Total		*1*	*1*	-	*12*	-	-	*11*	*2*	-	*2*	*1*	*1*	*2*	-	*1*	-	*3*	-	-	*2*	*2*	-	*5*	-				*31*	*77*
Lateral right	0-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				2	2
	30-60	1	-	-	2	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	2	1	2	-				9	19
	60-80	-	-	-	5	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3	-				13	26
	>80	-	-	-	4	-	-	7	-	-	-	1	1	1	-	1	-	2	-	-	1	1	-	1	-				9	29
Total		*1*	-	-	*11*	-	-	*12*	-	-	-	*1*	*1*	*2*	-	*1*	-	*2*	-	-	*2*	*3*	*1*	*6*	-				*33*	*76*
Medial	30-60	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				1	2
	60-80	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				2	4
	>80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
Total		-	-	-	2	-	-	*1*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*6*	*9*
Proximal	30-60	-	-	-	-	-	-	1	-	-	1	-	-	1	-	-	-	1	-	-	-	1	-	1	-	-	-	-	5	11
	60-80	-	-	-	3	-	-	1	-	-	1	-	-	1	-	-	-	1	-	-	-	1	-	-	-	-	-	-	8	16

	>80	-	-	-	-	-	-	6	-	-	1	-	-	-	-	-	-	3	-	1	2	-	-	-	-	-	-	-	3	16
Total		-	-	-	*3*	-	-	*8*	-	-	*3*	-	-	2	-	-	-	*5*	-	*1*	*2*	*2*	-	*1*	-	-	-	-	*16*	*43*
Indeterminate	30-60	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4
	60-80	-	-	-	-	-	1	-	8	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	1	-	-	4	16
	>80	-	-	-	-	-	1	2	6	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-	2	2	-	-	15	32
Total		-	-	-	-	-	*2*	*2*	*15*	-	-	-	-	-	-	-	*2*	-	*4*	-	-	-	-	-	*2*	*3*	-	-	22	52
Lateral left & right	30-60	-	-	-	2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	5
	60-80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
	>80	-	-	-	3	1	-	3	1	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	11
Total		-	-	-	*5*	*1*	-	*3*	*1*	*1*	-	-	*2*	*1*	-	-	-	-	-	-	-	-	-	*1*	*2*	-	-	-	-	*17*
Continuous 3-4 edges	0-30	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2
	30-60	-	-	-	-	-	-	3	-	1	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	13
	60-80	-	-	1	2	-	-	7	1	-	-	-	-	1	2	-	-	1	-	-	-	-	-	1	1	-	-	-	11	28
	>80	-	1	-	3	-	-	5	9	1	-	-	-	2	4	-	-	1	-	-	-	-	-	4	3	-	1	1	14	49
Total		-	*1*	*1*	*5*	-	-	*16*	*10*	*2*	-	-	-	*6*	*6*	-	-	*2*	-	-	*1*	-	-	*5*	*4*	-	*1*	*1*	*31*	*92*
Grand Total		2	3	1	41	1	2	69	28	5	7	2	4	19	6	2	2	20	4	2	8	8	3	25	6	3	1	1	169	444

Table 2. Retouch angle and retouch location for all blanks with a double and multi work edges. *Blank type not recorded. Note that work edges, not artefact numbers are represented (n=255). BL= blades C= cores, CH=chunks, FL= flakes, FR= fragments, N/R= not recorded OF= overshot flakes, SCP= side-struck core platform rejuvenation flake.

Retouch Type	Work edge shape	02	05	04	07	09	13	23	10	12	14	Total
Feathered	Straight	1	-	20	2	1	-	2	2	-	11	39
	Concave	-	-	4	-	-	-	-	1	-	5	10
	Convex	2	-	17	3	3	4	2	7	-	20	58
	Convergent/pointed	-	-	3	-	2	-	1	3	-	4	13
	Irregular	-	-	1	-	-	-	-	-	-	-	1
	Denticulated	-	-	3	1	-	-	-	-	-	3	7
Total		*3*	-	*48*	*6*	*6*	*4*	*5*	*13*	-	*43*	*128*
Stepped	Straight	-	2	22	3	-	-	1	7	-	12	47
	Concave	1	-	12	-	-	-	1	-	-	7	21
	Convex	1	-	17	-	5	-	2	8	-	16	49
	Convergent/pointed	-	-	3	-	-	-	-	-	-	1	4
	Denticulated	-	-	3	-	-	-	-	1	-	2	6
Total		*2*	*2*	*57*	*3*	*5*	-	*4*	*16*	-	*38*	*127*
Scalar	Straight	-	-	1	-	-	-	-	-	-	1	2
	Concave	-	-	3	-	-	-	-	1	1	3	8
	Convex	-	-	2	-	-	-	-	-	-	2	4
	Convergent/pointed	-	-	2	-	-	-	-	1	-	-	3
Total		-	-	*8*	-	-	-	-	2	*1*	*6*	*17*
Notch	Straight	-	-	1	-	-	-	-	-	-	-	1
	Concave	-	-	*9*	1	2	-	1	*9*	-	-	22
	Convex	-	-	-	-	-	-	-	1	-	-	1
	Convergent/pointed	-	-	1	-	-	-	-	-	-	-	1
	Irregular	-	-	1	-	-	-	-	-	-	-	1
	Denticulated	-	-	3	1	-	-	-	4	-	-	8
Total		-	-	*15*	*2*	*2*	-	*1*	*14*	-	-	*34*
Denticulate	Convex	-	-	1	-	-	-	-	1	-	-	2
	Convergent/pointed	-	-	-	-	1	-	-	-	-	-	1
	Irregular	-	-	-	-	1	-	-	1	-	-	2
	Denticulated	-	-	-	-	1	-	-	-	-	-	1
Total		-	-	*1*	-	*3*	-	-	*2*	-	-	*6*
Burin	Concave	-	-	1	-	-	-	-	-	-	-	1
Total		-	-	*1*	-	-	-	-	-	-	-	*1*
Fresh	Straight	-	-	*8*	-	-	-	*1*	*2*	-	-	*11*
	Concave	1	-	1	-	-	-	1	-	-	-	3
	Convex	-	-	5	-	-	-	-	-	-	-	*5*
	Convergent/pointed	-	-	2	-	-	-	-	-	-	-	2
	Irregular	-	-	2	-	-	-	-	-	-	-	2
	Denticulated	-	-	1	-	-	-	1	-	-	-	2
Total		*1*	-	*19*	-	-	-	*3*	*2*	-	-	25
Probable	Straight	-	-	3	-	-	-	-	-	-	1	4
	Concave	-	-	1	-	-	-	-	-	-	6	7
	Convex	-	-	2	-	-	-	-	1	-	1	4
	Convergent/pointed	-	-	1	-	-	-	-	-	-	1	2
	Denticulated	-	-	-	-	-	-	-	-	-	1	1
Total		-	-	7	-	-	-	-	*1*	-	*10*	*18*
Usewear	Straight	-	-	5	2	1	-	1	-	-	2	11
	Concave	-	-	1	-	-	-	-	-	-	-	1
	Convex	-	1	3	-	2	-	-	2	-	2	10
	Convergent/pointed	-	-	-	-	-	-	-	1	-	-	1
	Irregular	-	-	-	-	-	-	-	2	-	1	3
	Denticulated	-	-	-	-	-	1	-	-	-	-	1

Total		-	*1*	*9*	*2*	*3*	*1*	*1*	*5*	-	*5*	*27*
Irregular	Straight	-	-	5	1	-	-	-	-	-	3	9
	Concave	-	-	4	2	-	-	-	-	-	6	12
	Convex	-	-	13	1	3	-	2	4	-	3	26
	Convergent/pointed	-	-	4	-	-	-	-	1	-	1	6
	Irregular	-	-	2	-	-	-	-	-	-	3	5
	Denticulated	-	-	4	-	2	-	-	1	-	2	9
Total		-	-	*32*	*4*	*5*	-	*2*	*6*	-	*18*	*67*
Grand Total		**6**	**3**	**197**	**17**	**24**	**5**	**16**	**61**	**1**	**120**	**450**

Table 3. Retouch type and work edge shape for all blanks with single work edges

Retouch type	Work edge shape	02	04	07	09	13	23	10	14	Total
Feathered	Straight	2	8	1	-	-	-	5	12	28
	Concave	-	2	2	2	1	-	-	10	17
	Convex	-	11	3	1	1	-	4	13	33
	Convergent/pointed	-	7	4	2	-	3	4	10	30
	Denticulated	-	-	2	-	-	-	1	3	6
Total		*2*	*28*	*12*	*5*	*2*	*3*	*14*	*48*	*114*
Stepped	Straight	-	24	-	2	1	4	3	19	53
	Concave	-	6	-	-	-	-	-	3	9
	Convex	-	12	1	1	-	-	3	7	24
	Convergent/pointed	-	6	-	-	-	-	4	2	12
	Denticulated	-	2	1	-	-	-	-	-	3
Total		-	*50*	*2*	*3*	*1*	*4*	*10*	*31*	*101*
Scalar	Straight	-	-	-	-	-	-	-	3	3
	Concave	-	1	-	2	-	-	1	2	6
	Convex	-	3	-	-	-	-	-	1	4
	Convergent/pointed	-	-	-	-	-	-	-	1	1
	Denticulated	-	-	-	-	-	-	-	1	1
	Irregular	-	1	-	-	-	-	-	-	1
Total		-	*5*	-	*2*	-	-	*1*	*8*	*16*
Notch	Straight	-	-	1	-	-	-	1	-	2
	Concave	-	9	1	2	-	-	1	-	13
	Convex	-	-	1	2	-	-	1	1	5
	Convergent/pointed	1	1	-	-	-	-	2	-	4
	Denticulated	-	5	-	-	-	-	-	-	5
	Irregular	-	1	-	-	-	-	-	-	1
Total		*1*	*16*	*3*	*4*	-	-	*5*	*1*	*30*
Denticulate	Denticulated	-	-	-	2	-	1	-	-	3
	Irregular	-	1	-	-	-	-	-	-	*1*
Total		-	*1*	-	*2*	-	*1*	-	-	*4*
Burin	Concave	-	-	-	-	-	-	-	1	1
	Convex	-	-	-	-	-	-	-	1	1
	Convergent/pointed	-	1	-	-	-	-	-	-	1
Total		-	*1*	-	-	-	-	-	2	*3*
Fresh	Straight	1	4	-	2	-	2	-	-	9
	Concave	1	6	1	1	1	-	-	-	10
	Convex	-	4	-	1	-	-	-	-	5
	Convergent/pointed	-	1	1	1	-	-	-	-	3
	Denticulated	-	2	-	-	1	-	-	-	3
	Irregular	-	2	-	-	-	-	-	-	2

Total		*2*	*19*	*2*	*5*	*2*	*2*	-	-	*32*
Probable	Straight	-	2	1	-	-	-	-	1	4
	Concave	-	-	1	-	-	-	-	15	16
	Convex	-	3	1	-	1	-	1	-	6
	Convergent/pointed	-	2	-	-	1	-	-	1	4
	Denticulated	-	-	-	-	-	-	-	1	1
	Irregular	-	1	-	-	-	-	-	-	1
Total		-	*8*	*3*	-	*2*	-	*1*	*18*	*32*
Usewear	Straight	-	*4*	*2*	-	-	-	*3*	*5*	*14*
	Concave	-	-	-	-	-	-	-	1	1
	Convex	-	*4*	1	-	-	-	3	3	11
	Convergent/pointed	-	1	-	-	-	-	-	1	*2*
	Denticulated	-	-	-	-	-	-	1	1	2
Total		-	*9*	*3*	-	-	-	*7*	*11*	*30*
Irregular	Straight	-	3	2	2	-	-	-	14	21
	Concave	-	-	-	-	1	-	-	23	24
	Convex	-	5	-	2	-	1	-	15	23
	Convergent/pointed	-	3	2	-	-	-	-	*4*	9
	Denticulated	-	1	-	-	-	-	-	2	3
	Irregular	-	5	-	-	-	-	1	7	13
Total		-	*17*	*4*	*4*	*1*	*1*	*1*	65	93
Grand Total		**5**	**154**	**29**	**25**	**8**	**11**	**39**	**184**	**455**

Table 4. Retouch type and work edge shape for all blanks with double and multi-work edges

Retouch Type	Angle	02	04	07	13	23	10	11	14	Total
Deep short stepped surface covering	0-30	-	1	-	-	-	-	-	1	2
	30-60	-	2	-	-	1	-	-	*5*	*8*
	60-80	*1*	*4*	-	*1*	-	-	-	10	*16*
	>80	-	1	1	-	-	-	-	-	*2*
Total		*1*	*8*	*1*	*1*	*1*	-	-	*16*	*28*
Thin long feathered surface covering	30-60	2	3	1	1	-	-	-	8	15
	60-80	-	1	-	-	-	-	-	5	6
Total		*2*	*4*	*1*	*1*	-	-	-	*13*	*21*
Scalar	30-60	-	-	-	-	-	1	-	-	1
	60-80	-	1	-	-	-	1	-	-	2
Total		-	*1*	-	-	-	*2*	-	-	*3*
Irregular	30-60	-	1	-	-	-	-	-	1	2
	60-80	-	-	-	-	-	-	-	3	3
	>80	-	-	-	-	-	-	-	1	1
Total		-	*1*	-	-	-	-	-	*5*	*6*
Indeterminate	30-60	1	-	-	-	-	1	-	-	2
	60-80	-	-	-	-	-	-	1	-	1
Total		*1*	-	-	-	-	*1*	*1*	-	*3*
Grand Total		4	14	2	2	1	3	1	34	61

Table 5. Retouch type and angle for all non-hafted bifaces.

Retouch Type	Angle	5	10	14	Total
Thin long feathered surface covering	30-60	1	-	1	2
	60-80	-	-	1	1
Total		*1*	-	*2*	*3*
Deep short stepped, surface covering	30-60	-	-	3	3
	60-80	-	-	1	1
Total		-	-	*4*	*4*
Indeterminate	30-60	-	1	-	1
Total		-	*1*	-	*1*
Grand Total		1	1	6	8

Table 6. Retouch type and angle for all hafted bifaces.

Retouch types	Bulbs	02	04	07	13	23	10*		14*		Total
Deep short stepped	Not visible	-	1	1	1	-	-	-	7	2	12
	Diffuse	-	2	-	-	1	-	-	8	-	11
	Marked	1	6	-	-	-	-	-	-	-	7
Total		*1*	*9*	*1*	*1*	*1*	-	-	*15*	*2*	*30*
Thin long feathered	Not visible	1	-	1	-	-	-	1	11	2	16
	Diffuse	1	3	-	1	-	-	-	3	-	8
	Marked	-	1	-	-	-	-	-	-	-	1
Total		*2*	*4*	*1*	*1*	-	-	*1*	*14*	*2*	*25*
Scalar	Not visible	-	-	-	-	-	1	-	-	-	1
	Diffuse	-	-	-	-	-	1	-	-	-	1
	Marked	-	1	-	-	-	-	-	-	-	1
Total		-	*1*	-	-	-	2	-	-	-	*3*
Irregular	Not visible	-	-	-	-	-	-	-	5	-	5
	Diffuse	-	1	-	-	-	-	-	1	-	2
	Marked	-	-	-	-	-	-	-	-	-	
Total		-	*1*	-	-	-	-	-	*6*	-	*7*
Grand Total		3	15	2	2	1	2	1	35	4	65

Table 7. Development of bulb of percussion in retouch for all bifacially retouched artefacts. * first column contains non-hafted artefacts, second column contains hafted artefacts.

APPENDIX 6.5.

Artefact size

			02	05	04	07	09	13	23	12	10	14	Total
Probably retouched	Blade	Average L	-	47.1	48.2	29.0	-	-	32.3	-	-	-	43.6
		N	-	1	16	2	-	-	3	-	-	-	22
	Flake	Average L	28.5	-	33.8	22.7	32.8	39.8	24.0	-	28.9	44.8	32.0
		N	1	-	36	3	7	1	2	-	13	1	64
	N/R	Average L	-	-	31.1	-	-	-	-	-	-	23.2	24.7
		N	-	-	7	-	-	-	-	-	-	31	38
	Other	Average L	-	-	46.5	26.7	-	-	-	-	-	37.7	39.3
		N	-	-	10	1	-	-	1	-	2	1	15
Retouched	Blade	Average L	-	26.8	40.6	33.0	23.5	21.2	26.9	-	26.4	-	37.8
		N	-	2	38	2	1	1	3	-	1	-	48
	Flake	Average L	27.7	-	35.8	25.3	31.6	21.4	35.9	25.8	27.5	40.5	32.0
		N	4	-	66	7	12	2	5	1	37	1	135
	N/R	Average L	-	-	30.3	-	-	-	-	-	-	21.4	22.7
		N	-	-	9	-	-	-	-	-	-	77	86
	Other	Average L	-	-	34.6	-	-	-	-	-	31.4	30.7	32.4
		N	1	-	17	2	4	1	2	-	9	10	46
Indeter-minate	N/R	Average L	-	-	-	-	-	-	-	-	-	29.1	29.1
		N	-	-	-	-	-	-	-	-	-	1	1
Total			6	3	199	17	24	5	16	1	62	122	455

Table 1. Average length of all single work edges retouched and probably retouched artefacts.

			Arborèa	Campidano					Marmilla		
		Data	02	04	07	09	13	23	10	14	Total
Probably retouched	Blade	Average L	28.9	44.7	28.7	-	-	-	46.3	-	41.5
		N	1	9	2	-	-	-	2	-	14
	Flake	Average L	-	36.9	23.8	28.1	24.9	30.4	28.2	-	32.2
		N	-	21	3	9	2	1	5	-	41
	N/R	Average L	-	32.1	-	-	-	-	-	23.6	23.8
		N	-	1	-	-	-	-	-	43	44
	Other	Average L	-	37.9	-	-	-	-	26.7	35.6	34.5
		N	-	8	-	1	-	-	2	1	12
Retouched	Blade	Average L	-	52.4	-	33.7	-	16.8	36.9	-	48.7
		N	-	16	-	1	-	1	1	-	19
	Flake	Average L	40.2	36.7	32.5	37.3	20.5	29.7	31.9	33.4	34.2
		N	2	26	7	6	2	4	19	1	67
	N/R	Average L	-	29.4	-	-	-	-	-	23.7	24.1
		N	-	3	-	-	-	-	-	50	53
	Other	Average L	-	41.8	-	-	-	-	31.0	29.5	39.5
		N	1	17	5	2	-	-	3	2	30
Total			4	101	17	19	4	6	32	97	280

Table 2. Average length of all double and multi work edges retouched and probably retouched artefacts.

	Retouched blades (n=18)			Probably retouched blades (n=15)			Retouched flakes (n=64)			Probably retouched flakes (n=42)		
	L	W	T	L	W	T	L	W	T	L	W	T
Maximum	80.0	47.6	13.0	95.4	32.1	16.3	60.1	58.1	21.4	88.7	47.4	18.2
Average	46.1	26.8	8.5	45.1	22.9	8.5	34.1	30.4	9.7	32.2	26.6	8.6
Minimum	16.8	15.8	4.0	24.8	16.1	5.2	16.3	16.1	2.7	18.3	13.4	4.4

Table 3. Maximum, average and minimum lengths (L), widths (W) and thicknesses (T) for retouched and probably retouched flakes and blades (in mm).

	Hafted bifaces (n=8)			Non-hafted bifaces (n=64)		
	L	W	T	L	W	T
Maximum	27.7	21.7	6.2	58.7	40.6	26.6
Average	24.0	15.2	5.0	31.2	22.2	7.5
Minimum	21.1	12.0	3.7	13.4	8.5	3.8

Table 4. Maximum, average and minimum lengths (L), widths (W) and thicknesses (T) for hafted and non-hafted bifaces (in mm).

	Non-hafted bifaces (n=8)									Hafted bifaces (n=64)			
	02	04	07	10	11	13	14	23	Total	05	10	14	Total
Average Length	24.1	42.3	-	24.5	-	25.6	25.7	40.5	31.2	24.0	27.7	23.4	24.0
N	4	15	2	3	1	2	36	1	64	1	1	6	8

Table 5. Average length of all non-hafted and hafted bifaces.

Transect	Associated with	N	Average Length
02	02-B	1	18.1
	02-C-B off site	2	32.3
	Isolated	1	22.0
Total		*4*	*24.1*
4	04-B	11	43.8
	Isolated	4	34.6
Total		*15*	*42.3*
7	07-B	1	-
	07-D/E off site	1	-
Total		*2*	-
13	13-C	1	25.9
	13-d	1	25.3
Total		*2*	*25.6*
23	23-C-D off site	1	40.5
Total		*1*	*40.5*
10	10-B	2	25.6
	10-B off site	1	22.4
Total		*3*	*24.5*
11	Isolated	1	-
Total		*1*	
14	14-B	34	26.4
	14-d	2	15.6
Total		*36*	*25.7*
Total		64	31.2

Table 6. Average length of all non-hafted and hafted bifaces per transect

APPENDIX 6.6.

Visual characterisation secondary technology

Source	02	04	07	10	11	13	14	23	Total
SA	1	3	1	1	-	-	-	1	7
SA/SB	2	7	1	1	-	-	1	-	12
SC	-	3	-	-	1	-	-	-	4
SC/SB	-	-	-	1	-	1	-	-	2
N/R	-	-	-	-	-	-	35	-	35
Total	3	13	2	3	1	1	36	1	60

Table 1. Source data for non-hafted bifaces.

			Arborea		Campidano					Marmilla			
Source	Blank		02	05	04	07	09	13	23	10	12	14	Total
SA	Blade	Probably retouched	-	-	2	1	-	-	-	-	-	-	3
		Retouched	-	2	2	1	1	-	3	-	-	-	9
	Flake	Probably retouched	-	-	14	1	-	-	1	5	-	-	21
		Retouched	-	-	12	1	2	1	-	7	-	-	23
	Other	Probably retouched	-	-	6	-	-	-	-	1	-	-	7
		Retouched	-	-	7	-	-	-	1	3	-	2	13
	N/R	Probably retouched	-	-	2	-	-	-	-	-	-	-	2
		Retouched	-	-	3	-	-	-	-	-	-	-	3
Total			-	*2*	*48*	*4*	*3*	*1*	*5*	*16*	-	*2*	*81*
SA/SB	Blade	Probably retouched	-	1	6	1	-	-	1	-	-	-	9
		Retouched	-	-	20	1	-	-	-	-	-	-	21
	Flake	Probably retouched	1	-	5	-	4	-	1	-	-	-	11
		Retouched	-	-	18	2	9	-	2	5	1	-	37
	Other	Probably retouched	-	-	1	1	-	-	-	-	-	-	2
		Retouched	-	-	4	1	1	-	-	-	-	1	7
	N/R	Probably retouched	-	-	1	-	-	-	-	-	-	-	1
		Retouched	-	-	1	-	-	-	-	-	-	-	1
Total			*1*	*1*	*56*	*6*	*14*	-	*4*	*5*	*1*	*1*	*89*
SC	Blade	Probably retouched	-	-	3	-	-	-	2	-	-	-	5
		Retouched	-	-	11	-	-	-	-	1	-	-	12
	Flake	Probably retouched	-	-	8	-	-	1	-	4	-	1	14
		Retouched	1	-	12	1	-	1	1	10	-	1	27
	Other	Probably retouched	-	-	1	-	-	-	1	-	-	-	2
		Retouched	-	-	2	-	-	-	-	2	-	3	7
	N/R	Probably retouched	-	-	3	-	-	-	-	-	-	-	3
		Retouched	-	-	2	-	-	-	-	-	-	-	2
Total			*1*	-	*42*	*1*	-	*2*	*4*	*17*	-	*5*	*72*
SC/SB	Blade	Probably retouched	-	-	2	-	-	-	-	-	-	-	2
		Retouched	-	-	1	-	-	-	-	-	-	-	1
	Flake	Probably retouched	-	-	2	1	-	-	-	3	-	-	6
		Retouched	3	-	10	1	-	-	-	12	-	-	26
	Other	Probably retouched	-	-	1	-	-	-	-	-	-	-	1
		Retouched	1	-	-	-	-	-	1	-	-	4	6
	N/R	Retouched	-	-	2	-	-	-	-	-	-	-	2
Total			*4*	-	*18*	*2*	-	-	*1*	*15*	-	*4*	*44*
N/R	N/R	Probably retouched	-	-	-	-	-	-	-	-	-	31	31
		Retouched	-	-	-	-	-	-	-	-	-	77	77

Total			-	-	-	-	-	-	-	-	-	*108*	*108*
Grand Total			**6**	**3**	**164**	**13**	**17**	**3**	**14**	**53**	**1**	**120**	**394**

Table 2. Source data for non-hafted bifaces for all single work edge artefacts

Source	**Blank**		**02**	**04**	**07**	**09**	**13**	**23**	**10**	**14**	**Total**
SA	Blade	Probably retouched	-	5	1	-	-	-	1	-	7
		Retouched	-	5	-	-	-	1	1	-	7
	Flake	Probably retouched	-	5	-	2	-	1	2	-	10
		Retouched	1	6	4	2	1	1	7	-	22
	Other	Probably retouched	-	5	-	1	-	-	-	-	6
		Retouched	-	6	2	-	-	-	-	1	9
	N/R	Retouched	-	1	-	-	-	-	-	1	2
Total			*1*	*33*	*7*	*5*	*1*	*3*	*11*	*2*	*63*
SA/SB	Blade	Probably retouched	-	2	1	-	-	-	1	-	4
		Retouched	-	2	-	1	-	-	-	-	3
	Flake	Probably retouched	-	5	2	6	-	-	1	-	14
		Retouched	-	9	3	3	1	-	3	1	20
	Other	Probably retouched	-	2	-	-	-	-	-	-	2
		Retouched	-	2	-	-	-	-	-	-	2
Total			-	*22*	*6*	*10*	*1*	-	*5*	*1*	*45*
SC	Blade	Probably retouched	-	1	-	-	-	-	-	-	1
		Retouched	-	6	-	-	-	-	-	-	6
	Flake	Probably retouched	-	5	-	-	1	-	-	-	6
		Retouched	-	5	-	-	-	1	5	-	11
	Other	Probably retouched	-	1	-	-	-	-	1	-	2
		Retouched	1	4	-	-	-	-	1	1	7
	N/R	Retouched	-	1	-	-	-	-	-	-	1
Total			*1*	*23*	-	-	*1*	*1*	*7*	*1*	*34*
SC/SB	Blade	Probably retouched	1	1	-	-	-	-	-	-	2
		Retouched	-	2	-	-	-	-	-	-	2
	Flake	Probably retouched	-	3	1	-	1	-	1	-	6
		Retouched	-	2	-	-	-	1	1	-	4
	Other	Retouched	-	3	1	1	-	-	1	-	6
	N/R	Probably retouched	-	1	-	-	-	-	-	-	1
Total			*1*	*12*	*2*	*1*	*1*	*1*	*3*	-	*21*
N/R	N/R	Probably retouched	-	-	-	-	-	-	-	42	42
		Retouched	-	-	-	-	-	-	-	48	48
Total			-	-	-	-	-	-	-	*90*	*90*
Grand Total			**3**	**90**	**15**	**16**	**4**	**5**	**26**	**94**	**253**

Table 3. Source data for non-hafted bifaces for all double and multi-work edge artefacts

			Arborèa		Campidano					Marmilla			
	Source	**Material characteristics**	**02**	**05**	**04**	**07**	**09**	**13**	**23**	**10**	**12**	**14**	**Total**
Retouched Blade	SA	Completely Translucent + Internal Patterning	-	-	4	-	1	-	3	-	-	-	8
		Glossy Black/Grey	-	2	3	1	-	-	1	1	-	-	8
	SA/SB	Glossy Black/Grey + Banding	-	-	1	-	-	-	-	-	-	-	1
		Glossy Black/Grey + Translucent	-	-	3	-	-	-	-	-	-	-	3
		Translucent + Internal Patterning	-	-	14	1	1	-	-	-	-	-	16
		Marginally Translucent	-	-	1	-	-	-	-	-	-	-	1

		Marginally Translucent + Internal Patterning	-	-	3	-	-	-	-	-	-	-	3
	SC	Grey/Black Banding	-	-	18	-	-	-	-	1	-	-	19
	SC/SB	Opaque Black/Grey	-	-	2	-	-	-	-	-	-	-	2
		Indeterminate	-	-	4	-	-	1	-	-	-	-	5
	Total		-	2	53	2	2	*1*	*4*	2	-	-	*66*
Probably retouched blades	SA	Completely Translucent + Internal Patterning	-	-	-	-	-	-	-	1	-	-	1
		Glossy Black/Grey	-	1	7	1	-	-	-	-	-	-	9
	SA/SB	Glossy Black/Grey + Banding	-	-	2	-	-	-	-	-	-	-	2
		Glossy Black/Grey + Translucent	-	-	1	-	-	-	-	-	-	-	1
		Translucent	-	-		1	-	-	-	-	-	-	1
		Translucent + Internal Patterning	-	-	2	1	-	-	1	1	-	-	5
		Marginally Translucent + Internal Patterning	-	-	3	-	-	-	-	-	-	-	3
	SC	Grey/Black Banding	-	-	3	-	-	-	2	-	-	-	5
		Possible Banding	-	-	1	-	-	-	-	-	-	-	1
	SC/SB	Opaque Black/Grey	1	-	3	-	-	-	-	-	-	-	4
		Indeterminate	-	-	3	-	-	-	-	-	-	-	3
	Total		*1*	*1*	*25*	*3*	-	-	*3*	*2*	-	-	*35*
Retouched flakes	SA	Completely Translucent + Internal Patterning	-	-	2	-	-	-	1	-	-	-	3
		Glossy Black/Grey	1	-	16	6	4	2	-	14	-	-	43
	SA/SB	Glossy Black/Grey + Banding	-	-	*4*	-	1	-	-	2	-	1	8
		Glossy Black/Grey + Translucent	-	-	5	-	2	-	-	1	-	-	8
		Translucent + Internal Patterning	-	-	6	1	1	-	-	-	-	-	8
		Marginally Translucent + Internal Patterning	-	-	*10*	-	*1*	*1*	1	1	-	-	14
		Marginally Translucent	-	-	2	3	7	-	1	4	1	-	18
	SC	Grey/Black Banding	1	-	17	1	-	-	2	14	-	1	36
		Red/Black Banding	-	-	-	-	-	-	-	1	-	-	1
		Possible Banding	-	-	1	-	-	1	-	-	-	-	2
	SC/SB	Opaque Black/Grey	3	-	11	1	-	-	1	13	-	-	29
		Indeterminate	1	-	18	2	2	-	3	6	-	-	32
	Total		*6*	-	*92*	*14*	*18*	*4*	*9*	*56*	*1*	*2*	*202*
Probably retouched flake	SA	Completely Translucent	-	-	1	-	-	-	-	-	-	-	1
		Completely Translucent + Internal Patterning	-	-	-	-	-	-	2	1	-	-	3
		Glossy Black/Grey	-	-	19	1	2	-	-	6	-	-	28
	SA/SB	Glossy Black/Grey + Translucent	-	-	3	-	1	-	-	-	-	-	4
		Glossy Black/Grey + Banding	-	-	1	-	-	-	-	-	-	-	1
		Marginally Translucent	-	-	1	1	3	-	-	1	-	-	6
		Marginally Translucent + Internal patterning	-	-	3	-	2	-	-	-	-	-	5
		Translucent	-	-		1	-	-	-	-	-	-	1
		Translucent Internal patterning	1	-	4	-	1	-	1	-	-	-	7
	SC	Grey/Black Banding	-	-	11	-	-	1	-	4	-	1	17
		Red/Black Banding	-	-	1	-	-	-	-	-	-	-	1
		Possible Banding	-	-	4	-	-	1	-	-	-	-	5
	SC/SB	Opaque Grey/Black	-	-	2	2	-	1	-	4	-	-	9
		Indeterminate	-	-	10	1	4	-	-	2	-	-	17
	Total		*1*	-	*60*	*6*	*13*	*3*	*3*	*18*	-	*1*	*105*
Retouched other	SA	Glossy Black/Grey	-	-	14	2	-	-	1	3	-	3	23
	SA/SB	Glossy Black/Grey + Banding	-	-	1	-	-	-	-	-	-	-	1
		Glossy Black/Grey + Translucent	-	-	2	-	-	-	-	-	-	-	2
		Translucent + Internal Patterning	-	-	2	1	-	-	-	-	-		3

		Marginally Translucent	-	-	-	-	1	-	-	-	-	1	2
	SC	Grey/Black Banding	-	-	6	-	-	-	-	3	-	4	13
		Possible Banding	1	-	1	-	-	-	-	-	-	-	2
	SC/SB	Opaque Black/Grey	1	-	3	1	1	-	1	1	-	4	12
		Indeterminate	-	-	6	3	4	1	-	5	-	-	19
	Total		2	-	35	7	6	1	2	12	-	12	77
Probably retouched other	SA	Glossy Black/Grey	-	-	11	-	1	-	-	1	-	-	13
	SA/SB	Glossy Black/Grey + Translucent	-	-	1	-	-	-	-	-	-	-	1
		Marginally Translucent + Internal Patterning	-	-	1	-	-	-	-	-	-	-	1
		Translucent + Internal Patterning	-	-	1	1	-	-	-	-	-	-	2
	SC	Grey/Black Banding	-	-	2	-	-	-	-	1	-	-	3
		Red/Black Banding	-	-	-	-	-	-	1	-	-	-	1
	SC/SB	Opaque Black/Grey	-	-	1	-	-	-	-	-	-	-	1
		Indeterminate	-	-	1	-	-	-	-	2	-	2	5
	Total		-	-	18	1	1	-	1	4	-	2	27
Retouched (no blank recorded)	SA	Glossy Black/Grey	-	-	4	-	-	-	-	-	-	1	5
	SA/SB	Translucent + Internal Patterning	-	-	1	-	-	-	-	-	-	-	1
	SC	Grey/Black Banding	-	-	2	-	-	-	-	-	-	-	2
		Red/Black Banding	-	-	1	-	-	-	-	-	-	-	1
	SC/SB	Opaque Black/Grey	-	-	2	-	-	-	-	-	-	-	2
		Indeterminate	-	-	2	-	-	-	-	-	-	-	2
	Total		-	-	12	-	-	-	-	-	-	-	13
Probable retouch (no blank recorded)	SA	Glossy Black/Grey	-	-	2	-	-	-	-	-	-	-	2
	SA/SB	Translucent + Internal Patterning	-	-	1	-	-	-	-	-	-	-	1
	SC	Grey/Black Banding	-	-	2	-	-	-	-	-	-	-	2
		Possible Banding	-	-	1	-	-	-	-	-	-	-	1
	SC/SB	Opaque Black/Grey	-	-	1	-	-	-	-	-	-	-	1
		Indeterminate	-	-	1	-	-	-	-	-	-	-	1
	Total		-	-	8	-	-	-	-	-	-	-	8
Grand Total			**10**	**3**	**303**	**33**	**40**	**9**	**22**	**94**	**1**	**17**	**533**

Table 4. Source data and raw material characteristics for all unifacially modified artefacts

Source	**Material characteristics**	**02**	**04**	**07**	**13**	**23**	**10**	**11**	**14**	**Total**
SA	Completely Translucent	-	-	-	-	-	1	-	-	1
	Completely Translucent + Internal Patterning	-	2	-	-	1	-	-	-	3
	Glossy Black/Grey	1	1	1	-	-	-	-	-	3
Total		*1*	*3*	*1*	-	*1*	*1*	-	-	*7*
SA/SB	Glossy Black/Grey + Banding	-		-	-	-	1	-	-	1
	Glossy Black/Grey + Translucent	-	1	-	-	-	-	-	1	2
	Marginally Translucent	-	2	1	-	-	-	-	-	3
	Marginally Translucent + Internal Patterning	-	1	-	-	-	-	-	-	1
	Translucent + Internal Patterning	2	3	-	-	-	-	-	-	5
Total		*2*	*7*	*1*	-	-	*1*	-	*1*	*12*
SC	Grey/Black Banding	-	3	-	-	-	-	1	-	4
Total		-	*3*	-	-	-	-	*1*	-	*4*
SC/SB	Opaque Black/Grey	-	-	-	1	-	1	-	-	2
Total		-	-	-	*1*	-	*1*	-	-	*2*
Grand Total		**3**	**13**	**2**	**1**	**1**	**3**	**1**	**1**	**25**

Table 5. Source data and raw material characteristics for all bifacially retouched artefacts

Cortex Type	cortex location	Blade	Flake	Other	Total
Type 1	Platform	-	2	-	2
	Lateral side(s)	2	6	2	10
	Middle	-	5	2	7
	Distal	3	4	-	7
	Lateral side(s) & distal	-	3	-	3
	Platform & lateral	-	2	-	2
	Platform, lateral & distal	-	1	-	1
	Platform & dorsal	-	1	-	1
	Proximal & lateral	-	2	-	2
	All but proximal	-	2	-	2
	All but lateral	-	2	-	2
	All but proximal & lateral left	-	1	-	1
	Dorsal	-	5	2	7
Total		*5*	*36*	*6*	*47*
Type 2	Platform	-	6	-	6
	Proximal	-	1	-	1
	Lateral side(s)	1	22	2	25
	Middle	-	13	3	16
	Distal	1	3	1	5
	Bottom of core	-	-	1	1
	Platform & lateral	-	1	-	1
	Lateral(s) & middle	1	3	-	4
	Lateral side(s) & distal	-	2	-	2
	Bottom & side of core	-	1	-	1
	Edges	-	-	1	1
	All but proximal	-	2	-	2
	All but lateral side(s)	-	5	-	5
	Dorsal	-	9	-	9
Total		*3*	*68*	*8*	*79*
Type 3	Platform	-	1	-	1
	Lateral side(s)	1	4	1	6
	Distal	-	1	1	2
	Platform & lateral side(s)	-	1	-	1
	Lateral side(s) & distal	1	-	-	1
	Middle & distal	-	1	-	1
	All but lateral side(s)	-	1	-	1
	Dorsal	1	-	-	1
Total		*3*	*9*	*2*	*14*
Type 4	Platform	1	-	1	2
	Proximal	-	1	-	1
	Lateral side(s)	6	2	-	8
	Middle	-	-	1	1
	Distal	2	2	-	4
	Lateral side(s) & distal	1	1	-	2
	Dorsal	-	1	-	1
Total		*10*	*7*	*2*	*19*
Grand Total		**21**	**120**	**18**	**159**

Table 6. Cortex type and location for all unifacially retouched artefacts

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