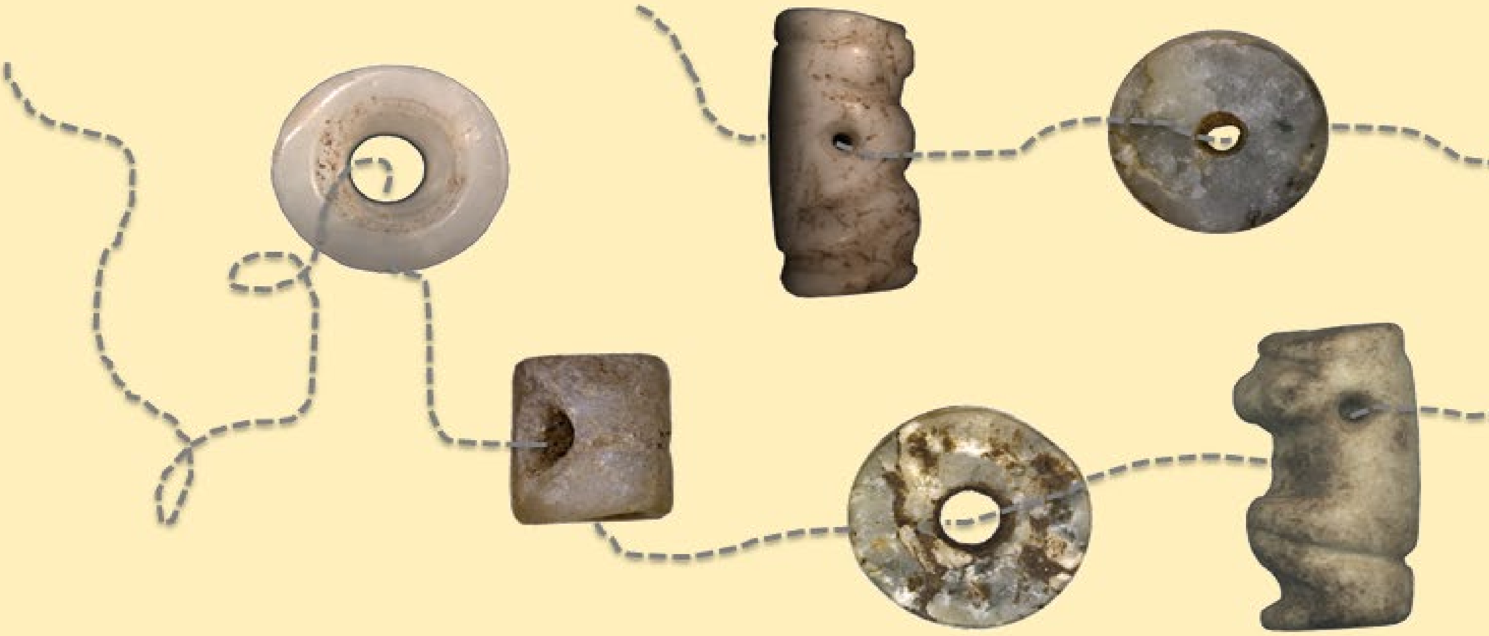

Stringing Beads Together

A microwear study of bodily ornaments in late pre-Colonial north-central Venezuela and north-western Dominican Republic

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Chapter 1 – Introduction

Bodily adornments have long been the focus of interest in archaeology (*e.g.*, Beck 1928). Especially beads made of glass and shell have received considerable attention, due to their use and importance as exchange items between cultures (*e.g.*, DeCorse 1989; Francis Jr. 1991a; 1991b; Gassón 2000; Trubitt 2003). Archaeologists have often associated ornaments with concepts such as aesthetics, religion, magic, personhood and identity (*e.g.*, Barge 1982; Loren 2009; Taborin 1993; White 1992; 2007; White and Beaudry 2008; Wright and Garrard 2003). In addition, as ornaments are attached to bodies, it is often assumed that they lend their meaning, value and capacities to individuals (Aizpurúa and McAnany 1999; Joyce 2005; Loren 2009; Miller 2009; Seeger 1975; Turner 1995; White 1992). Over the last two decades, archaeological research into ornaments has changed its character, developing an increasingly analytical focus, in which they are regarded similarly to other, "utilitarian" artefact types. This resulted in abundant research on chemical composition, technology and use-wear in different regions of the world (*e.g.*, Barge 1982; Bonnardin 2008; Bonneau *et al*. 2014; D'Errico 1993; Gorelick and Gwinnett 1989; Miller 1996; Rösch *et al.* 1997; Wright *et al.* 2008; Taborin 1991; 1993; Van Gijn 2006; Vanhaeren and D'Errico 2003; Velázquez-Castro 2012).

Ornaments are surrounded by assumptions regarding their symbolic meaning and display on the bodies of people. We should not fail to ask such questions of ornaments; but, specific methodologies should be pursued in order to produce an interpretation that goes beyond just reflecting Western systems of value attribution and aesthetics. In this sense, ornaments must be approached with research methods available for other artefacts. These methods can provide evidence regarding how past ornaments were perceived and treated. Ornaments, more precisely beads and pendants, should be analyzed individually, looking for the processes that contributed to their current appearance. They are not just immutable and static pieces of necklaces, but objects with complex and varied biographies (Brück 2004; Frieman 2012). Drawing on the concept of cultural biography of artefacts (Kopytoff 1986) and its recent applications in microscopic analysis of wear-traces (Van Gijn 2010; 2012; and also Breukel 2013; Verschoof 2011; Wentink 2006; 2008), this research will inquire into the biographies of ornaments, both individually and as a group. The main focus will be the *chaîne opératoire* of production (Balfet 1991a; Desrosiers 1991; Dobres 2010) and the use life of beads and pendants.

The central research question in this thesis is whether artefact analysis can shed new light into the diverse and numerous ornaments from the pre-Colonial circum-

Caribbean. Both ethnohistoric sources and archaeological artefacts are evidence of the abundance of bodily ornaments since at least the beginning of the Ceramic Age (from ca. 400 BC). The present research will focus primarily on the information conveyed by the archaeological material – an area which has not been extensively explored until now. Most research conducted on pendants and beads was concerned with spatiotemporal distribution of artefacts, exchange networks of raw materials and valuables, as well as with the definition of types and iconographic analysis. While some researchers have focused on how ornaments were manufactured (*e.g.*, Bartone and Crock 1993; Carlson 1995; De Mille *et al.* 2008; Lammers-Keijsers 2007; Vargas Arenas *et al.* 1997), there are still many gaps in our knowledge not only of how they were produced, but also used and integrated in the lives of indigenous communities (as similarly noted by Watters 1997a; 1997b). My goal is to look for empirical evidence of how people dealt with these pieces, rather than assuming specific usages on the sole basis of ethnohistoric sources or ethnographic analogies. This is not to say that I will not consider the informations conveyed by these sources or the forms depicted on artefacts; but these will have a comparatively minor role in this research.

Bodily ornaments are very common and diverse among indigenous societies of lowland South America, traditionally the primary ethnographic analogues to the pre-Colonial communities of the Caribbean (Boomert 2001a; McGinnis 1997a; Roe 1982; Stevens-Arroyo 1988). In this research, the ways in which ornaments are conceived, produced and used by Amerindian peoples will serve as reference for understanding the circum-Caribbean specimens. This data will be coupled with an extensive microscopic research of beads and pendants in order to shed light on the biographies of these artefacts in two case studies from the circum-Caribbean region. Both case studies date to the Late Ceramic Age period, which extends from about AD 600/800 to the first encounters with the Europeans (AD 1492). One of them is the northwest of Dominican Republic, where the two main studied sites, El Flaco and La Luperona, date from the 13th to the 15th century AD (Hofman and Hoogland 2015). The other context is the Valencia Lake Basin in north-central Venezuela, with occupations dating from ca. AD 850 – 1200 (Antczak and Antczak 2006; Mackowiak de Antczak 2000).

In the following sections of this chapter, the main ideas and concepts underlying this thesis will be discussed. The specific objectives and research questions will be posed and, finally, the thesis outline will be presented.

1.1 – Jewellery, lapidary, and (personal) ornaments

Different terms have been used to refer to ornaments in archaeology, but not all of them are appropriate for the material studied here. For instance, when talking about the ornament workshops from the Early Ceramic Age, archaeologists often refer to “(micro-) lapidary” industries (*e.g.*, Boomert 2007; De Mille *et al.* 2008; Hofman *et al.* 2007; Narganes Storde

1995; 1999; Watters and Scaglion 1994). The term “gemstones” is also used (Murphy *et al.* 2000) in reference to (semi-) precious materials, commonly rocks and minerals, that are used in lapidary. Even though these terms are widely used in the archaeology of the region, I opted for not using them here. While constant reference will be made to previous studies about ornaments in the Caribbean, the term lapidary is regarded as inappropriate. This is because it refers directly to modern lapidary and the use of metals and mechanized power tools. Even though there are certain continuities between ornament making in the present in relation to traditional techniques (which would certainly be worth exploring from an ethnoarchaeological perspective), in this research I would rather highlight the differences between them. They differ in terms of techniques and tools used, time-input, necessary skill, and more importantly, in terms of motivation behind the work and contexts of production and consumption. For the same reasons, the term jewellery was also not considered appropriate.

Lapidary also refers primarily to the working of inorganic materials, most commonly rocks and minerals.[1] In this research, the focus is broader than this, even if organic materials are not commonly preserved in the archaeological record. Regardless of the obvious differences between technologies focused on different raw materials (*e.g.*, shell, stone, ceramics), for this research artefacts were first considered under “ornament making technology” and only separated in different material categories during analysis. This differs from traditional research projects in which raw materials are first separated and objects of a same type are analyzed by different specialists. I do not wish to advocate a typological focus over specialization according to raw materials. However, Amerindian ornament making (as well as many other crafts) can only be understood in its totality, i.e. going beyond the traditional specializations of archaeologists.

Another terminological choice was made in relation to “ornament” and “adornment”. A dictionary search will define the two words as synonyms, although often either one will be presented as more limited.[2] It has been argued that both words are too loaded with value judgements and aesthetic appreciation imposed by the modern observer (Roach-Higgins and Eicher 1992). Accoutrements and apparel could be suggested as neutral alternatives; however they imply the addition of an object to the body, to the exclusion of direct corporeal modifications. Roach-Higgins and Eicher (1992) suggest the use of “dress” as a broad term that does not impose value judgements. However, for many Amerindian communities, dress may not be an appropriate word as it is more closely connected to the idea of clothing, whereas they were often reported to be “naked”. Taking into consideration that these terms are often synonyms in dictionaries, I opted for “ornaments”, with the

1 This is only true to a certain extent. Several materials of organic origin are also used in modern lapidary and may be included under this denomination (Pedersen 2004).

2 Consulted dictionaries: www.merriam-webster.com; www.oxforddictionaries.com; www.thefreedictionary.com.

remark that they "adorn" the body. In Chapter 4, the notions of beauty and decoration among South American indigenous communities will be discussed, further clarifying why I argue that these terms can be used in those particular contexts.

Ornaments are also often assumed to have been personal. The association between ornaments and individuals seems to be connected to interpretations of burial contexts and accompanying items as directly related to the identity and social status of the deceased (Binford 1971; Chapman 2003; Fowler 2004). Conversely, during the last three decades, following the rise of interpretative archaeologies, archaeologists have looked at the meaning of ornaments and at how people made use of them to create a personal discourse. From this point of view, ornaments have a role in the construction and manipulation of personal identity, in the mediation of relationships and in the process of signalling belongingness to a social group (Loren 2009; 2010; Newell *et al.* 1990; Roach-Higgins and Eicher 1992; White 1992; White and Beaudry 2008; Wright and Garrard 2003). In this sense, they are not only connected to an individual but to the ways in which group identity (whether of an age group or a social class) can be expressed or even challenged on the individual level. The approach to ornaments as part of a system of communication has been advocated within the study of Amerindian art and ornaments, especially focusing on how they are used to highlight differences between ethnic, age and gender groups (*e.g.*, Ribeiro 1986; Seeger 1975; Turner 1995). The direct association between ornaments, individuals and social persona has been heavily criticized, as it imposes on the past several modern assumptions: the central role of the (idealized and atomized) individual and the association between certain items with prestige and wealth (Brück 2004; Fowler 2004; Thomas 2002).

More recently, archaeologists have started to pay more attention to the body, but not as a natural entity upon which culture is imprinted. Rather, it is approached beyond its immediate surface, exploring how ornamentation, together with bodily practices, sensual engagement and dispositions, has an active role in the constitution of personhood and sociality (Alberti 2012; Hamilakis *et al.* 2002; Joyce 2005; Thomas 2002; Torres-Rouff 2012). The body and its substances are central focus of Amerindian concern, attention and manipulation in daily practices, social organization and mythological narratives (Rival 2005; Seeger *et al.* 1979; Vilaça 2005). In these contexts, ornaments are not only products of bodily engagement, but also encourage and complete the actions of bodies (Lagrou 2009; Van Velthem 2010a). The biomorphic iconography recurrent in circum-Caribbean Ceramic Age ornaments also suggests the attribution of importance to bodies (*e.g.*, Antczak and Antczak 2006; Bercht *et al.* 1997; McGinnis 1997a). Therefore, rather than referring to "personal" ornaments, the focus will be on *bodily* ornaments. However, both older and more recent approaches often look at ornaments as ready-made, fixed entities manipulated by humans. This is a problem to the study of traditional societies, as the production of objects may be intrinsic to the engagement of humans with them. It is in the context of production that what Gosden (2005) called “what materials demand of people” becomes more visible to archaeologists. My focus is on the processes that constitute and maintain ornaments, which are mediated by humans and their choices

1.2 – “Circum-Caribbean” ornaments

Ornaments have often been recovered from archaeological contexts throughout the Caribbean, including the Lesser and Greater Antilles and north-eastern South America. The choice for the two assemblages of ornaments analyzed in this research is connected to the regional definition used here. From a restrictive point of view, the Caribbean can be defined as encompassing solely the West Indies, i.e. the long chain of small and large islands in stepping-stone disposition, starting with Trinidad in the south up to Cuba and the Bahamas in the north. However, such definition excludes other areas that are in contact with the Caribbean Sea and relevant from an archaeological and cultural standpoint. I will thus refer to a broader term, namely circum-Caribbean, which also encompasses the southernmost islands, off the coast of Venezuela, and the northern part of the continental regions.

The idea of “circum-Caribbean” was consolidated in the context of Julian Steward’s volume 4 of the *Handbook of South American Indians* (1948). In this series, together with other researchers, he discusses the different cultures and levels of development found among South American indigenous communities. The work is marked by the predominance of a neo-evolutionist framework, focused on the impact of ecology on cultural behaviour (Carneiro 2007). To a great extent, the discussion referred to the ancestries of the peoples that inhabited the Caribbean archipelago, which purportedly displayed a Formative level of cultural development and whose region of origin was either Amazonia or the Andes (cf. Rouse 1953; 1991). Through the compilation of both ethnographic and archaeological data, cultures of Central America, West Indies, northern Colombia and Venezuela were grouped together in these early disciplinary discussions (Siegel 2010a). In the present research, it is not my goal to provide insight into these ideas of cultural “origins”, migrations and diffusion of traits and archaeological cultures.

Rather, the concept “circum-Caribbean” will be used with reference to the connectivity that probably existed between these areas (Hofman and Bright 2010; Hofman *et al.* 2010). This is not to say that the numerous cultures occupying the areas are to be regarded as homogenous. Differences are acknowledged, but they should not overlook the fact that past communities probably shared certain commonalities and identity (Hofman and Bright 2010; also Boomert 2001a). The definition therefore encompasses not only the West Indies, the coast of Guianas and eastern Venezuela, but also central and western Venezuela and the off-shore islands, the isthmo-Columbian region, and the coast of Central America. Attempts have been made at reconstructing these pan-Caribbean interaction dynamics on the basis of the circulation of specific artefact types, most notably ornaments made of exotic raw materials and depicting biomorphic beings (Boomert 1987; 2001a; Cody 1991a; Hofman and Hoogland 2011; Hofman *et al.* 2014a; 2014b; Mol 2007; Rodríguez Ramos 2010; 2011; 2013).

The use of the circum-Caribbean concept here is therefore linked to the idea of a shared cultural background which may be expressed by shared iconographic motifs and appreciation for certain materials. In this research, the connection with northern South America will be given greater emphasis, as north-eastern South America has been postulated to be the region of origin of (most) Ceramic Age inhabitants of the Caribbean (Rouse 1992). With this framework in mind, it makes sense to look at both north-central Venezuela and north-western Dominican Republic, despite the geographical distance between them. My goal is to understand each case study on its own and within broader pan-regional dynamics, and only at a later moment to compare them. In this sense, the research questions were asked of each case study, focusing on the application of microwear analysis and its contributions.

1.3 – Objectives and main questions

The main objective will be to evaluate whether microwear analysis and experimental archaeology can provide us with a better understanding of the biographies of ornaments in the Late Ceramic Age. Another question is if this approach is equally capable of providing independent and new data about ornaments from modern excavations and from museum and private collections. The two case studies will be: beads and pendants from Valencioid occupations around the Lake Valencia in Venezuela and beads from Meillacoid/Chicoid occupations in north-western Dominican Republic. While several types of modification to the body can be included under the denomination "bodily ornaments", the present thesis will focus exclusively on beads and pendants. Even though this choice seems to limit the scope of the research, these two categories are the most commonly recovered ornaments in the archaeological contexts. The main sub-questions to be addressed for each context will be as follows:

1- Which raw materials were used for the production of ornaments?
   a. How were they obtained?
   b. Which characteristics were valued on them?
2- How were beads and pendants produced in each case study?
   a. Which were the successive stages of production and their order?
   b. What was the toolkit used?
   c. Were they locally produced?
3- Is there evidence of different skill levels within each assemblage?
   a. Evidence for technical errors or "sloppiness"

b. Execution of complex, risky, and time-consuming techniques

4- Were they used?

a. Variability of systems of attachment with strings

b. Degrees of use-wear

5- Which were their archaeological contexts?

a. How do these relate to the skill levels on individual artefacts?

b. How do these relate to degrees of use-wear?

To answer these questions, microscopic analysis of the traces imprinted on the surfaces of ornaments during manufacture and use is conducted. An experimental programme, including the replication of techniques possibly used in the manufacture of ornaments, is also part of this research, as it is the basis of interpretation within microwear analysis (Bamforth 2010; Keeley 1974). Archaeological literature regarding raw material availability on each region will be consulted in order to provide information on this stage of the biography. Literature on the specific contexts in which ornaments were found, where available, will also be summed to the microwear data. Finally, the case studies will be contrasted, in order to assess if people were dealing with ornaments in different ways in each context.

1.4 – Outline of the thesis

The present thesis will be divided in nine chapters. The first two chapters (2 and 3) refer to previous archaeological research on ornaments in the circum-Caribbean and to how the present thesis can be allocated in this panorama.

Chapter 2 encompasses a discussion of previous approaches to the study of ornaments from the circum-Caribbean and Amazonia in Ceramic Age contexts. It is organized around the main research trends: typology and iconography, provenance studies, technology and use. I will demonstrate that the first and second topics have been the main focus, while technology has had little impact and use has not been explored at all. At the same time, the chapter presents the main contexts in which ornaments are found and briefly discusses the variability of types and raw materials.

Chapter 3 zooms into the two specific areas in which the case studies are situated. The archaeology of the Valencia Lake Basin and the north-western Dominican Republic are discussed, including environmental settings, overviews of regional archaeological research, current research topics, and detailed information on the sites and assemblages under study. Finally, the two assemblages are contrasted in terms of their respective limits and comparability to each other.

The next two chapters discuss the specific approaches to the study of ornaments used in this thesis. Chapter 4 presents a theoretical overview of the two approaches to the study of material culture advanced here: *chaîne opératoire* and cultural biography of artefacts. Their origins and history within the discipline are explained, together with specific focuses. Finally, the two are contrasted, highlighting advantages and limits, and in the following, arguing why they are being used in conjunction in this thesis. In the same chapter, ethnographic contexts from the lowlands of South America are discussed with focus on the biographies of ornaments.

Chapter 5 focuses on the methodology used for the analysis of ornaments. First, a discussion of the varied methods to the study of ornament manufacture and use, including microwear analysis, is conducted. Second, crucial terms are defined, such as bead, pendant and the different sub-types found among the studied assemblages. The standard operations of production in ornament making are also described, together with specific terms used throughout the thesis. In the sequence, a protocol of analysis is presented. In the next section, the raw materials that make part of the collections and their properties are discussed. Finally, a brief overview of experimental archaeology within the field of microwear analysis is made, followed by an outline of the experimental programme conducted during this research and the chosen variables.

Chapters 6 and 7 will present the results of the microwear analyses of the Venezuelan and Dominican samples, respectively. They were separated in two chapters due to their length and abundance of data for each context. Each chapter is divided according to the specific collections studied for each case study, being further divided in raw material types, technological operations and use-wear. Data obtained from the archaeological artefacts is simultaneously contrasted to experimental specimens, in order to provide possible interpretations for the observed features in terms of techniques and tools used.

The production sequences are organized in technical schemes that group together similarly produced ornaments. These are presented in Chapter 8. This chapter brings together the evidence provided by the analyses and literature review on archaeological contexts and material provenance in order to propose biographies for ornaments in each case study. Tentative answers are provided to the questions and sub-questions posed in the Introduction, often trying to contrast them to the biographies of ornaments among South American communities. The assemblages are compared in relation to the data obtained and to possible avenues for further research into ornaments.

In Chapter 9, the outcomes and results of this research are evaluated, in order to highlight if and how microwear analysis, focused on technologies of production and use-wear, collaborated to a further understanding of ornaments and the contexts from which they were recovered. The limiting factors, especially methodological, are considered and possible ways of dealing with them are suggested for future research. Possible fruitful avenues of research into the variability of ornaments, their production sequences and modes of usage in the circum-Caribbean are also pointed out, suggesting how further study may bring light into broader and current questions in the archaeology of the region.

Chapter 2 – Previous studies of circum-Caribbean ornaments

The ornamentation of the body is recurrent among indigenous communities throughout the Americas. These accoutrements can vary greatly in terms of raw materials, colour, depictions, composition, and placement on the body (Ribeiro 1988). In this chapter, ornaments from archaeological contexts in the pre-Colonial circum-Caribbean and Amazonia will be discussed, focusing on four major research trends developed by archaeologists for their study: 1) typology and iconography, 2) provenance and circulation of raw materials, 3) technologies of production, and 4) systems of attachment. These approaches will be reviewed, in order to assess underexplored topics and possible gaps in knowledge.

Numerous sites have been interpreted as ornament workshops in the Caribbean. In the West Indies, most bead and pendant workshops are located in the Lesser Antilles and Puerto Rico (Hofman *et al.* 2014b). They are associated to Saladoid and Huecoid contexts, dating from the Early Ceramic Age (400 BC – AD 600/800). These *lapidary* workshops are found in Puerto Rico (Punta Candelero, Tecla and Hacienda Grande; Rodríguez 1991a, 1991b), Vieques (La Hueca/Sorcé; Chanlatte-Baik and Narganes 1980; Narganes Storde 1995; 1999), St. Croix in the Virgin Islands (Prosperity; Faber Morse 1989), Antigua (Royall's and Elliot's; Murphy *et al.* 2000), St. Martin (Hope Estate; Haviser 1999), Montserrat (Trants; Bartone and Crock 1991; Watters and Scaglion 1994), Martinique (Vivé; Bérard 2004), Grenada (Pearls; Cody 1991b), and Tobago (Golden Grove; Boomert 2000; Boomert and Rogers 2007).

Several bead types were recovered from the workshops, especially disc, cylindrical, and barrel-shaped beads. In addition, pendants depicting a range of zoomorphic figures, including frogs, bats, and vulturine birds have been found. A great variety of raw materials was used in the production of ornaments, both potentially local and exotic to the West Indies. Lithic trade networks and their fluctuations through time have been discussed in recent publications (Hofman *et al.* 2007; 2014b; Knippenberg 2007; Mol 2014). These long distance connections and exchanges were associated to the maintenance of ties between parent and daughter communities from different islands and the mainland during the process of colonization of the archipelago (Boomert 2014; Hofman and Hoogland 2011; Hofman *et al.* 2007). In addition to stone and minerals, the use of marine gastropod and bivalve shells for the production of ornaments was also noted (Lammers Keijsers 2007; Linville 2005; Murphy *et al.* 2000; Serrand 2003; Turney 2001; Van der Steen 1992). In this period, beads and pendants were associated to some among the first pottery-bearers of the islands[3]. The

3 Evidence for the use of pottery among "Archaic-Age" populations is also attested in the Antilles (Rodríguez Ramos

highly skilful production and circulation of such "prestige items" suggests the existence of non-formalized hierarchies within the indigenous communities, *i.e.* "big-men" competing for restricted access to social and material resources (Boomert 2001b; 2014).

By the end of the Early Ceramic and beginning of the Late Ceramic Age (AD 600/800 - 1492), the long-distance distribution of semi-precious ornaments declines and more localized interaction networks prevail in the Lesser Antilles (Hofman *et al.* 2007). Centres for ornament manufacture were identified in St. Thomas (the Tutu site; Righter 2002), Tobago (Golden Grove and Lovers' Retreat; Boomert and Rogers 2007), and Aruba (Linville 2005; Serrand 1999). The process is reflected on the stone types used for bead-making: diorite, calcite, and crystal quartz prevail in this period, alongside the use of shell. Diorite beads, for instance, present a broad distribution throughout the post-Saladoid Caribbean. However, the wide availability of diorite poses a challenge for attesting the origins of the beads and their routes of circulation (Boomert and Rogers 2007; Hofman *et al.* 2007; Knippenberg 2007).

Archaeologists studying the societies from both the Greater Antilles and northern South America during the second part of the Late Ceramic Age (AD 1200 until the encounter with Europeans) draw extensively on early historical accounts and on the presence of elaborate material culture (Bercht *et al.* 1997; Curet 2014; Mol 2007; Oliver 2009; Wilson 1997). The presence of labour-intensive, skilful and standardized crafts, such as the production of ornaments, is often interpreted as evidence of social hierarchies and elite control (Costin 1991; Earle 1987). This follows a tradition of approaching monumental architecture, elaborate burials, and bead workshops as evidence of resource control and power legitimization by elites (Binford 1971; Costin 1991; Curet 1996; Curet and Oliver 1998; Earle 1987; Miller 1996).

In the Greater Antilles, "ritual paraphernalia" is associated to a pan-regional shamanic worldview and to early accounts about "Taíno" religion and social complexity (Arrom 1975; 1997). These include items such as three-pointers, vomiting spatulas and snuffs, wooden and cotton figures, wooden stools, and stone carvings (Arrom 1975; Bercht *et al.* 1997; Breukel 2013; McGinnis 1997a, 1997b; Mol 2007; Olazagasti 1997; Oliver 2009; Ostapkowicz 2013; Ostapkowicz and Newson 2012; Ostapkowicz *et al.* 2011; Walker 1997). Similar to these items, abundant beads and pendants recovered from the islands come from non-controlled excavations and are broadly related to the "Taíno" phenomenon (*sensu* Curet 2014). In the north-eastern part of South America, evidence of the use of ornaments is abundant. In Venezuela, several ornament types are found in the Valencia Lake Basin (north-central region), in the Quíbor valley (north-western), and in the Andes. Gassón (2000) relates the abundance of "ceremonial" artefacts, notably shell ornaments,

et al. 2008; Wilson 2007). Likewise, pendants made of both shell and serpentinite are registered in Puerto Rico during the Archaic Age (Boomert 2014; Rodríguez Ramos 2007).

in both the Valencia Lake Basin and also in the Quíbor valley to social complexity and inequality, as "primitive" valuables related to elite status. Likewise, the distribution of certain pendant types with recurring shapes and depictions over large areas is seen as evidence of formalization of symbolic expression. This would take place in the context of emerging elite manipulation as an ideology that could give support to a chiefdom society was devised (Vargas Arenas *et al.* 1997).

Ornaments in the circum-Caribbean have been regarded as finished objects, representative of types. Even when reference is made to workshops, there is still little focus on the processes that led to the creation of an artefact as it was found by archaeologists. However, new avenues of research are being increasingly explored, both in terms of approaches and methods used. The major trends in the research of ornaments in the circum-Caribbean will be discussed below, with a focus on methods of analysis and interpretation, in order to better situate the present research.

2.1 – Typology and iconography

According to the cultural-historical sequence of the Caribbean region, the first ceramic-bearing inhabitants of the Antilles, associated to the Cedrosan Saladoid subseries, had migrated from the Orinoco River basin in north-eastern South America (Rouse 1953; 1992). The Saladoid series would later on differentiate and evolve into the Ostionoid series, spread accross significant areas of the Greater Antilles in the late pre-Colonial period. The bearers of this ceramic style would be the direct ancestors of the "Taíno" *cacicazgos* met by the Spanish colonizers from 1492 onwards. While several critiques were made of this model, considered too broad and homogenizing (Chanlatte-Baik and Narganes 1980; Curet 2005; Rodríguez Ramos 2010), the connection with the South American mainland is still often used as basis for interpretations of past material culture patterns.

Bead typologies have not been systematically created in the Caribbean, even though the most common approach to the study of beads is typological in character. The most systematic typologies were made by Watters and Scaglion (1994) on stone beads collected from the surface of the Trants site in Montserrat, and by Jay Haviser (1990) with beads of different raw materials from the Dutch islands of Curaçao and Bonaire. Both researches draw largely on the system proposed by Horace Beck (1928), a classic reference for bead typology worldwide. They have a marked focus on the different bead types present in the collections and their statistics, based on variations in longitudinal and transverse sections (Watters and Scaglion 1994) and on perforation types (Haviser 1990). Other authors have also a primarily typological approach to the analysis of ornaments, even if with some interest in techniques and use-wear (*e.g.*, Linville 2005; Narganes Storde 1995; 1999; Righter 2002; Turney 2001; Van der Steen 1992).

The use of Amerindian ethnology allied with ethnohistorical accounts has made important contributions to the understanding of pre-Colonial societies of the Caribbean (*e.g.*, Boomert 2000; 2001a; 2001b; Petitjean Roget 1997; Roe 1982; 1997; Siegel 1997; 2010b; Stevens-Arroyo 1988). Representational material culture is contrasted to recurrent themes in Amazonian worldviews, such as shamanism, animism, and a "three-layered division of the cosmos" (Boomert 1987; 2001a; 2001b; McGinnis 1997a; Roe 1982; Siegel 1997; 2010b). For instance, a recurrent reference is made to "pairs of opposition", often understood as dualism between the sexes: depictions of frogs and nocturnal creatures linked to a female sphere, while dogs and jaguars to the male (Boomert 1987; Petitjean Roget 1997; McGinnis 1997a; Roe 1982). These interpretations are contrasted to the descriptions left about "Taíno" mythology, especially from Fray Ramón Pané's account (Arrom 1997; Petitjean Roget 1997; Siegel 1997).

Differences in the choice of motifs between the Caribbean and northern South America have been regarded as an adaptation to the island environment, where large land mammals are not present (Roe 1982; Rodríguez 1997). Frogs and other water-related fauna would have become more important in this process of "symbolic replacement" (Rodríguez 1997). The theme of the frog is common in Amerindian mythologies and its motif is prominent in pre- and early Colonial material culture (Boomert 1987; Wassén 1934), being particularly noticeable in the Amazon basin in the form of the greenstone *muiraquitãs* (Barata 1954; Boomert 1987; Costa *et al.* 2002a). These are frog-shaped pendants produced in the Lower Amazon from a range of rock materials, including quartz, tremolite, nephrite, albite-microcline-quartz, variscite-strengite (all likely local to the Amazonian basin), and jadeitite (of unknown provenance), and also sometimes ceramics (Costa *et al.* 2002b; Meirelles and Costa 2012).

As Boomert (1987) observes, in addition to the Lower Amazon, where the frog pendants are associated to the Kondurí and Santarém complexes, similar artefacts were produced in contexts associated with the Kwatta complex of northern Suriname (also Rostain 2006), by the inhabitants of the Valencia Lake Basin (also Antczak and Antczak 2006), and by the bearers of Saladoid and Huecoid pottery from the Antilles (Narganes Storde 1995; 1999). On the one hand, the Early Ceramic Age artefacts differ from the ones produced at a much later date on the mainland: according to Cody (1991b), with the exception of "true" *muiraquitãs* (*sensu* Barata 1954)[4] in the site of Pearls (Grenada), in the West Indies a segmented-frog type predominates (Narganes Storde 1995; Rodríguez 1991a; 1991b). On the other hand, Antillean and Venezuelan ornaments differ markedly from the Lower Amazon specimens in manufacture and in the larger variety of species depicted by the former (Rostain 2006). In the West Indies, frog shapes are also depicted in

4 According to Barata (1954), the true *muiraquitãs* present a system of lateral double perforations, which are not visible from the front (carved face). This system would indicate a specific string attachment and isolated usage that would be more special than the use of beads in necklaces.

ceramics, shell and stone during the Late Ceramic Age. While certain artefacts depict quite naturalistic frogs, it is common to see different degrees of conventionalization, in which artisans carved only specific features of the frog, such as the bulging eyes and folded legs (Petitjean Roget 1975, 1997; Wassén 1934). Some motifs were shared across considerable distances, both in space and time. For instance, shell ornaments depicting frogs in the form of "mirrored" folded legs from Lake Valencia, which will be studied in this thesis[5], are also found in the eastern Dominican Republic (De Ruiter 2009; Samson 2010).

Representational pendants have likewise figured in discussions concerning migrations, perpetuating a view of movement of people as a monolithic event concerning entire populations (Curet 2005). "Beak-bird" pendants, for instance, were produced in Puerto Rico and Vieques, associated to Huecoid contexts (Chanlatte-Baik and Narganes 1980). Several authors have looked at the beings depicted in the pendants (a long-beaked bird with a human head on its claws), suggested an identification for the bird species[6] and asserted the possible homeland of the culture that produced them based on the species geographical distribution. The first publications, by Chanlatte and Narganes took place as a means of contesting Rouse's ideas of a single migration of ceramist people from the Lower Orinoco, in order to suggest a different and earlier origin for the Huecoid series as opposed to the Saladoid. Similarly, vulturine birds have been depicted in the ceramics of the Lower Amazon (in vessels believed to mimic the tripartite structure of the universe, cf. Gomes 2012) and in pendants from burials in islands at the mouth of the Amazon (cf. Boomert 2001a; Meggers and Evans 1957).

While differences are noted in the interpretations of representational ornaments, the insistence in the South American lowlands as frame of reference presents a monolithic picture of the pre-Colonial Caribbean. Rodríguez Ramos (2010) pointed out how such interpretations tend to put other potential regional links to the hindsight, such as with the Isthmo-Colombian region. Interpretations too often oscillate between ethnohistoric accounts (based on the "Taíno" peoples), ethnographic data (largely based on present-day inhabitants of the Amazon and Orinoco river basins) and material culture associated to the Early and Late Ceramic Ages (also Antczak and Antczak in press; Curet 2014; Ulloa Hung 2013). In other words, archaeologists have used two main sources for drawing interpretations about the life ways of different peoples whose material culture patterns appear to be similar if one only concentrates on their ceremonial and representational aspects. This tendency among scholars has limited our understanding of the societies that occupied the region through time.

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5 Frog-shaped beads, cf. Chapter 5.

6 These suggestions are: an Andean condor (*Vultur gryphus*, by Chanlatte and Narganes 1980; Narganes Storde 1999), king vultures (*Sarcoramphus papa*, by Boomert 2001a; Durand and Petitjean Roget 1991), and a macaw (by McGinnis 1997a).

2.2 – Provenance and circulation of (raw) materials

Discussions regarding the colonizers and inhabitants of the circum-Caribbean are increasingly taking into account the heterogeneity of social formations, how ephemeral they may have been, and how complex and entangled networks of interactions were. At the same time, the role of the Caribbean Sea is being differently perceived: as a vehicle for multi-scalar interactions and exchanges between communities of varying degrees of social complexity, in which people, goods, and ideas circulated (Hauser and Curet 2011; Hofman *et al.* 2006; 2007; 2008a; 2010; 2014a; 2014b; Hofman and Hoogland 2011; Mol 2007; 2014; Rodríguez Ramos 2010; Wilson 2007).

Extensive networks of artefact and raw material circulation were in operation during the Early Ceramic Age. Among the materials recovered from ornament workshop contexts, semi-precious and unevenly distributed rock types are included, such as amethyst, jadeitite, serpentinite, carnelian, chalcedony, turquoise, nephrite, and others (Cody 1991b; Hofman *et al.* 2007; 2014b; Murphy *et al.* 2000; Rodríguez 1991b). There is evidence of specialization in stone types and of circulation of finished pendants of exotic stones: the workshops at Trants (Montserrat) and Royall's (Antigua) would have been specialized in the production of carnelian beads, whereas the raw material source is in Antigua (Hofman *et al.* 2014b; Murphy *et al.* 2000). Pearls (Grenada) would have been specialized in the production of amethyst beads, whose raw material source has not been identified[7] (Cody 1991b; Watters 1997a; 1997b). At the same time, beads of both materials are found in these sites, suggesting that the finished products were being exchanged. Alongside exotic materials, commonly available rock types, such as calcite, diorite, and quartz were also present in Early Ceramic Age contexts.

Geochemical characterization of jadeitite celts has been undertaken recently with materials from the northern Lesser Antilles during the later part of the Early Ceramic Age. Such artefacts have been tentatively traced back to sources in the Montagua Fault Zone[8] in Guatemala, despite the occurrence of jadeite sources both in Cuba and the Dominican Republic (Garcia-Casco *et al.* 2013; Harlow *et al.* 2006; Rodríguez Ramos 2011). However, this linkage with Guatemala still demands further investigation, as the Antillean sources cannot be excluded. Beak-bird pendants have been encompassed in a similar discussion. The most common material for their manufacture is serpentinite, but some specimens were also produced of jadeitite, nephrite, and calcite (Narganes Storde 1995; 1999). Serpentinite has a wide distribution with sources on south-western Puerto Rico and debitage was recovered from Punta Candelero, both evidence of the production of the pendants *in situ*. There is,

7 The South American mainland has been suggested as possible source. However, as both Cody (1991b) and Watters (1997a) remark, amethyst can be found in Martinique. Thus far, little evidence of amethyst working was found in that island (Bérard 2004), which does not support or falsify the hypothesis of sourcing in Martinique.

8 Meirelles and Costa (2012) also suggest the Montagua Fault Zone as possible source for the jadeite used in the manufacture of some *muiraquitãs*. However, it is possible that they were made of yet a different variety of jadeitite. Further studies are necessary.

however, no debitage associated to the manufacture of nephrite and jadeitite specimens in the Antilles (Rodríguez Ramos 2010). Rodríguez Ramos (2013) has suggested that the Montagua Fault Zone is a probable source, based on characterization studies conducted on materials from Central America and Puerto Rico. In addition, it is suggested that the Antillean beak-bird pendants are similar to pendants from the Isthmo-Columbian region in terms of layout and technology. If the jadeitite source identification is correct, the pendants would be evidence of millenary "trans-Caribbean" interaction networks between the two regions (Rodríguez Ramos 2007; 2010; 2013). However, similarly to the jadeitite celts, more research is needed to evaluate this hypothesis.

Artefacts made of shell and lithics have received considerable attention, while other materials used for ornament making, such as ceramics, coral, wood, seeds, animal teeth and bones, are just mentioned (*e.g.*, Boomert 2014; Narganes Storde 1999; Ostapkowicz 2013; Steenvoorden 1992). The growing evidence for connections between islands and with the surrounding mainlands has resulted in a renewed interest for canine pendants (Narganes Storde 2003). This approach is directly associated to the study of human remains by multi-isotope analyses in order to understand human and animal mobility (Laffoon *et al.* 2013; 2014). A recent combined isotope study (Laffoon *et al.* 2014) focused on tracing the origins of pendants made on canines of a jaguar, a tapir and a peccary from the sites of La Hueca/Sorcé (Vieques) and Punta Candelero (Puerto Rico). While not pinpointing precise areas for the origin of the teeth, the authors suggest at least three areas of origin, namely north-eastern South America, the Isthmo-Columbian area and Mesoamerica. This evidence supports the idea of a more complex scenario regarding the circulation of goods, including contacts with other surrounding continental areas besides north-eastern South America.

Likewise, metal artefacts have recently gained attention from researchers interested in networks of circulation of materials in the pre-Colonial and early Colonial Caribbean. For instance, *guanín*, a gold-silver-copper alloy is mentioned in ethnohistoric sources as a material highly-prized by the inhabitants of the Antilles. An alloy with such high percentage of copper does not occur naturally and thus requires high-temperature smelting, for which there is no evidence on the islands (Oliver 2000; Siegel and Severin 1993). While gold ornaments (ear plugs, nose rings, beads, pendants, and inlays) were shaped into thin sheets by hammering together nuggets of material collected from local rivers, *guanín* artefacts were also produced through lost-wax casting, a technique that allows the production of three-dimensional figures (Martinón-Torres *et al.* 2012; Valcárcel Rojas and Martinón-Torres 2013; Cooper *et al.* 2008). Alongside iconographic similarities, this evidence supports the idea that smelting and casting of these artefacts took place in the Sierra Nevada de Santa Marta in north-eastern Colombia, associated to Tairona and Zenú contexts. From these areas, such artefacts were likely exchanged through rivers in north-eastern South America, eventually reaching the Lesser and Greater Antilles (Boomert

1987; Hofman and Hoogland 2011; Valcárcel Rojas and Martinón-Torres 2013).

On the mainland, exchange networks of beads and pendants are also noted during the late pre-Colonial and early Colonial periods: the "greenstone" frog-shaped pendants, produced where the Tapajós River meets the Amazon, were circulated throughout the whole Amazon region (Costa *et al.* 2002a; Moraes *et al.* 2014). These were probably part of ceremonial exchanges between "big men" of tribal communities and also between the elites of chiefdoms, serving as a means of socio-political integration (Boomert 1987). In the coast of Suriname, the peoples associated to the Kwatta complex were also specialized in the production of frog-shaped pendants and responsible for their exchange with both immediate neighbours and communities further to the east, on Marajó Island (Migeon 2008; Rostain 2006; Rostain and Versteeg 2003). They depict mostly frogs, but also vulturine birds, fishes, turtles, and other non-identified forms, and are made from a range of rock types, including rhyolite, quartz, nephrite and tremolite, and also shell and resin.

During the early Colonial period, strings of shell beads known as *quirípas* were used as currency between natives and Europeans in north-eastern South America due to money shortage (Gassón 2000; Hill 2007). The *quirípas* circulated in complex indigenous exchange systems that connected the Venezuelan llanos to the southern Caribbean islands (Biord Castillo 2006). They integrated the System of Orinoco Regional Interdependence and were multi-ethnic and politically horizontal (Arvelo-Jiménez and Biord 1994; Biord Castillo 2006). A possible pre-Colonial antecedent to these exchanges potentially took place at the Valencia Lake Basin, where abundant shell disc beads have been found (Gassón 2000; Kidder 1944; 1948; Osgood 1943; Rouse and Cruxent 1963). The peoples that occupied the area maintained contacts with the Venezuelan coast and with the off-shore islands, in order to obtain marine products, including ornament raw materials (Antczak 1998; Antczak and Antczak 2006; 2008). A Valencioid Sphere of Interaction has been proposed, which would have operated from roughly AD 1000 to the Colonial period (Antczak and Antczak 2006; 2008).[9] At the same time, large rectangular "bat wing" pendants made of serpentinite in the mainland (Wagner and Schubert 1972) were taken to the off-shore islands, where one of them was deposited in a burial (Antczak 1998; Antczak and Antczak 2006). These pendants, also often made of *Lobatus gigas* lips, have been found in Valencioid contexts and are prominent in the Venezuelan Andes (Trujillo area), Quíbor valley, and northern Colombia (Kidder 1948; Osgood and Howard 1943; Vargas Arenas *et al.* 1997; Vellard 1938; Wagner 1973; Wagner and Schubert 1972).

Beads and pendants, especially those made of exotic materials, were often exchanged between the peoples that inhabited the circum-Caribbean and even other continental regions. A continuously growing body of research has focused on existing evidence, both acquired through early Colonial chronicles and innovative scientific

9 The archaeology of the Valencia Lake Basin is thoroughly discussed in the next chapter.

methods. Yet, there is a perceived lasting gap in the scenarios thus constructed for the lives of pre-Colonial societies. This will be discussed in the following sections.

2.3 – Technology and production sequences

The approaches outlined in the previous sections predominate in the circum-Caribbean, creating a gap in the understanding of ornaments and the associated social contexts. The events that took place between the acquisition of a raw material, often only defined by its exotic or non-exotic character, and the deposition of a finished pendant are largely unknown. Even though a number of workshops are known from the Early Ceramic Age, it is often not clear which artefacts were recovered besides preforms, finished, and fragmented ornaments or their relative proportions in the sites. Scales of production have not been contrasted, although evidence suggests that some workshops were responsible for a markedly small production (Boomert and Rogers 2007; Bérard 2004; Righter 2002). The problem lies partially at the use of a very broad and loose definition of the word "workshop"[10], thus leading to its application to contexts of small scale production and in which evidence for specialization is lacking.

A more in-depth knowledge of production sequences can give insight into craft activities, in terms of organization, specialization (presence and type), social acquisition of skills, and related issues. It can also highlight the logics behind the acquisition and exchange of ornaments. With the type of information available for workshops at the moment, these issues are only limitedly discussed. For the Late Ceramic Age, the trajectories of beads are even less understood as evidence of production is lacking and the raw materials used are generally widely available throughout the archipelago. Additionally, ornaments have often been recovered from uncontrolled contexts, with unknown provenience, or as single finds.

A study of shell technology has been conducted by Vargas Arenas and colleagues (1997), focusing on material from the Quíbor valley (state of Lara) and from the Valencia Lake Basin (Carabobo and Aragua states) in Venezuela. They suggest sequences of production for most kinds of shell ornaments based on macroscopic observation of a large assemblage of artefacts. Their work is markedly typological in their concern with artefact types, subtypes, and exhaustive measuring of dimensions and angles (Vargas Arenas *et al.* 1997). While attention is given to techniques and gestures applied to finished shell artefacts, the authors are less concerned with the necessary toolkits and use-wear. Their comparison of the two assemblages is largely based on the presence or absence of specific types and raw materials. The authors conclude that in Lara shell working was more developed, which was evident in the larger number of formal types and decorative techniques, thus requiring more skill and time-investment than in the Valencia Lake Basin (Vargas Arenas *et al.* 1997,

10 According to Pelegrin (1995), the production of a specific category of objects is the main *raison d'être* of the workshop, which is evidenced by an abundance of debris and broken pieces, and near lack of finished products.

298).

Wagner and Schubert (1972) report on the production of serpentinite and steatite “bat wing” pendants from the Venezuelan Andes, state of Mérida (AD 1000 – 1500). While the focus is primarily on chemical characterization and sourcing of materials, they provide information on the manufacture of the pendants: sawing large slabs of material in several “standardized” blanks and using grinding stones made of banded gneiss. At the Kwatta complex sites (Guianas), a technological study of the “green stone” pendants is still missing. Nevertheless, based on a 17th century source (Goupy des Marets), the use of string sawing with a cotton thread for the separation of the harder rock materials in blanks is suggested (Rostain 2006). A similar claim is made for Costa Rica (Lothrop 1955), where abundant evidence of the use of string sawing for the production of jadeitite ornaments is attested. Lothrop (1955) refers to Ferdinand Columbus and Las Casas, both of whom mention the use of string sawing in Panama and the West Indies during the 16th century.

Recent studies have been conducted on the production of beads and pendants in the Brazilian Amazon. While it had been argued before that the Lower Tapajós River was the primary centre for the production of green stone frog pendants, only more recently direct evidence of production was recovered from a site in Santarém (Moraes *et al.* 2014). Artefacts such as unipolar green stone flakes were interpreted as debris from the production of blanks and shaping of the pendants, alongside unfinished and broken pendants, and possible drill bits. The authors mention the use of cutting, scraping and abrading implements for the production of pendants of varied raw materials. Drill bits would also have been locally produced, involving different stages of heat treatment, polishing, and snapping of a relatively soft stone. In the southeast of the Amazon basin, a stone bead making workshop was found and studied through technological analysis (Falci 2012; Rodet *et al.* 2014a). The production sequence encompassed substantial flaking to obtain the blank and to shape disc beads made of silicified kaolinite, alongside grinding and perforation of preforms using quartz drill bits. It was probably a camp specialized in the large-scale production of beads that circulated along the rivers of the immediate surrounding region (Falci 2012; Rodet *et al.* 2014b).

In the Antilles, the focus has been primarily on shell artefacts. This material is widely available and was extensively used in the region. Attention has been given to the mechanics, use and artefact types of the *Lobatus gigas* shell (*e.g.*, Antczak 1998; Carlson 1995; Clerc 1974; Lammers-Keijsers 2007; Linville 2005; Lundberg 1987; O’Day and Keegan 2001; Robinson 1978; Serrand 1999). Regarding bead making technology, the most extensive study has been conducted by Carlson (1995) with the production of *Chama sarda* beads in Grand Turk (also Littman and Keegan 1991). The production sequence included the use of bow drills with chert drill bits and of “polishing stations” made of a mixture of salt water, sand and lime. Both Carlson (1995) and Antczak (1998) suggest the use of “conch hammers" for fine scale shell working such as giving beads and discs a roughly circular shape. The grinding of beads is perceived as considerably time-consuming, especially in the proportions evidenced in Grand Turk. The existence of specialized craftsmen is thus suggested, dedicated to the production and transportation of beads to the Greater Antilles (Carlson 1995). However, it has been argued that shell bead making does not require high craftsmanship (Miller 1996). In addition, several beads can be attached to a string and ground together, standardizing their diameters and reducing the time-input necessary for individual beads.

Other extensive studies of shell ornaments have been conducted by Van der Steen (1992) for the Golden Rock site in St. Eustatius, by Turney (2001) for the Elliot's and Royall's sites in Antigua, by Linville (2005) for Aruba collections, and by Sutty (1978) for sites in the Grenadines. These works focus on typology, while at the same time referring to techniques of production. Serrand (1999; 2003; 2007) has also studied shell technology in the Caribbean (Lesser Antilles and Aruba), suggesting production sequences and patterns in shell modification. Lammers-Keijsers (2007; 2008) has experimented with shell tools and ornaments and conducted a microscopic analysis of shell artefacts from the sites of Anse à la Gourde and Morel in Guadeloupe. *Lobatus* sp. beads were produced with a bow- or pump-drill tipped with chert, techniques that left large perforations on the beads and caused considerable downward pressure. The *Chama sarda* beads, more fragile and displaying smaller holes, were perforated using a hafted hand-held drill, capable of making smaller cones. After drilling, *Lobatus* beads would have been strung together and rolled on a stone in order to be ground down, which is evidenced by their uniform diameter in comparison to thickness.

In relation to stone bead making technology, a study has focused on Early Ceramic Age perforation techniques in Antigua (De Mille and Varney 2003; De Mille *et al.* 2008). Replications of perforations were made with wooden toothpicks mounted on a power tool with added slurry and later examined with a Scanning Electron Microscope (SEM). While the bore holes observed on archaeological calcite beads were partially reproduced, some features were not similar. The use of a power tool for the experiment may be problematic as it creates different conditions in terms of the number of rotations, pressure and heating of the drill in contact with the material. The same can be observed for the use of a toothpick whose composition and morphology is different from wooden drill bits that may have been used in Saladoid times.

A general production sequence was proposed for stone beads and pendants from the Early Ceramic Age site of Vivé in Martinique (Bérard 2004). Thin flakes were used as blanks for the production of disc beads (which implies the existence of a first stage of flaking nodules of raw material), while quartz and amethyst crystals were used for the production of tubular beads. Four successive stages were proposed: the bead blank is shaped by percussion and pecking, followed by the polishing of the sides, execution of biconical perforations, and finally overall polishing. A manufacture sequence of stone beads has also been proposed for the Trants site in Montserrat (Bartone and Crock 1991; Crock and Bartone 1998). The authors describe four stages, including flaking, pecking, grinding and polishing. However, only a few photographs and no other illustrations are presented, which prevent detailed regional comparison.

In sum, despite the abundance of ornaments and workshop sites in the circum-Caribbean, the production of beads and pendants is still understudied. For instance, the drilling techniques used to create holes on lithic ornaments from Saladoid and Huecoid contexts remain unknown. The perforation is technical evidence of the high craftsmanship of the peoples that left these remains, especially when applied to hard materials. Late Ceramic Age beads and pendants have not been the focus of technological studies with the exception of the ones mentioned above. It is with this gap in mind that the present thesis will focus on this time period, leaving questions regarding earlier ornaments for future research.

2.4 – Use and systems of attachment

There are no extensive studies regarding the use and systems of attachment of individual beads and pendants in the Caribbean. Microwear research has been conducted on beads and other paraphernalia from Guadeloupe, but observations on use-wear are not extensive as the focus was on toolkits of production (Lammers-Keijsers 2007). Nevertheless, the recurring typological categories used by archaeologists are often influenced by ethnohistoric or ethnographic accounts, which contain limited information on modes of wear. They can provide an initial avenue for exploration.

For instance, a recurrent type of tubular bead presents two perforations, one along its length and another one perpendicular to it. It is common that the perforation along the width is closer to one of the ends of the bead. These “double-perforated” beads can be found throughout the Caribbean islands since the Early Ceramic Age, in sites like Trants (Watters and Scaglion 1994) and Pearls (Boomert 2007). They are also present in the of Late Ceramic Age Dominican Republic assemblages discussed in the present research. In both time periods, “double-perforated” beads were predominantly made of diorite (or other non-identified igneous rocks) and calcite. Following Fewkes (1922, 232), it has been suggested that such beads would be strung through the perforation along the width, while the length perforation would serve to insert feathers (McGinnis 1997a; Rodríguez Ramos 2007; Watters and Scaglion 1994). It is questionable whether all beads of such type would be placed in the same kind of arrangement. Additionally, it is possible that for such an attachment to be possible, one would have to add resin to the feather. A microscopic analysis of this type of beads could shed light into this hypothesis.

Another category of ornaments whose use is directly related to its typology is the tinkler. This term generally refers to *Oliva* sp. shells which were modified by the creation of a perforation on one side of the body whorl and by the removal of the apex and part of the inner whorl (Robinson 1978; Turney 2001; Van der Steen 1992). *Conus* sp. and *Cypraecassis testiculus* specimens are also found. These shells are believed to have been strung together and tied around the ankles or arms by Amerindians, in order to produce rhythmic sounds during dances and ceremonies. Archaeologists often refer to Roth's (1924) account about peoples from the Guianas that used similar "musical instruments". In fact, similar ornaments made of a range of raw materials (nuts, claws, small gourds) are used by several Amerindian communities from Brazil tied on different areas of the body (Travassos 1986, 180-1). Artefacts of the same type made of shell are found in Mesoamerica, where they are sewn on the edge of elite clothing on stela carvings (Aizpurúa and MacAnany 1999; Melgar 2010; Suarez 1981), and in the southern United States, among present-day Zuñi people (Righter 2002). Tinklers are also found throughout the Early and Late Ceramic Age circum-Caribbean and will be further discussed in the following chapters.

Discs and plaques from Antillean Ceramic Age sites have commonly been interpreted as inlays (*e.g.*, Lammers-Keijsers 2007; Righter 2002; Turney 2001). These were placed on anthropo- or zoomorphic artefacts made of ceramics (*adornos*), wood (idols, *duhos* and vomiting spatulas), shell (*guaízas* and pendants), cotton (idols and belts), bone (spatulas and snuffs), and stone (three-pointers, idols, masks, and maybe collars and elbow stones), in order to highlight some features, such as the eyes, ears, and mouth (Alegría 1983; Pons Alegría 1980). A range of raw materials were used for this purpose, such as shell and mother-of-pearl, green stones, gold, and (turtle) bone, being attached through the use of tree resin[11], pressure, or sewing. While most archaeological artefacts from controlled excavations identified as inlays are (rectangular) plaques or discs, most inlays still attached to figures observed on museum collections are clearly eye and mouth pieces. This suggests an over-identification of artefacts of unknown functionality with the category.

Other accoutrements worn by Amerindians are penis sheaths made of gastropods, such as the ones recovered from the Valencia Lake Basin in Venezuela (Peñalver Gomez 1983; Vargas Arenas *et al.* 1997). Based on historical accounts, automorphic artefacts made of marine (*Strombus pugilis* and *Cassis madagascariensis*) and freshwater shells (*Pomacea urceus*) were associated to this usage (Peñalver Gomez 1983). The artefacts were produced through the removal of the central part of the shell and the placement of perforations on both sides, where strings would be attached. The use of cotton has been attested in the Dominican Republic by chroniclers such as Las Casas (cf. Alegría 1995; Ostapkowicz 2013) and the strings for attaching and composing ornaments were possibly made of such material, as they still are in ethnographic contexts in the lowlands of South America (Ri-

11 Alegría (1983) cites Las Casas, who mentions the use of the resin from the tree *Clusia rosea*.

beiro 1988). Other possibilities are palm fibres (presently used by the Maimandê, cf. Miller 2007), plants belonging to the old family Agavaceae (*e.g.*, *henequen: Agave fourcroydes*; and *cabuya*: *Furcraea hexapetala*), or to the Bromeliaceae family (*curagua*: *Ananas lucidus*). The first two plants are both locally available in the Dominican Republic and are mentioned by Oviedo as used by the "Taíno" for the manufacture of strings and ropes (cf. Deive 2002). The production of such items, alongside that of hammocks, has been considered a female activity according to ethnohistoric sources (Sued Badillo 1979). The *curagua* is currently used for making strings and ropes by indigenous communities of the Orinoco, such as the Hutï (Leal and Amaya 1991).

Alegría (1995), in an overview of the attires and accoutrements of the "*caciques* Taíno", refers to Las Casas's description of *naguas*, i.e. aprons made of cotton and embroidered with thousands of small shell and stone beads.[12] These were worn by women during "socio-religious" ceremonies (*areytos*). Other objects were likewise embroidered, such as caps and belts (Alegría 1995; Olazagasti 1997). Two "Taíno" belts have survived and are housed in the Dominican Republic and Austria. The belt from Vienna is composed of ca. 11,000 small disc beads (with 5 mm of diameter), made of *Chama sarda*, *Lobatus gigas*, and presumably seeds embroidered in a cotton structure (Ostapkowicz 2013). Creating a parallel to the *Lobatus* shell beads from Guadeloupe (Hofman and Hoogland 2004; Lammers-Keijsers 2007), a constant diameter as opposed to varying thicknesses suggest the use of a technique that provides relative standardization, such as stringing beads and grinding them together.

Belts are also depicted on ceramic figurines and *duhos* (ceremonial seats) from the Greater Antilles, as well as other cotton adornments, for instance headdresses and armbands (Ostapkowicz 2013). Similarly, headdresses, necklaces, ear and nose plugs, and pierced ear lobes are observed on ceramic figurines depicting females from Valencioid contexts (Antczak and Antczak 2006; Mackowiak de Antczak 2000). Additionally, body divisions and decorations (painted or incised lines and punctuations) are present, which are reminiscent of body paint or scarification. Ceramic figurines from the Lower Amazon have pierced ear lobes, polychrome body paint, arm and ankle bands and headdresses. One small specimen, depicting a seated female individual, has possible *muiraquitãs* attached to a headband (Gomes 2001, 141); another figurine depicts one hanging on a string from the neck. This difference in modes of attachment may be related to the different positioning of the holes, as argued by Barata (1954). McGinnis (1997a) refers to Martir d'Anglería who mentioned the use of small "demons" as part of headbands in Hispaniola.

The modes of usage of bodily ornaments can also be assessed through direct evidence from burial contexts. This is the case with the a female burial from Anse à la Gourde

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12 Embroidered aprons made of seeds were worn by indigenous groups throughout the Guiana Highlands. Nowadays it is common to see aprons made of glass seed beads (Ribeiro 1988; Roth 1924; Van Velthem 2002).

(Guadeloupe) with more than 1100 *Lobatus gigas* disc beads around her pelvis (Hofman and Hoogland 2004; Lammers-Keijsers 2007). Also from Guadeloupe, a burial with a four shell beads around the neck of a dog was uncovered in Morel (Hoogland and Hofman 2013). Similar finds are reported from the Lake Valencia: bodily ornaments are commonly associated to burials, both direct and urn burials of humans, and also of a monkey (Antczak 1998). At the site of Los Tamarindos, on the north-eastern shore, a female individual had a string of beads around her pelvis (Kidder 1944). In an earlier pre-ceramic burial context on the northern shore (4400 BP), perforated *Oliva* sp. shells were concentrated around the neck of an individual, disposed as if they had been strung together in a necklace (Antczak 1998; Antczak and Antczak 2008).

In this chapter, the main lines of inquire used to approach ornaments in the circum-Caribbean region and Amazonia were discussed. Most researches have regarded ornaments as valuable finished and static objects or as (exotic) raw materials. Previous studies have only presented partial views of the pre-Colonial biographies of ornaments. The focus of this research will thus be on technology and use-wear, i.e. how ornaments were produced, used and transformed by humans. The need for more overarching biographies will be a constant concern as well as the ways in which the individual biographies of beads can be entangled in broader social processes.

Chapter 3 – Circum-Caribbean case studies

In the last chapter, a research gap was perceived in study of ornaments from the pre-Colonial circum-Caribbean, which the present study aims to start overcoming. The focus of this research will be on two Late Ceramic Age case studies, one in north-western Dominican Republic and the other in north-central Venezuela (figure 1, a). The aim is to understand how beads and pendants figure in each context and to use their "life trajectories" as proxies for human activities in the past. Only in a later moment the case studies will be contrasted to each other. In other words, potential links between the Antilles and the surrounding mainlands will not be considered *a priori*. Likewise, the samples are not regarded as representative of the whole circum-Caribbean region in any given period of time. The specificities that pertain to the human communities that produced, used and discarded the ornaments may nevertheless be part of regional tendencies in terms of raw material preferences and acquisition, technological traditions, or trade networks of specific goods (cf. Chapter 2). The "circum-Caribbean" adjective is therefore a basal concern which has largely guided the literature review and broader contextualization, rather than a claim for generalization which the proportions of this research and dataset do not allow.

3.1 – North-central Venezuela and the Lake Valencia

The first case study concerns north-eastern South America, to the north of the Orinoco River. More specifically, the focus will be on north-central Venezuela, mainly the immediate surroundings of the Lake Valencia. The lake has a roughly elliptical shape with an extension of 436 km², maximum diameters of 85 km developing east-west and 25 km, north-south (Berry 1939, 549). Presently, it has more than 20 islands and stands at approximately 400 m above sea level (masl), although its water level has fluctuated a lot over hundreds of years. The most important river that flows into the eastern part of the lake is called Aragua, which also denominates the fertile plains that extend to the east. The western shore is also occupied by low fertile plains, while the northern and southern shores are only about 5 km from mountain ranges (Berry 1939). On the north, the lake is separated from the Caribbean coast by approximately 25 km in straight line and by the Coastal Range, whose peaks can reach altitudes of more than 2700 m (Berry 1939). It is the largest reservoir of freshwater of north-central Venezuela and, together with the fertile alluvial plains, seems to have been attractive for Amerindians communities who occupied its shores in the pre-Colonial period (Antczak 1998; figure 1, b).

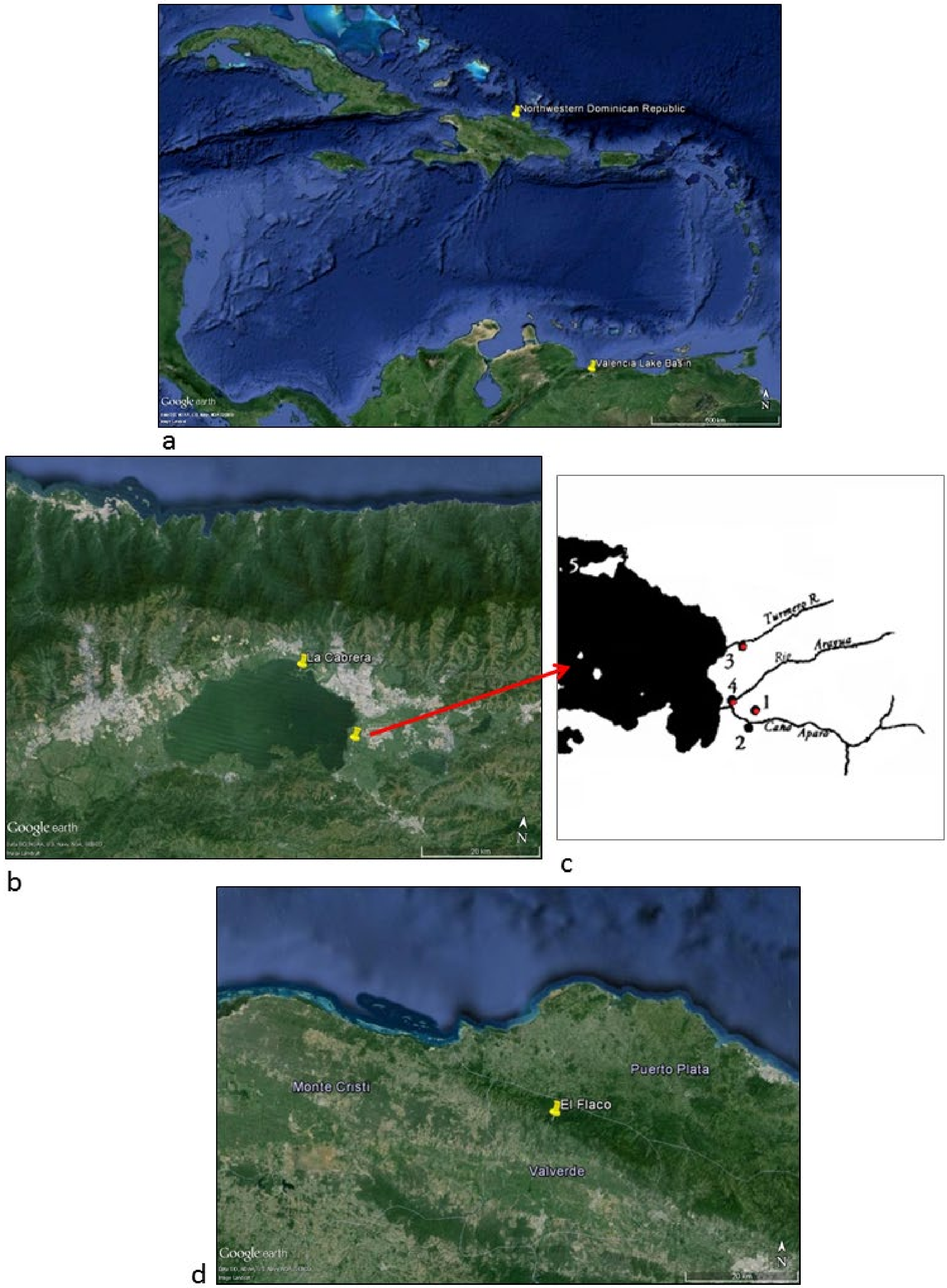

Figure 1: Maps of the studied regions. **a**: the circum-Caribbean and the two case-studies; **b**: Lake Valencia, showing La Cabrera Peninsula (centre) and the eastern shore; **c**: Sites at the eastern shore (1- La Mata, 2-Tocorón, 3-Camburito, 4-El Zamuro), after Mackowiak de Antczak (2000, 384); **d**: north-western Dominican Republic and the El Flaco site.

3.1.1 – Previous research on the Valencia Lake Basin

The first ceramic-bearing occupants of the Valencia Lake Basin are associated to the Barrancoid series, typical of the lower Orinoco basin (Rouse and Cruxent 1963). The lower strata of the Los Tamarindos site (La Cabrera Peninsula at the north-eastern shore) and of some mounds of the eastern shore were assigned to this series (Kidder 1944; 1948, 421; Osgood and Howard 1943). These occupations pre-date the construction of the mounds, being restricted to pile dwellings and possibly suspended houses built on the flooded area of the lake (Bennett 1937). Ceramic pipes, a few griddles, and primary burials, with rare grave goods have been recovered. Bat wing pendants and stone beads are found, alongside shell beads and flat pendants (Kidder 1948). Radiocarbon dates for El Palito, a Barrancoid site on the coast, point to an occupation between 260 and 290 ±120 years BC (Rouse and Cruxent 1963; Sanoja and Vargas 1978).

The upper strata of the Los Tamarindos site and the eastern and western mound complexes display material associated to the Valencia phase of the Valencioid series (Antczak 1998; Kidder 1948; Rouse and Cruxent 1963). The series is believed to have developed locally as the result of movement into the region of Arauquinoid- and Valloid ceramics-bearing peoples from the Middle Orinoco (Rouse and Cruxent 1963). In addition to the Valencia style pottery with abundant plastic decoration and *adornos*, hundreds of pottery figurines are known from the Valencia Lake Basin, often depicting standing or seated females (Antczak and Antczak 2006; Mackowiak de Antczak 2000; Rouse and Cruxent 1963). Numerous bodily ornaments were recovered, such as beads and pendants made of marine shells, bone, ceramic, stone, jet, wood and metal. Small and medium sized disc beads were recovered in great quantities, being in fact the most numerous artefact category (Antczak and Antczak 2008).

The artificial mounds ("*cerritos*") are round and elongated accumulations of humus and clay, which served as dwelling sites and burial grounds (Kidder 1948; Rouse and Cruxent 1963). It is not possible to attest if all the mounds were contemporaneous (Antczak 1998). In the centre of the Tocorón Mound 6 (eastern shore), the burial of a small individual was found, interpreted as "either a child or a monkey", accompanied by a "necklace" of more than 1000 shell beads (Osgood 1943, 23). As mentioned in the previous chapter, a primary and direct burial of a young adult female is reported from Los Tamarindos, flexed on her back and on top of "a string of heavy shell beads" next to her pelvis (Kidder 1944, 52). Great variability has been noted in Valencioid funerary practices (De Veth 2013). There is preference for single burials, to which most grave goods were associated, but multiple funerary urns with secondary burials were also registered (Rouse and Cruxent 1963). Grave goods also accompanied ceramic urns, such as anthropomorphic figurines, decorated pottery vessels, food offerings, white pebbles, and numerous ornaments of shell, stone and bone (Antczak 1998; Kidder 1948). Individuals with cranial modification have also been found (Jahn 1932; Marcano 1889).

The Valencioid skilful non-ceramic working is noted in representational artefacts, such as carved pendants. These were shaped as turtles, frogs, dogs, fishes, birds and anthropomorphic figures, with varying degrees of conventionalization (Antczak 1998; Antczak and Antczak 2008; Kidder 1948). Turtles, for instance, were depicted in a variety of media: ceramic, shell, stone, and bone (Antczak and Antczak 2006). The number of zoomorphic stone pendants does not seem to have been extensive.[13] The presence of an unfinished pendant in the shape of a dog made in quartzite, together with fragments of stones, bone and shell, is interpreted as evidence of pendant manufacture in the eastern shore (Marcano 1889). Serpentinite bat wing pendants, recovered from Valencioid contexts, are similar to other specimens found in the Venezuelan Andes (Wagner and Schubert 1972). Other artefacts to which a "ceremonial" character has been attributed are ceramic pipes and musical instruments, such as rattles, whistles, *ocarinas* and deer bone flutes (Antczak and Antczak 2006; Osgood 1943). The presence of a few artefacts made of gold, such as *narigüeras* (hammered gold nose rings), was seen as evidence of an exchange network that reached up to northern Colombia (Antczak *et al.* 2015; Sanoja and Vargas 1978).

Great importance was attributed to the *Lobatus gigas* shell by the bearers of Valencioid pottery (Antczak 1998; Antczak and Antczak 1999; 2006; 2008). A wide range of other shell species is represented in Valencioid contexts, mostly from marine habitats (*e.g., Oliva*, *Fissurelidae*, *Cassis*, *Conus*, etc.). Land and freshwater molluscs were also attested, but in smaller numbers (Antczak and Antczak 2006). Many seashell species were probably not relied upon as food source, but as raw material for ornaments and other artefacts (Antczak 1998; Antczak and Antczak 1999). Some marine shell raw materials (*Cassis*, *Donax* and *Pitar*) were probably brought from peripheral coastal areas to the west of Lake Valencia. This implies an indirect form of raw material acquisition, that is, by exchanges with other peoples, not associated to Valencioid pottery.

There are still gaps in the understanding of the absolute chronology of the Valencia Lake Basin occupations. Micro-contextual and large-scale open area excavations have not taken place, also preventing insights regarding settlement and house structures (Antczak 1998). An additional problem is the lack of fine-mesh sieving in previous excavations, potentially resulting in the loss of many small artefacts (Antczak 1998). The preference for collecting pieces of more obvious "museum value" also hampers a more thorough understanding of the activities carried out at the sites (Mackowiak de Antczak 2000). Intensive action of looters alongside agricultural work also poses a challenge for future field projects in the area[14]. More recently, however, new studies of the excavated archaeological

13 Bennett (1937) recovered only 2 carved stone pendants, Marcano (1889) reports 1, and Osgood (1943) did not find any.

14 Kidder (1944, 25) mentions this problem for the Camburito site, stating that the mounds were, at the time he was writing, already "practically obliterated".

material from the Valencia Lake Basin were conducted, re-evaluating ceramic sequences and incorporating analyses of ceramic iconography and elemental composition (*e.g.*, Antczak and Antczak 2006; in press; Herrera Malatesta 2009; Kasztocsczky *et al.* 2004; Mackowiak de Antczak 2000; Pino *et al.* 2013). In addition, studies of shell ecology, distribution and modifications were conducted, as well as of other non-ceramic artefacts (*e.g.*, Antczak 1998; Antczak and Antczak 2008; Antczak *et al.* 2008).

These new studies are bringing new light into the relations established by the inhabitants of the Valencia Lake Basin with surrounding regions in the context of a Valencioid Sphere of Interaction. Towards the end of the first millennium AD, inhabitants of central coast settlements, associated to the Ocumaroid ceramic style, travelled to islands off the coast of Venezuela and brought sea products to the mainland to exchange with peoples from the Valencia Lake Basin. These exchanges would have operated during the "classical" mound-building period in the eastern shore of the lake (ca. AD 800 – 1100, cf. Antczak 1998). Around AD 1000, the communities from the Lake Valencia started to cross the Coastal Range and the open sea to reach the islands. The *Lobatus gigas* shell was then directly exploited in the Los Roques Archipelago, an island group distant approximately 130 km from the central coast of Venezuela. This later period is exemplified by material recovered at the La Cabrera Peninsula, on the northern shore of the lake, such as artefacts made of coral[15] and *Lobatus gigas* shells (Berry 1939). The occupants of this settlement organized seasonal expeditions to the islands, coordinated by a community headman (a "Big Man") together with his kin followers (Antczak 1998, 300).

The most complex camp established in the archipelago was in the Dos Mosquises Island (Antczak 1998; Antczak and Antczak 2006), where the meat of the *Lobatus gigas* and shell raw materials were prepared to be sent to the mainland (Antczak and Antczak 2006; 2008). It also included "ceremonial" contexts, displaying anthropomorphic figurines, bone flutes, *Lobatus gigas* shells, ornaments and a human burial (Antczak and Antczak 2006; Mackowiak de Antczak 2000). The production of shell beads and discs also took place in the island, but not in the same intensity as in the Valencia Lake Basin settlements. These contexts were interpreted as evidence of the performance of rituals associated to the large-scale exploitation of the gastropod, perhaps as compensation to a "spirit master of the shell" (Antczak and Antczak 2006; 2008). The association between ceramic figurines and unmodified *Lobatus gigas* specimens has been interpreted as evidence of the presence of shamans who used the figurines, which assumed the social role of women, as mediators through which to placate the spirits (Mackowiak de Antczak 2000).

An expansion of a Valencioid "chiefdom" into surrounding areas, subjugating other peoples, has been suggested as Valencioid pottery was found in regions to the east

15 Berry (1939, 558) suggests that corals (presumably large pieces) were used for shredding manioc; however, these may have been used as grinding platforms for ornaments and other artefacts.

and northeast from ca. AD 1200 (Antczak and Antczak 2006; Rouse and Cruxent 1963). The variability in burial practices and grave goods haa also been regarded as evidence of increasing social stratification (Sanoja and Vargas 1978, 121). However, such inferences cannot be securely made on the basis of burial evidence due to the lack of detailed contextual information (Antczak 1998, 54). In addition, rather than a continuous development of a single society, the occupation of north-central Venezuela should be regarded as more complex and varied, including “multidimensional negotiations” (Mackowiak de Antczak 2000, 322) between different communities from the Valencia Lake Basin and others, as well as different phases of occupation and regional articulation (Antczak 1998).

3.1.2 – Valencia Lake Basin assemblages under study

During this research, 115 artefacts from five contexts in the Valencia Lake Basin were analyzed. The artefacts from the first collection were recovered from the sites of El Zamuro (*n*=21 artefacts), Camburito (*n*=14), generally assigned to El Zamuro/Camburito (*n*=06) or to Los Cerritos (*n*=13), which refers to the whole mounded complex of the eastern shore of Lake Valencia (A. Antczak, pers. comm. 2015; figure 1, c).[16] One artefact comes from the Hacienda Mariara in the north of lake, others from La Cabrera (*n*=05) and some were just assigned to the Valencia Lake Basin (*n*=02).[17] The artefacts from the second collection are from the site of La Mata (*n*=53). In the following sections, the focus will be placed on the three sites on the eastern shore from which most specimens come (107; 93%).

<u>3.1.2.1 – Alfredo Jahn collection</u>

Three sites were investigated on the eastern shore of the Lake Valencia by the engineer of the German railway Alfredo Jahn in 1903, commissioned by the *Museum für Völkerkunde* in Berlin, Germany.[18] The Camburito site is on the left bank of the Turmero River and lies 3 km from the edge of the lake (Osgood 1943). About 50-60 mounds were recorded, but the archaeological material seems to have come from only two (even though 13 were investigated). The site of El Zamuro, six kilometres south of Camburito, is located on the right bank of the Aragua River, next to where it meets a narrow creek, called Caño Aparo. A differentiation between this site and La Mata based on visual evidence seems problematic, which suggests that they were associated complexes (Osgood 1943, 14; Mackowiak de Antczak 2000). In El Zamuro, 22 to 26 mounds were recorded and at least two, excavated. Finally, Jahn also excavated a burial site with no mounds, lying 2 km east of Camburito.

The mounds are described as ovoid, with heights varying between 3 and 15 m, and

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16 This data was assembled together and given to me by A. and M. Antczak, who contrasted the identification files of individual artefacts from the Ethnologisches Museum in Berlin and Jahn’s manuscript.

17 The artefacts generally assigned to the Valencia Lake Basin do not belong to the Jahn collection, but to that of Schliephacke from 1931.

18 Jahn’s report was published in German by Karl Von den Steinen in 1904 (Jahn 1932). I did not however have access to this publication and therefore will only refer to summaries made by other authors.

diameter between 10 and 300 m (Lejeal 1905). The finds from the three sites are reported as 32 skulls, over 100 whole ceramic objects, 140 stone tools, and 28 necklaces (Lejeal 1905; Osgood 1943). After excavated, the material was sent to Berlin, where it stayed until 1945, when it was shipped to St. Petersburg in Russia. After the end of the Cold War, the materials were sent back to Germany, but only part of the "28 necklaces" was returned to the Museum (Diaz Peña 2006).[19] The collection, now housed at the Ethnologisches Museum Berlin, is composed of over a 1000 artefacts, among which pottery, shell and stone. For the present research, 64 artefacts made of shell, stone and ceramic were borrowed from the museum[20] and sent to Leiden University (The Netherlands) in order to be analyzed at the Laboratory for Material Culture Studies (Faculty of Archaeology). Of the artefacts received, 62 were considered potential "bodily ornaments" and analyzed for this research. Not all bodily ornaments from the Jahn collection were sent to Leiden for different reasons: certain artefact types were already represented in the sample, others did not fit the bead/pendant category (*e.g.*, penis sheaths), and finally, others were likely considered too valuable to be sent outside of Germany.

This collection was chosen because it is sufficiently large, relatively well preserved, and easily transportable to Leiden, where the laboratory equipped with necessary microscopes is present and where most of this research was conducted. The identification numbers of the artefacts that will be used in the following are the same as the ones attributed by the Museum.

3.1.2.2 – Private collections from La Mata

The other Valencioid collection was recovered from the La Mata site by a private collector. The site, composed of about 46 mounds (cf. Osgood 1943), was excavated by G. Marcano (1889), by L. G. Martinez, by R. Requena and M. del Castillo, by W. C. Bennett (Bennett 1937), and by Peñalver Gómez. It was lying at approximately 5 km from the eastern shore of the Lake Valencia at the time of Bennett's work. The mound 6 which Bennett (1937) excavated had a round shape, about 30 m in diameter and 2,8 m of maximum height at the centre. Burials were registered from the top layers of the mound, including a thick organic layer which also presented considerable domestic refuse, such as grinding stones, broken axes, and cooking pots (Bennett 1937).

In total, 57 burials were recovered, composed mostly by single adult burials, often secondary in urns. Shallow urns, in contrast with large ones used for the burial of adult individuals, were used for the primary interment of children, often accompanied by many

19 The trajectory of the collection is described by Diaz Peña (2006), partially based on information provided by A. and M. Antczak. The authors have compiled information about Jahn's excavations and this collection, which are part of an unpublished book.

20 Bringing this collection to Leiden was made possible through the kind intermediation of Dr. Manuela Fischer, curator of the Ancient Americas collection in the Ethnologisches Museum Berlin, and with the help and support of Dr. Andrzej Antczak and Dr. Marlena Antczak from Leiden University.

beads. For instance, the burial of a child was covered by an inverted urn and contained four types of beads and a stone frog (pendant?) (Bennett 1937). According to Bennett's table 1 (1937, 86), there is evidence for the presence of beads in all types of burials, except for direct secondary burials. The skeletal remains of a child were deposited on a "cooking platter" with "beads and seashell ornaments", possibly subjected to cremation. De Veth (2013) interprets this child burial as evidence of a different posture towards the spirits of children, which may cause harm to the living.

Bennett (1937) created typologies per artefact category. Alongside ceramic sherds, figurines, pipes, and modelled animals, ceramic anthropomorphic amulets are found, some likely used as whistles. He also mentions the presence of a short tubular clay bead. The most extensive ornament typology is for shell, including tubular and disc beads, pierced (whole) shells, cut-out beads, and pendants. For stone, Bennett (1937) mentions bat wing pendants, stone amulets, and stone beads. Osgood (1943) uses the same typology for the Tocorón collection, with some extra types. Through the observation of plates provided by G. Marcano (1889)[21], it is possible to see that some of these recurrent types are also present on his collections from the La Mata site.

This sample is composed by 53 artefacts, most of which are made of marine shells and only a few of stone. Other 19 shell artefacts were also part of the collection, but not analyzed due to their poor preservation. The artefacts will be identified as VAS-1 to 53, a random identification given as no other was previously assigned. Two of these artefacts belong to different private collections: VAS-36 and VAS-53. When contrasted to pictures of other Valencioid artefacts, the two collections form a representative sample of the most common ornament types recovered from Lake Valencia contexts.

3.2 – North-western Dominican Republic

The second case study is located in the Greater Antilles, which encompass the largest islands of the West Indies: Cuba, Jamaica, Hispaniola and Puerto Rico (Newsom and Wing 2004). The island of Hispaniola is currently divided in two countries: Haiti in the west and the Dominican Republic in the east. The assemblages analyzed here come from the area closer to the border between the two countries, on the Dominican side. The northwest of the Dominican Republic encompasses parts of the present-day provinces of Puerto Plata, Valverde Mao and Montecristi. It comprises the high peaks of the Cordillera Septentrional (up to 1913 masl), which develops from the north-west to the south-east along 200 km, with its valleys and abundant sources of freshwater in the form of rivers and small streams. The weather is humid, with predominance of tropical forest, except for the Montecristi region, characterized as semi-arid. To the south of the Cordillera lies the Cibao valley-Vega

21 While Vicente Marcano conducted the excavations, his brother Gaspar was the one who published the book *Ethnographie Précolombienne de Venezuela* in 1889, reporting this research (Antczak and Antczak 1999; Jahn 1932).

Real, not included in this study. To the north, the plains associated with the Bajabonico and Camú River basins are found and further on, the sea (figure 1, d). This is an environmentally diverse area, encompassing mangroves, swamps, forests, beaches and high mountains. As will be discussed below, this environmental diversity is associated to diversity in human cultural landscapes (De Ruiter 2012; Ulloa Hung 2014).

3.2.1 – Previous research in the northwest

The north-western region of the Dominican Republic has been the focus of little archaeological research in comparison to other areas of the country, such as the east and southeast. Most researchers interested in this area focused on the Colonial period, as this is where Christopher Columbus first founded a permanent settlement in the New World, La Isabela in 1493, during his second voyage to the Caribbean (Deagan and Cruxent 2002; Ulloa Hung 2014).

Accodring to the culture historical framework, the island of Hispaniola, together with Puerto Rico and eastern Cuba, was occupied by the "Classic Taíno" during the Late Ceramic Age (Rouse 1992). The "Taíno" were the producers of pottery of the Ostionoid series, to which belonged regional subseries, namely Ostionan, Elenan, Meillacan, and Chican. The two former were the oldest varieties, while the latter were more recent. Chican Ostionoid, the most recent one, would represent the highest level of cultural development, encompassing ceramics with elaborate plastic decorations, shamanic paraphernalia, idols carved in different media, and ball courts (Bercht *et al.* 1997; Curet 1996; 2014; Siegel 2010b). These features were evidence of increased ceremonialism, social hierarchies, and of a chiefdom organization (Rouse 1951; 1992). The north-western region of the Dominican Republic, in particular the Cibao valley, was seen as the place of origin of the Meillacoid ceramic style[22], which developed through the integration between the possessors of a previous, non-local style and the Ostionoid populations (Veloz Maggiolo *et al.* 1981).

Archaeologists have associated the Meillacoid ceramic traits to Ciguayo and Macorix peoples described in ethnohistorical accounts (Veloz Maggiolo and Ortega 1980). From the end of the 8th century, the latter had occupied the Yaque del Norte River basin and from there, they expanded east and west, reaching other islands. In an attempt to explain archaeological variability through historical sources, archaeologists have argued that the Macorix/Meillacan communities spoke an Arawak language different from the "Taíno" and constituted a society in transition to a chiefdom organization (Guerrero and Veloz Maggiolo 1988; Ortega 2005; Vega 1990; Veloz Maggiolo *et al.* 1981). Ceramics displaying traits of both styles were found in several sites in the region (Veloz Maggiolo and Ortega 1980), being evidence of the mixing between different cultures. However, such

22 In order to avoid following the homogenizing tendency implied by the use of series and subseries by Rouse, I will henceforth refer to these as ceramic styles, with the termination –oid.

a focus on ethnohistorical sources and on the attribution of ethnic categories to artefact groups has tended to homogenise the pre-Colonial period. The co-existence of different styles and intermixing of traits in the ceramic material suggests high cultural variability. In addition to drawing an uncritical correlation between the distribution of diagnostic archaeological artefacts and the ethnohistorical panorama, variability in ceramic traits was treated as necessarily connected to specific ethnic groups and the occurrence of ceramic styles in different areas as resulting from either diffusion or inter-marriage (Ulloa Hung 2013; 2014).

Ulloa Hung (2014) and de Ruiter (2012) surveyed the region of Punta Rucia, around the border between the provinces of Puerto Plata and Montecristi. Their research was concerned not only with ceramic variability, but also with the understanding of settlement patterns, i.e. the insertion of archaeological sites in the natural and cultural environments. Groups of ceramic traits, which thus far stood for bounded cultural entities, were henceforth regarded as evidence of constant interactions between social groups. This encouraged the development of a new view of the regional archaeology as a complex "mosaic of cultures" that involved not only the bearers of the Meillacoid, Chicoid and Ostionoid styles, but also the so-called "Archaic-Age" communities through acculturation, assimilation, syncretism, etc. (Ulloa Hung 2014). The positioning of settlements in a landscape of great ecological diversity had an important role in the establishment of relations with other communities, as sites belonging to a given ceramic style were located close by and in association to specific environmental zones and visibility ranges (De Ruiter 2012; Ulloa Hung 2014).

3.2.2 – Sites and assemblages under study

As part of the ERC project Nexus 1492, coordinated by prof. Dr. Corinne L. Hofman, further research in the north-western region of the Dominican Republic is being carried out. The research in the area follows Columbus's route from La Isabela across the mountain ranges to the Cibao valley in the south, where he founded the fort of Santo Tomás de Jánico (Hofman and Hoogland 2015). Unlike previous works, the focus is not on the Colonial period from a Spanish and historical point of view. Rather, the project aims at reconstructing indigenous settlement patterns and life ways in the last centuries before and during the Colonial period in order to understand the interactions and socio-cultural transformations that took place (Hofman and Hoogland 2015). Surveys were conducted in the summers and winters of 2013 and 2014, centred on the regions to the west and south-west of La Isabela (Ulloa Hung 2014). This area comprises present-day provinces of Puerto Plata, Valverde Mao and Montecristi.

During the survey of 2013, 50 places were characterized as archaeological sites, being divided in three types, namely open-air settlements (*n*=36), *concheros* (shell middens, *n*=9) and rock shelters (*n*=5). The first two were Late Ceramic Age occupations: of the settlements, 11 were characterized as Chicoid, eight were Meillacoid, three had ceramics with traits of both series, and two had mixed traits of the Ostionoid and Meillacoid series (Ulloa Hung 2014). While both the shell middens and rock shelters are distributed in lines along the coast to the west of La Isabela, the settlements are located up to 15 km from the coast on the Cordillera Septentrional, with heights varying between 50 and 550 m. Inter-visibility and proximity of freshwater sources are common features shared by most of them. Beads and pendants were occasionally recovered from the surveyed sites, while they were more abundant in sites where large-scale excavations were conducted. In fact, the recovery of ornaments is not rare, a testimony of which being private and museum collections in the north-western region.23 In the present thesis, I will focus only on the beads, as the pendants are being studied by T.W. Breukel, in the context of a PhD dissertation in Leiden University. A few beads come from the northern part of Montecristi, the westernmost province of the Dominican Republic. A systematic survey is being carried out in that area by E. Herrera Malatesta also as a PhD project.

3.2.2.1 – El Flaco

Also as part of the Nexus project in the northwest, a site is being excavated by a team from Leiden University, coordinated by prof. Dr. C.L. Hofman and prof. Dr. M.L.P. Hoogland (Hofman and Hoogland 2015). The site is situated on the southern slopes of the Cordillera Septentrional, in the locality of Cruce de Guayacanes in the footsteps of the Paso de los Hidalgos. It is an open air site, located in an area of approximately 303 meters above sea level (masl), nearby small sources of freshwater and at a distance of 15 km to the large river Yaque del Norte on the south. The site lies on top of a limestone bedrock, from whose profiles local people collect white clay.

The site is well preserved, although it has been subjected to the action of looters, from whose digs depressions are left on certain sectors. The settlement is disposed in a north-west – south-east direction and presents a pattern similar to that of other sites in the north-western region, namely the presence of platforms surrounded by mounds (De Ruiter 2012; Veloz Maggiolo and Ortega 1980; Ulloa Hung 2013; 2014). During the summers of 2013 and 2014, open area excavations were conducted, exposing house plans located on the platforms. These are evidence of intentional modifications to the landscape in order to create flat areas for the placement of houses (Hofman and Hoogland 2015). The house plans are associated with mounded areas, which were used for multiple tasks. Most residues from the houses seem to have been "swept" to the side, thus forming the artificial mounds. There is also evidence for the use of such mounds for burning "garbage", the placement of burials, cultivation, and the preparation of food on hearth structures (Hofman

23 Some of which I had the chance to visit during the summer of 2014. Museum collections with several bodily ornaments on display are at La Isabela and at the Centro León in Santiago de los Caballeros.

and Hoogland 2015). The radiocarbon dates obtained for the site situate it between the 13th and 15th centuries.

Considerable archaeological material was recovered from the surface, but the majority from sub-surface. Most artefacts were concentrated on the mounds' layers, while the platforms did not display as many artefacts. The ceramics were attributed to a Meillacoid style or Meillacoid manufacture techniques with Chicoid plastic decoration (Hofman and Hoogland 2015). Abundant shell specimens were recovered, gastropods and bivalves of marine, freshwater and land origins. A few fragments of a large marine gastropod were recovered, possibly of *Lobatus* or *Strombus* genera, but displayed no macroscopic evidence of being tools. Amorphous fragments of corals and fragments of branches of *Acropora cerviconis* were recovered. At least one large slab of coral (*Acropora palmata*?) was recovered from the surface, as a potential grinding platform. The lithic material is composed of greenstone axes, their flakes and fragments, partially reduced greenstone pebbles, alongside possible hammerstones, decorated pestles and a few flakes of non-identified materials. Only two flint flakes were collected. Beads, pendants, an earplug and a tinkler were also recovered, most commonly from the mounded areas, made of a range of different materials, including stone, shell, coral, bone and ceramic. The beads (*n*=33) will be discussed in the following chapters of this thesis.

Part of the lithic material found on the site seems to have been produced on limestone, potentially collected locally. A red coarse-grained sandstone is also found in the periphery of the site and elsewhere in the region, even though to my knowledge it has not been recovered in the archaeological layers. From the nearby river beds in the region, for instance the Yaque and Amina, pebbles of different stone types (and even certain *Porites* corals) can be collected, which could have been used as raw material for axes, beads and other artefacts. The geological and chemical characterization of the lithic material will be conducted during a PhD research by A. Knaf in the VU Amsterdam, also as part of the Nexus project.[24]

3.2.2.2 – Other sites in the north-western region

During the summer of 2013, the excavation of another archaeological site in the region was started by the Leiden University team. The site of La Luperona is an open air settlement located in the municipality of Unijica, on the northern slopes of the Cordillera Septentrional (Hofman and Hoogland 2015). The site also presents a layout of platforms and associated mounded areas. A large trench was excavated on one of the platforms, on which post holes and a hearth structure were found. The ceramics of the site were associated to the

24 The information included in this paragraph is the fruit of collaboration with Alice Knaf in the summer of 2014. We visited some of the river beds to assess lithic raw material availability in the region (with the help of Dr. Jorge Ulloa Hung) and also briefly discussed most of the lithic material recovered from El Flaco, La Luperona and other sites in the north-western region.

Meillacoid series. The area is currently used for a cattle grazing and several artefacts can be spotted on the surface. According to two radiocarbon datings, the site was occupied during the 13th century (Hofman and Hoogland 2015). Ornaments were also collected during the work at this locality, most notably a large anthropomorphic calcite pendant found on the surface. The beads were made of calcite, diorite and an unidentified green stone. A bone earplug was also found.

Beads, tinklers and earplugs were also recovered from other sites investigated during the survey. The sites will be briefly discussed in the following, based on the survey reports (Ulloa Hung 2013; Ulloa Hung and Herrera Malatesta 2014; Ulloa Hung *et al.* 2014). The sites are: Juan Alonso Indio, La Piragua I, Leonido Gómez, Rosa Gómez, Lucrécio González and El Manantial.

From the site of Juan Alonso Indio, three beads were recovered: one from the surface and two from layers 2 and 3 of a test pit. The site is composed by 15 mounds disposed in a circle, on the southern margins of the Caonao River (80 masl). The ceramic assemblage was linked to the Meillacoid series. I only had access to two of the beads, from the surface and from layer 2, both of which are made of calcite. At the site of La Piragua I in Gualete, a large bead made of an igneous rock was donated to the Museo del Hombre Dominicano. The ceramics of the site present Chicoid characteristics. The site is positioned on top of an elevation (200 m) and nearby freshwater sources. The presence of two other sites in its surroundings (La Piragua II and III) on different heights suggests the existence of a system of interconnected settlements, in which each has a different range of visibility.

At the village of La Jaiba, several sites were encountered, many of which located on the estate belonging to the Gómez family. The site of Leonido Gómez is located in an elevation (234 masl), being higher than the neighbouring sites. Alongside Chicoid ceramics, two beads were recovered from the surface, one made of calcite and the other from an unidentified igneous rock. It is a large site, but considerably impacted by cattle grazing. Another site, named after its owner, Rosa Gómez, is located on a flat hilltop at 134 masl, from where one can observe to the north the sea and mangroves in a distance. In the other directions, the site is surrounded by the mountains of the Cordillera and by four neighbouring sites. Due to the small number of pot sherds recovered, it was not possible to attribute the site to a ceramic series (Ulloa Hung 2013, 27). A tinkler and two other *Oliva* sp. shells were recovered in association from the first layer of a test pit. Even though only one specimen had clear intentional traces of modification, the other ones possessed broken apexes, being possible preforms of the same artefact type. The artefacts were not included in the analysis for this research.

Other ornaments were collected in the province of Montecristi. A small calcite bead was donated by Abel González, who was collaborating in the survey. The house and cultivation plot of his family is located on top of the large site of Lucrécio González. The site is situated in a valley (82 masl) surrounded by the Cordillera, approximately one hour by car from the city of Montecristi (Ulloa Hung and Herrera Malatesta 2014; Ulloa Hung *et al.* 2014). Abundant material can be found on the surface, including Meillacoid ceramics and many beads. From the site of El Manantial, also in Montecristi, two ornaments were donated: an earplug made of a fine-grained green stone and a disc bead of a light green unidentified stone. Only the bead will be analyzed in this research. The last artefact from Montecristi is a perforated shell disc, collected during the systematic survey, along the transect 8-83 in the locality of El Guano nearby the road. It was found relatively isolated from other finds in that transect, even though shell specimens and fragments were found nearby.

3.3 – Comparability and limits of the samples

The two case studies presented above may seem disparate at first, as the two areas are not close to each other nor encompass the remains of closely related cultures. However, they can be approximated by the idea of circum-Caribbean shared cosmological beliefs. This assumption is connected to the theory according to which the Early Ceramic Age colonizers of the Antilles, bearers of the Cedrosan Saladoid ceramics, would have come from the middle and lower Orinoco (Rouse 1992). Through long-term local processes of development and interaction, they eventually gave rise to the Ostionoid ceramic series and other variants (such as Meillacoid and Chicoid). In addition, both contexts are from the Late Ceramic Age and have been surrounded by debates regarding social complexity, i.e. they have been associated to regional processes of increase in social stratification and profusion of highly skilful crafts and exotic goods.

At the same time, such contexts differ considerably. No field study has been recently conducted in the Valencia Lake Basin, which results in a lack of more detailed contextual information. The studied assemblages come from uncontrolled and unsystematic excavations. Nevertheless, it is clear that bodily ornaments constitute a large fraction of these assemblages, which suggests an important role attributed to such artefacts. In this sense, the Valencioid samples are representative of the type and raw material variability in the area[25].

The north-western Dominican Republic contexts are still understudied: much has been said on the basis of ethnohistoric sources, regarding the “Taíno”, and of small-scale excavations and test pits. In addition, the relations between the main ceramic styles identified by Rouse (1992) in this sector are still not thoroughly understood. Only more recently surveys are being conducted in the region, alongside open area excavations of settlement sites. There is more available contextual information for the Dominican material analyzed

25 An important element contributing to this perception of representability was, besides referring to previous publications about the archaeology of the Valencia Lake Basin, the figures of Valencioid collections provided to me by A. and M. Antczak.

in this thesis than for the Venezuelan collection. However, bodily ornaments compose a smaller fraction of the archaeological material recovered from the Dominican sites. This may be related to different site functionalities as many of the Valencioid ornaments were associated to burials. Such issues will be discussed further in the next chapters.

Chapter 4 – Theoretical concepts and approaches

In the previous chapters, a regional problematic was outlined and gaps in the current knowledge about ornaments were noted in relation to their production and, especially, use by past Caribbean Amerindians. In this chapter, a theoretical framework for understanding and interpreting ornaments will be devised, by bringing together concepts from archaeology and examples from ethnology. Two different approaches to material culture will be outlined, which have been used not only by archaeologists, but also by ethnologists, museologists and art historians. Examples of how bodily ornaments are conceived and dealt with by indigenous societies of the South American lowlands will be presented. These examples will be organized according to the material culture approaches proposed here. My aim is to evaluate how approaches from material culture studies can shed new light on ethnographic case studies and how these, in combination, can provide a new understanding of the archaeological artefacts analyzed here.

4.1 – Approaches to material culture

This research centres on artefacts or, in other words, material culture. However, I will not present trends in material culture studies as they developed through time and space, as these are multiple, varied and not directly relevant here. This section aims to present the two specific approaches followed in this research: *chaîne opératoire* and cultural biography. Their intellectual trajectories and how they can be combined will be presented in the following.

4.1.1 – Chaîne opératoire

The *chaîne opératoire* approach has been developed over the last 30 years as an instrument for analysis of technology that focus primarily on technical procedures rather than only on finished products (Balfet 1991a; Cresswell 1983). The term was first used by A. Leroi-Gourhan (1993) in the 1960s, arguing that a technique is the result of not only a tool, but also of the gesture used, both of which are organized in chains that can be more or less rigid or flexible. A few decades later, the concept was further developed and popularized in the study of cultural technology by R. Cresswell (1983), who regarded it as an analytical tool for understanding the relation between technical and social systems. The focus of Cresswell was on the culturally imbricated process from which a raw material is transformed into a usable product (Balfet 1991a; Desrosiers 1991; Djindjian 2013). Each of the stages of a *chaîne opératoire* involves a place and a time, some elements (i.e. actor, energy input, tool and raw material), a gesture and an action (Cresswell 1983). A production sequence involves constant performance control, re-evaluations (Pelegrin 1991) and technological choices, which are made against a broader set of possibilities (Lemonnier 1993). These are at the same time evidence of culturally-specific ways of doing and of the individual skill of the maker. The individual technical acts do not stand alone, but are part of operations which hierarchically connect to each other, thus forming a *chaîne opératoire* (Desrosiers 1991). While this sequence is often the unit of analysis, several sequences are articulated in a broader technical process (Desrosiers 1991). This approach also pays tribute to M. Mauss (2003), for his discussion of bodily dispositions and techniques as intrinsically connected to the social context in which a person is immersed since youth. In the entanglement between hands, mind, and social body, technology is a coherent process in which an artefact is simultaneously physically and symbolically constructed (Lemonnier 1993).

The approach was first developed within ethnology, as a tool for observation, description and analysis of technical procedures (Balfet 1991a), but soon was extended into archaeology. This was the case for lithic technology studies, distancing them from the chronological focus on typologies. As tool and concept, the *chaîne opératoire* is supposed to encompass all the stages in the life of an artefact, especially those pertaining to its production: from raw material procurement, to the different technical procedures, until its use and discard (Inizan *et al.* 1999; Karlin *et al.* 1991; Pelegrin 1991; 2001; Sellet 1993). Through this approach it is possible to assess the quotidian of the maker, in terms of his choices, strategies, and the problems he was faced with given the characteristics and affordances of the raw material being worked (Bodu 1999; Cahen and Karlin 1980; Karlin *et al.* 1991; Pelegrin 1991). Methodologically, using the *chaîne opératoire* implies in looking at entire assemblages (including tools, cores and *débitage* products) and organizing the known and unknown data in a "technical scheme", i.e. an ideal *chaîne opératoire* that takes into account the successive sequences, operations and gestures involved in the production of a given artefact (Balfet 1991b; Karlin *et al.* 1991). It is also argued that experimental replication of archaeological artefacts can shed light into material affordances, decision making processes and the tools, gestures and force applied (Inizan *et al.* 1999; Karlin *et al.* 1991; Pelegrin 2000a; Tixier 1980). In fact, more recently, different Anglo-American authors have looked at the *chaîne opératoire* as a technology approach that can provide a focus on the mutual relation between objects and people (Hodder 2011; Jones 2004; Knappett 2012; Stark 1998). Likewise, the approach is being applied to different technologies, including groundstone (*e.g.*, Souza 2011; Tsoraki 2011a; 2011b), ceramics (*e.g.*, Balfet 1991b; Gosselain 2000; Ramón Joffre 2011; Ramón Joffre and Bell 2013; Sillar and Tite 2000; Van der Leeuw 1993), bone and ivory (Dobres 1995; 2001; Sidéra and Legrand 2006; White 1992) and other material types.[26] By expanding to other

26 A review of technological approaches focused on ornament making will be presented on Chapter 5.

nationalities, the *chaîne opératoire* approach became integrated with the studies known as anthropology of technology (Dobres 2001; 2009; Lemonnier 1993; Pfaffenberger 1988; 1992; Schiffer 2001; Silva 2002).

In order to work and transform a given material, technical knowledge allows the craftsperson to evaluate the relations between physical constraints and the outcomes of his/her gestures (Karlin *et al.* 1991). One of the main aspects underlying the *chaîne opératoire* approach is that material constraints are not the single or main factor informing the choices made by a craftsperson (Cresswell 1983; Dobres 1995; 2001; 2010; Lemonnier 1993; Stout 2002). It is in fact a complex interplay between political, social, cultural, individual, mechanical and environmental factors that guides technological choices. In order to create an object, not only knowledge of technical procedures and physical characteristics is required, but also of a culture-specific system of values, supernatural forces, and of what is considered a successful technology and end-product (Dobres 2001; 2009; Pfaffenberger 1988; 1992). These are transmitted across generations, forming what some authors have denominated a *technological style*, which is can often be related to group identity (Gosselain 2000; Stark 1998). While practicing a craft necessarily requires learning concepts and developing specific mental templates (*images mentales*) that guide production step-by-step, no craft is practiced as a mechanical reproduction of standard gestures (Chevallier 1993; Pelegrin 1991; 2005). Skill is only acquired through a dynamic engagement with materials, generally practiced since an early age under adult supervision, through explanation, demonstration, and support. Only then is a person capable of making informed judgments and choices regarding the best ways of proceeding with his/her task, anticipate technical accidents and make recalculations (Kuijpers 2012; Pelegrin 1991; 2005; Stout 2002). Likewise, crafting can also be a result of cooperation between individuals (Dupuis 1992) and has to be understood within a "humanly meaningful context" (Stout 2002, 714).

The discussion regarding skill and the existence of a conceptual basis and mental templates that guide the practice of a craft has recently received considerable attention. Authors of French tradition have placed emphasis on the engagement between body and mind in the form of mental templates and different types of *savoir-faires* required for the execution of a given technology (some using this approach in connection to cognitive archaeology: De Beaune 2004; Karlin and Julien 1994; Pelegrin 1991; 2001; 2005; Roux and Bril 2005). However, T. Ingold (2001; 2007; 2013) criticizes J. Pelegrin and the *chaîne opératoire* approach for advocating an atomized view of making that imposes stages in what can only be characterized as the continuous flow of substances in the world. Another aspect of his critique is precisely the idea of a mental template that guides action, as this also insists on the post-Enlightment Western conceptual dichotomy between the mind and the body or in other words, culture and nature. This opposition lies at the basis of the

Western view of crafting as the imposition of a fixed cultural form on an inert, natural matter (Ingold 2013; Olsen 2003; 2012). While these critiques highlight the problem of applying a mechanical scheme to the human engagement with materials, the *chaîne opératoire* is a tool for analysis that can only work through the hierarchical structuring of data. Ingold (2007; 2013), in his recent writings on skill, does not offer a specific methodology for studying crafts and materials and keeps distance from concrete ethnographical case studies (as already suggested by Tilley 2007), by focusing on every day, "general human" practices.

Another critique to *chaîne opératoire* approaches is the tendency to isolate one craft from the others, overlooking cross-craft interactions and imposing an artificial linearity to its execution (Brysbaert 2007; 2011; Tsoraki 2011a). This problem becomes evident in composite artefacts, in which parts made of different materials are connected together in a single object. The fact that different crafts interact with each other and that actors must have shared knowledge from a multiplicity of tasks is remarkable across large distances or in contexts of craft specialization, but not unexpected in small-scale societies. The "division of labour" among archaeologists is most likely the root of the lack of attention to cross-craft interaction and has hampered a more thorough understanding of technological systems.[27] Often archaeologists working with *chaîne opératoire* have regarded tools as intentional final products for whose production there would be a specially designed procedure. Instead of this linear and teleological view, it is argued that sequences should be regarded as cycles, as abandoned artefacts or debris are often recycled and used or, in the case of metals and glass, pieces are remelted in order to produce other artefacts (Brysbaert 2007). The selection of technical procedures and products may also be more casual and less controlled than often assumed (Holdaway and Douglass 2011). The primary focus on production processes has also been criticized as a partial viewing of the lives of objects (Joy 2009), often overlooking cycles of use, recycling and reuse and the broader social context in which they were inserted. This is only partially true as authors from the French tradition have advocated the advantages brought by functional studies through use-wear analysis for a few decades now (*e.g.*, Cahen *et al.* 1980). And in fact, a complete envisioning of the *chaîne opératoire* must include all relevant stages that take place before an object is discarded (Sellet 1993). In any case, it is with reference to a perhaps "short-sighted" *chaîne opératoire* approach that the concept of biography will be introduced here.

4.1.2 – Cultural biography

The origin of the concept of "cultural biography of things" is attributed to Kopytoff (1986), who stressed that, similarly to people, things can also change status throughout their lives. In other words, people and things should not be considered as static and opposed categories.

27 While I am aware of this problem, the focus of this research will be only on beads and pendants. It will nevertheless consider the different raw materials from which they are made, rather than focusing on a single raw material type (see Chapter 5).

Objects can oscillate in a continuum that stretches from the perfect commodity (understood as anti-cultural and homogenizing) and the gift (singular, cultural, and inalienable). On a given social setting, objects have expected life pathways. These ideal cultural biographies involve specific expectations, values, and preconceptions shared by people regarding the origins, uses, and discard of objects. Objects, in a constant state of becoming, can acquire multiple and partial biographies, just like people (also Appadurai 1986). The concept is derived from social (economic) anthropology, whose primary interest were the mechanisms underlying commoditization (Fontijn 2013).

As part of the "material turn" of the late 1990s (Knappett 2012; Olsen 2003), the concept reappeared in anthropology, archaeology and museum studies. Along this intellectual trajectory, Kopytoff's original focus on commoditization was left aside in order to prioritize agency, materiality and the relationships between objects and people (Fontijn 2013; Hoskins 2006; Joy 2009). For instance, Hoskins (1998; 2006), one of the main proponents of the concept in anthropology, argues that the biography metaphor can only make sense if it is conceived in relation to a human lifespan and as part of human biographies. In fact, the social relationships and the mutual creation of people and objects are the primary interest in these approaches (Gosden and Marshall 1999; Joy 2009). According to its advocates, unlike *chaîne opératoire* and behavioural life-histories[28], the biographical approach can make sense of the complex, non-linear and dynamic lives of certain artefact categories (Joy 2009). The concept has been more easily applied to ethnographic and historical contexts than to prehistory, as considerable information about the biography of the objects is not available for the latter. For instance, it has been applied to early Colonial encounters in the Americas (*e.g.*, Gassón 2000; Saunders 1999; Scaramelli and Scaramelli 2005), with a focus on how objects changed meaning as they were exchanged between Europeans and indigenous communities. Another example is its use in the study of museum objects, especially those in ethnographic collections: the expectations around the objects and their agency greatly vary from one context to the other (Gosden and Marshall 1999; Thomas 2010).

However, the supposedly greater availability of information in these contexts has often led to approaches that regard artefacts solely through a textual metaphor, leaving aside people's engagements with their material aspects (*e.g.*, contexts of production and use). In this sense, not only prehistorians are presenting partial views, but so are the other scholars under the assumption of cultural attribution of meaning. Similar critiques were made by proponents of a return to the properties of materials and to the symmetrically positioning of things in relation to humans (Ingold 2007; 2013; Jones 2004; Knappett

28 Behavioural archaeology's "life-history" (LaMotta 2012) parallels to a certain extent the *chaîne opératoire* approach. However, their framework for interpretation and making sense of human-artefact relations is based on "practical reason ontologies" (Dobres 2010) and not in tune with the alternative, Amerindian ontologies I am interested in here.

2012; Olsen 2003; 2012). The Anglo-Saxon tradition of material culture studies, to which biographical studies are often associated, has been criticized for its anthropocentric and abstract focus, for the most part disconnected from materials (Knappett 2012). In any case, unlike the *chaîne opératoire*, the biography is not a specific methodology or analytical tool. An archaeological approach that has been advanced for investigating the cultural biography of artefacts is based on micro-wear analysis (Van Gijn 2010; 2012). Such an approach can offer insights not only into production sequences, but also on use and reuse episodes, physical treatments (application of ochre, wrapping), (post-) depositional and curatorial processes (*e.g.*, Breukel 2013; Van Gijn 2010; 2012; 2014a; Van Gijn and Verbaas 2009; Verschoof 2011; Wentink 2006; 2008).[29] In this case, biography (composed of conception, birth, life and death of an artefact) is used as a metaphor that structure a narrative focused on human-material interactions.

4.1.3 – Merging concepts?

It has been suggested before that one of the differences between the French and the Anglo-Saxon traditions of artefact studies is the focus of the latter on consumption and of the former on technologies of production (Coupaye and Douny 2009). This difference can be perceived when opposing the two approaches outlined above. However, as already suggested, the limits of each approach depend on who is using them and what are his/her interests and contexts of research. Nevertheless, the scope of the biographical approach is wider than the *chaîne opératoire*, as its primary interest lies on the broader cultural setting that an artefact is part of and on possible cross-cultural changes in status and meaning. On the other hand, the *chaîne opératoire* is characterized by a focus on techniques, gestures and decision-making processes that take place in crafting. It therefore refers to bodily engagement. The "short-sightedness" of the latter and the "hyperopia" of the former make them complementary. In this sense, my goal is to by a fine-scale approach to individual objects, looking for traces of their manufacture and use, assess the biographies of ornaments within each of the contexts studied in this thesis.

Both approaches will be used here in connection with rejections of a Western post-Enlightment philosophical tradition which tended to regard objects as passive and inert repositories of meanings imposed by people. For instance, early post-processual material culture studies focused on social constructivism and on discourse as keys to interpretation. Over the last decade, they have been considered anthropocentric and disconnected from materials (Ingold 2007; Jones 2004; Knappett 2012; Olsen 2003; 2012). I will focus on how people engaged with materials in order to create ornaments and make use of them. Material agency will not feature in my discussions, only in the sense of competences, affordances and qualities (Jones 2004; Olsen 2012) and of how people become "entangled

29 The methodology of microwear analysis, with emphasis on ornaments, will be discussed on Chapter 5.

and domesticated by things" (Hodder 2011, 161-2; also Gosden 2005). In addition, ethnographic informations regarding how some South American indigenous communities produce and engage with ornaments will be discussed in order to devise an interpretative framework for the present research.

4.2 – Biographies of ornaments among Amerindian communities

Bodily ornaments are abundant among Amerindian communities from the lowlands of South America, being present in different forms: from objects and paint added to the body to more permanent modifications. They should not, however, be understood as cultural objects added to a previously natural surface (Hamilakis *et al.* 2002; Joyce 2005; Thomas 2002). Among Amerindian societies, the body is the place of identity and is continuously constructed through "prophylactic procedures" (Vilaça 2005) or "bodily treatments" (Santos-Granero 2012) that are applied to a person since birth and even after death (also Seeger 1975; Seeger *et al.* 1979; Walker 2009). This maintenance of the body is made through consubstantiality (sharing of substances such as saliva, food, blood, etc.), conviviality, and the adornment of the body (Conklin 1996; Overing 2004; 2006; Rival 2005; Santos-Granero 2012; Vidal 2005; Van Velthem 2003; 2010a; Vilaça 1992; 1998, 2005; Viveiros de Castro 1998; 2004). It is through this broad set of bodily treatments that a being will evolve into a person with esteemed qualities.[30]

Ethnological discussions have included ornaments within the broad denomination of "indigenous art", first as a symbolic language to express group associations (Ribeiro 1986; 1988; 1989; Seeger 1975; Van Velthem 1994) and more recently, through a focus on the agentive capacities of objects (Lagrou 2009; 2013; Miller 2007a; 2009; Van Velthem 2003; 2010a; 2010b)[31]. Whether or not bodily ornaments should be understood under the category of "art" will not be a concern here. This is because I follow Ribeiro (1994) and Overing (1996; 2003), who argue that there is no clear separation between the technical/utilitarian and the beautiful/artistic among Amazonian indigenous communities. The aesthetic dimension of production is an intrinsic element of the making of people and artefacts, generating a beautiful and moral existence and the capacity to act (Lagrou 2009; Overing 1996; 2003). In addition, archaeologists and anthropologists focused on practice and technology have been distancing themselves from the art vs. artefact dichotomy, in order to focus on the processes of making, engagement with materials and craftsmanship (*e.g.*, Berleant 2007; Dobres 2001; Ingold 2001; 2007; 2013).

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30 According to perspectivist approaches to Amerindian ontologies, animated beings (humans, animals, plants and spirits) differ from each other on the basis of their bodies (Viveiros de Castro 1998). These are bodies that encompass a specific *habitus*, understood as bundles of affects and capacities. The body has a role as "the site and instrument of ontological differentiation" (Viveiros de Castro 2004, 6).

31 These authors are following Alfred Gell's (1998) ideas and their general impact on the study of art objects worldwide. This reference is more clearly explicit in E. Lagrou's (2009) work. The so-called "material turn" in the social sciences may also have a role in these theoretical reorientations.

Even though scholars have stressed the need of not assuming that the body is a natural and given individual form (Fowler 2004; Hamilakis *et al.* 2002; Thomas 2002), artefacts are still generally regarded either as raw materials or as finished products. The processes and transformations which artefacts undergo between and after the two states are taken for granted. The limited number of detailed accounts on the making and its complex culture-specific associations poses a problem when trying to approach ornaments through the biographical and *chaîne opératoire* perspectives proposed above. The studies focused on such issues conducted among lowland Amerindian communities were carried out by archaeologists. Encompassed under the field of ethnoarchaeology, they have focused on processes of raw material procurement, transmission of knowledge, the socio-cultural dimensions and symbolic associations of artefact production, use and discard (*e.g.*, DeBoer and Lathrap 1979; Duin 2000/2001; González-Ruibal *et al.* 2011; Hofman and Jacobs 2000/2001; Hofman *et al.* 2008b; Silva 2010; 2013; Van den Bel 2009; Vredenbregt 2004; Wüst 1981/1982). Such studies have provided ethnographic information that is directly relevant for archaeological research regarding artefacts and their multidimensional aspects (techno-economical, social, ideological and cognitive) in a cultural setting (Politis 2002, 66; Silva 2009). However, they were not concerned with the production and use of ornaments. In the next sections, ethnographic data will be organized according to a biographical focus, looking at how Amerindian peoples are dealing with ornaments. The focus will be on the different "life stages" of ornaments and the corresponding relations established with people. The data presented is secondary, i.e. based on the works of ethnologists who studied different groups from the South American lowlands. With a few exceptions (Miller 2007a; Ribeiro 1988; Van Velthem 2003), their focus was not on the processes of production and usage of artefacts. In the table below (tab. 1), the main indigenous groups cited in this thesis are included, together with regional location (country and state) and linguistic affiliation.

Table 1: Main Amerindian communities cited, their linguistic affiliation, location, and consulted literature.

Ethnic group	Linguistic aff.	Country	State	Main literature
Araweté	Tupi-guarani	Brazil	Pará	Viveiros de Castro 1986
Asurini Xingu	Tupi-guarani	Brazil	Pará	Silva 2010; 2013
Kaxinawa	Pano	Brazil	Acre	Lagrou 2007
Maimandê	Nambikwara	Brazil	Mato Grosso	Miller 2007a; 2009
Paraná	Jê	Brazil	Mato Grosso	Ewart 2012
Piaroa	Saliva	Venezuela	Amazonas	Overing 2003; 2006
Suyá	Jê	Brazil	Mato Grosso	Seeger 1975
Yaruro	Yaruro	Venezuela	Apure	Petrullo 1939
Wari'	Txapakura	Brazil	Rondônia	Vilaça 1992
Wayana	Carib	Brazil	Pará	Van Velthem 2003

4.3.1 – Conceptualization and raw material acquisition

Ornaments feature in mythological accounts, in references to the highly ornamented bodies of primordial beings and to raw materials that were acquired from them. In the first case, supernatural entities (such as deities and the spirits of the dead) are conceived as highly adorned, powerful, luminous, immortal, and dangerous beings, predators of humans (Lagrou 2002; 2009; Overing 1989; 2006; Petrullo 1939; Van Velthem 2010a; 2010b; Viveiros de Castro 1986; 2006). These, also conceived as cannibal monsters[32], are an ideal that is supposed to be copied only in ritual occasions (Lagrou 2002; Miller 2009; Van Velthem 2003; 2010a; 2010b; Vilaça 1998). This corresponds in many myths to imitating or stealing objects, decorative motifs and capacities from supernatural beings (Barcelos Neto 2001; Lagrou 2013).

In the acquisition of raw materials, the role of alterity, in the form of both other humans and supernatural beings, is prominent. The collection of raw materials, as in the case of food shamanism (Århem 1996), often requires reciprocal exchanges. The use of certain materials (animal, plant or mineral) is an appropriation of something made by spirits of the dead or spirit owners of these things. In order to avoid their dissatisfaction towards humans, it is necessary to compensate them by giving offerings such as food, *chicha*, necklaces, coca, snuff, etc. (Miller 2007a; 2009).[33] This may also take place to remove the subjectivity from such things before they can be consumed and used by humans. Miller (2009) mentions a case in which the Maimandê were intensively collecting snails to produce mother-of-pearl necklaces to be sold in a big event; at a given occasion, they were informed by a drunk boy from the village that the "Owner of the earrings"[34] (a giant alligator) was angry at the Maimandê for exploiting the lake so much and not even for their personal use. He threatened not only to hide the shells, but also to kidnap a Maimandê child as payment for them. Alternatively, the women were supposed to take several offerings to him on the next day (Miller 2007a, 115). Counter-prestations are not always necessary; in some occasions, the shaman may only need to look at ornaments of the spirits to obtain them: this was the case with toucan feather headdress, which the shaman saw being used by the people of the water (Miller 2009).

In such cases, it is necessary to appropriate the powers and capacities of the external and transform it in order to produce social identity (Fausto 1999; Hugh-Jones 2009; Lagrou 2009).[35] The raw material for Piaroa beads is derived from a granite outcrop

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32 In fact, some of these beings can be regarded as monstrous, ugly and terrible, having social characteristics that are seen as detrimental (Overing 1989; Viveiros de Castro 2006).

33 This is also noted for other crafts. For instance, the Kari'na of the Lower Maroni River in Suriname, upon extraction of clay from the source, make a small vessel to test its workability and later throw it in the water as a payment to the clay spirit (Hofman *et al.* 2008b; Vredenbregt 2004).

34 While the "owner of the earrings" is hardly ever seen by most Maimandê people, the shaman sees him as a person with the entire body ornamented with whole shells (Miller 2007a).

35 It has been argued that symbolic exchanges with alterity in which this Other is incorporated and domesticated (predation) are central in the definition of humanity and production of sociality among Amerindian communities

which is believed to be formed by the faeces of a subterranean tapir/anaconda monster, a very powerful and dangerous deity (Overing 1989; 2004; 2006). Similarly, the use and incorporation of *miçangas* (glass seed beads) in adornments (necklaces, aprons, belts, arm- and ankle bands) by the Kaxinawa, Kayapó, Wayana, and Desana is understood as a negotiation with the Other (Buchillet 2002; Hugh-Jones 1992; Lagrou 2009; Van Velthem 2010a; 2010b). This transformation and pacification (predation) of the Other is generally performed through an aesthetic incorporation: for the Kaxinawa, weaving their traditional patterns with these beads (Lagrou 2012; 2013). Kaxinawa myths associate the origin of beads to a dangerous and cannibal deity, the Inka, who owned them. Nowadays, *miçangas* are obtained through exchange with white people. Lagrou (2009) interprets this as an overlap between both as powerful and fascinating Others.[36] Likewise, *miçangas* are incorporated in mythological narratives, in which they are the faeces of a bird or caterpillar that lives in a giant tree or are grown from trees themselves (Lagrou 2012; 2013; Van Velthem 2002). On both Kaxinawa and Wayana myths, the *miçangas* come from trees that are inhabited by powerful and dangerous spirits. Lagrou (2013, 31) also compares the *miçangas* to trophies conquered in predatorial activities, similar to animal or enemy teeth obtained in hunting or war expeditions and used as pendants (also Chaumeil 1997; Ewart 2012).

This predatorial logic may explain why "exotic" materials, i.e. not locally available and from distant regions, are often valued. However, properties of materials cannot be overlooked, especially since these are significant part of the information archaeological artefacts can provide us with. For instance, glass beads are valued for their material properties, i.e. their remarkable durability and hardness when compared to beads made from plant materials (Howard 2000; Lagrou 2009; Scaramelli and Scaramelli 2005; Van Velthem 2010b). The qualities of glass, mirrors and crystals, especially luminosity, reflectiveness and translucency, are often associated to shamanism and to an Amazonian ontology of spirits (Viveiros de Castro 2006). Rather than the capacity to reproduce images, their attractiveness would be in the intense light these things reflect, which refers to the transcorporeal mode of being of spirits and shamans. Associations between the ingestion of psychotropic substances, illumination and knowledge are also relevant in this context. The "brilliance" present in materials such as polished stone and wood surfaces, metal, pearls and shells was valued by indigenous communities throughout the Americas, being associated to power, spirituality and morality (Saunders 1999).[37] It has been argued, on the

(Århem 1996; Fausto 1999; Vilaça 2005; Viveiros de Castro 1996; 1998).

36 In fact, there is a conceptual overlap between different types of Others, which are understood as real, potential or virtual affines. This includes spirits of the dead (ancestors), spirit owners of materials, and deities, but also encompasses in-laws and the white men (Vilaça 1992; 1998). This is because the denomination "spirits" refers more to a relation in which transcorporeality is constitutive, rather than to a specific taxonomy (Viveiros de Castro 2006). Such equivalences are central in models of generalized predation among Amerindian societies.

37 Following Saunders (1999), Keehnen (2012) also identifies this "aesthetic of brilliance" among indigenous communities in the insular Caribbean, in their early Colonial trade with Europeans for glass beads, majolica sherds, coins, bells, etc.

other hand, that the prominence of vision is a feature of Western societies (Howes 2011). The importance of things that produce reactions on other senses and also of multisensorial experiences still has to be further explored, especially in regards to ornaments. For instance, rhythmic sounds produced by tinklers when hung in groups, the weight and pressure exerted by certain ornaments and the texture of some materials to the touch. Likewise, Oliver (2000) has noted that, besides colour and resplendence, guanín ornaments were valued for their distinctive smell.

4.3.2 – Production process

As previously noted, the opposition between art and artefact in Amerindian societies is in question. It is argued that there is no distinction between the "productive beauty" of a pan, a well-raised and ornamented child and a skilfully sculpted stool (Lagrou 2009; Overing 1989; 1996; 2004; 2006). They should be regarded as objectifications of thought, skills and intentionality of the producer from whom they acquire agentive capacities (also Santos-Granero 2009a; 2012). Their ability to perform is what makes them beautiful. Depending on the craft, different attributes are valued in a craftsperson: in tasks that require the use of difficult techniques, skill, discipline and attentiveness to traditional models are central; while in those that focus on representation, inspiration comes from engagement with alterity as decorative motifs and patterns often come from supernatural beings (Lagrou 2009, 22; Van Velthem 2010b). These designs are often highly meaningful and make references to mythological narratives and social organization, such as age, gender, status, group affiliation, etc. (Andrade 2007; Lagrou 2009; Vidal 2007). In the case of the Paraná, glass beads have been introduced relatively recently and there are no fixed traditional templates: motifs have often been copied from neighbouring groups or are largely fruit of the maker's individual desires. Nevertheless, Ewart (2012, 185) argues that there are specific characteristics and patterns considered aesthetically pleasing, which guide choices. The incorporation of foreign designs is also observed, for instance among the Kayapó and Wayana, contexts in which Western motifs are depicted in beadwork (Lagrou 2009; 2012; Van Velthem 2010b).

A craftsperson, through contact with a material, transfer to the artefact his/her affects, skills, agency and care, similarly to what parents do with their children (Santos-Granero 2009a; 2012). The inscription of social and technical knowledge on a body is a form of producing personhood (Rival 2005). In many Amerindian societies from the lowlands, being a craftsperson does not equal being a (full- or part-time) specialist (Lagrou 2009, 17), as it is often connected to gender-specific domestic contexts, in which social relations with close kin have a big role. The contexts in which these productive activities take place seem to be either casual, in which people gather together to make things and talk to each other, or more ritualized, in which makers may be subjected to seclusion and/or dietary restrictions (Ewart 2012; Lagrou 2009; 2012; Hugh-Jones 2009). This is because the production of certain artefacts, including ornaments can be conceived as dangerous (Hugh-Jones 2009). For instance, Araweté men should avoid having sexual intercourse with women at the time of the production of a bow, otherwise the wood will break (Viveiros de Castro 1992).[38] The production of an ornament, like the Tukanoan crystal quartz pendant, does not take place on a single day: very time-consuming activities such as perforating quartz with a wooden stick and grinding it against sandstone may be divided along months (Koch-Grünberg 2005). In the case of pieces that are perforated along their thickness (a tubular bead according to my terminology, see Chapter 5), like the one worn on the chest by the chief, it may take more than a lifetime before they are finished (Roth 1924).[39] The importance of making is exemplified by the dichotomy created by the Wayana, in which only the artefacts that are produced with local raw materials and using traditional techniques, shape and decorative patterns can be considered "original" (Van Velthem 2010b). The term also refers to particularly well-made Wayana things. Only these original things can be ornaments for people, houses and the village. On the other extreme, "imported" objects are synonym to industrial and of low quality – whether they were produced by the white men[40] or by the Wayana themselves.

The production of the plant-based threads for stringing ornaments and for weaving also requires technical knowledge and dexterity. Among Brazilian indigenous groups, fibres are often made from cotton, but also from plants of the Bromeliaceae and Palmaceae families (Miller 2007a; Ribeiro 1988; 1994). After collection, plants have to undergo a set of procedures, such as being soaked in water, beaten, and dried under the sun. Twisting can be made by rolling the fibres on the thigh, or through a more complex mechanism involving the use of a spindle whorl (Ribeiro 1994). The weaving of fibres and the production of threads are typically female tasks, knowledge of which is transmitted to younger generations by kin women, who often take children for raw material collecting trips. Their production may also be a dangerous task: Maimandê women cannot make palm threads (by twisting fibres) that will be used for stringing beads when they are pregnant (or just had babies). The fibres are associated with the umbilical cord and twisting them may result in pains for the child (Miller 2007a). This stage, most commonly invisible in the archaeological record, is compelling evidence of the engagement between bodily gestures, practical knowledge of the surrounding environment and ornament making.

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38 The association between an object and the subjectivity of powerful and dangerous entities can be seen in the cases of the Araweté rattle. While women do participate in the production of rattles, they cannot touch them after finished. The ceremonial object, associated to shamanic knowledge and power, can only be used by men. It is linked to the Maï, the gods, who can break a woman's neck if she tries to summon them (Viveiros de Castro 1992, 46). Women are regarded as "breakers of rattles" since when they have sexual intercourse with men, the latter do not sing during the night. The rattle is also not a transferable object and must be burned after the owner dies.

39 The grinding of stone axes by the Maori also took considerable time, however the activity was regarded as pleasing and as a good way of spending time (Beek and Mason 2002).

40 As discussed above, glass beads are an exception to this scheme and are highly valued (Van Velthem 2010b).

The ability to make objects is directly related to the acquisition of desired moral qualities: the learning process starts early in life, but expert craftsmen are generally adults, political and spiritual leaders (Guss 1990; Hugh-Jones 2009; Overing 1989; Silva 2010; 2013; Van Velthem 2003). As Hugh-Jones (2009, 49) stresses, "making things is thus self-making and the mastery of technique is a mastery of the self".[41] Training is at the same time moral, intellectual and spiritual and it relies heavily on observation of adults, who provide ample explanations and demonstrations, and on practical attempts at replication, often producing miniatures. While it is important to know the correct manner in which things are supposed to be produced, individual creativity in the form of introduction of new designs and techniques is valued and widely recognized (Ewart 2012; Silva 2010; Van Velthem 1994; 2003). Archaeologically, these individual choices may be more easily perceived in small variations within decorative patterns (embellishments, cf. Mackowiak de Antczak 2000). For the Paraná, the interest in beadwork and feather ornaments lies more on the possibility of making and remaking rather than on finished products: old ornaments can be disassembled and the glass beads and feathers removed in order to make a new artefact for a later occasion (Ewart 2012, 185).

4.3.3 – Use, storage and deposition

Ornaments are constitutive parts of their owner's body: they act on and transform each other. Abundant ornamentation is often associated with specific contexts, such as rituals, feasts, and war expeditions.[42] Most people are not hyper-adorned on a daily basis as this can lead to dangerous exchanges of perspectives, making people similar to the highly adorned, supernatural beings (Ewart 2012; Van Velthem 2010b). There are two exceptions: shamans and small children. The ornaments of the shaman are connected to his powers and capacities: he can see and interact with all beings in their real, human form (Miller 2007a; 2009; Vilaça 1992; 1998; Viveiros de Castro 2006). Children are another exception, as they often need to be highly adorned because their souls are easily detached from their bodies (Ewart 2012; Santos-Granero 2012; Walker 2009). "Bodily procedures" are applied to people, when they are newborns, during rites of passages (*e.g.*, puberty initiation rites), adulthood, and until they die. It is therefore a means of protecting, socializing, and linking valued qualities to the body (Lagrou 2012; Miller 2009; Santos-Granero 2012; Seeger 1975; Walker 2009). Similarly to body paint, the wearing of ornaments by members of a community is generally connected to the social position of each person, especially gender, age-group, status and the occasion in which it is going to be worn (Andrade 2007; Vidal 2007). This means that most commonly men and women have their own and proper set of

41 This also echoes what Chevallier (1991) says about the technical *savoir-faire*: having it equates with a *savoir*-être or –*vivre* in a community.

42 In the archaeological record, burials are also instances in which individuals can be hyper-adorned, see examples from Valencia Lake Basin and Guadeloupe cited in the previous two chapters.

ornaments.

Ornaments are also placed on children in order to help them acquire qualities that are associated to the beings from which the raw materials were extracted (Santos-Granero 2012). An example is parents giving jaguar claws necklaces to boys in order to make them good hunters, as these animals use their claws to catch preys. The raw materials and sizes of lip-plugs among some Jê and Tupian groups vary according to the stage of development of the individual (Seeger 1975; Souza 2011). Among the Suyá of Central Brazil, the positioning of plugs on specific places (i.e. below the lip and on ear lobes) are directly related to desired social capacities, such as singing, speaking, hearing and understanding (Seeger 1975). Both the Maimandê and the Piaroa possess internal "beads of life/knowledge" that make their interior beautiful and healthy (Miller 2007a; Overing 2004; 2006). This is evidence of a moral dimension of beauty, in which it is equated with other desired social qualities, such as being good and sociable people (Overing 2004). The link between being ornamented and the potential to act is a recurrent theme among Amerindian communities in which decoration is an integral part of the body on which it is applied. In this sense, whether it is an artefact or the human body, without ornamentation it will be incomplete, unable to perform culturally (Lagrou 2007; 2009).

Ribeiro (1988) in her extensive book on Brazilian indigenous craft mentions a great number of boxes that are used to store ornaments, especially those made of featherwork. While this may be just regarded as "reasonable" given their fragility, another account by Miller (2009) about the Maimandê adds a different dimension to such practice. According to a shaman, the sickness that inflicted a woman was caused by the breakage of her internal bands of beads. This was a result of her improper way of storing (external) bands of beads: she should have kept them stretched out, instead of bundled in coils. This is an example of what was stressed above: through continuous usage (and production), a person is permanently linked to bodily ornaments (Santos-Granero 2012). A comparable account of the subjectivity stored in beads refers to granite beads worn by the Piaroa. The chief that worn them had to clean and beautify the beads every night in order to remove their predatory violence, associated to the tapir/anaconda creator god's venom and to its productive knowledge (Overing 1989).[43] When Paraná women are given glass beads, they quickly store away the valuables, keeping them out of sight, wrapped up in an old dress and inside lockable suitcases or chests (Ewart 2012). Before specific occasions such as rituals, the beads are taken out and made into ornaments to be worn and later disassembled.

In Amerindian contexts, not only the construction of bodies should be taken into account, but also their destruction and consumption (Fausto 1999). Certain objects are made of durable materials, so that they will last long, perhaps longer than the lifespan of

43 Archaeologically, this practice may be perceived as the curation of artefacts, such as the handling of threepointers (Breukel 2013) and wrapping and unwrapping of flint axes (Wentink 2006; 2008).

many individuals, while others are made of perishable materials and/or disassembled, so that they do not last longer than they are supposed to (Barcelos Neto 2008). This durability seems to be directly connected to their agencies. For instance, among the Kayapó of Central Brazil, the objects of a deceased person are deliberately broken, *i.e.* magically killed, so that the person's shade will not come back and kill the living relatives (Turner 2009; also Santos-Granero 2009a; Walker 2009). If not disposed of, these objects would be like an unburied part of the deceased's corpse. Among the Asurini of the lower Xingu River in Brazil, personal belongings of the deceased can be destroyed, placed *on* the grave, or even kept as a memento of the kin who passed away (Silva 2013). Turner (2009) also mentions artefacts that are considered more valuable and for such reason are kept, such as Brazilian-style houses and expensive commodities (a shotgun, for example). Among the Paraná, glass beads are directly involved in intersubjective relations and the moral standing of persons (Ewart 2012). Women often have to give away many of the glass beads, acquired with difficulty from Western visitors: as prestation for services (such as shamanic cures and grave-digging activities), in the form of "jewellery" given to non-indigenous friends or as accompaniment to the deceased. Objects may also need to pass through a process of "de-subjectivization" in order to be transferred to third-party – for example, when used artefacts are being exchanged or sold (Santos-Granero 2009a). They can either be made in a way in which they will have less subjectivity (agency) or be "mutilated" before being disposed of.

This deposition or discard of ornaments is the final stage of their biographies, although they may be unburied in the future and once again join the lives of peoples. The focus on processes (acquisition, production, incorporation, exchange, discard) resonates with the biographical approach proposed here: rather than focusing on beads and pendants as finished and static products, my goal is to track the processes of transformation, gestures and choices that culminated in the recovered archaeological artefacts. Silva (2010; 2013), following Ingold (2001), also stresses the importance of practice, bodily engagement, and the embodiment of a craft. Given the importance of knowledge transmission and of making things in proper and correct ways (socially-specific *savoir-faires*), the *chaîne opératoire* can also be used as a means to approach Amerindian craft. The two concepts (biography and *chaîne opératoire*) will be used in the following chapters and the biographies of pre-Colonial circum-Caribbean ornaments will be considered in the light of the ethnographic examples presented above. The ethnographic patterns of dealing with ornaments will be contrasted to the archaeological evidence in Chapter 8.

Chapter 5 – Research methods

Different analytical methods have been used to study archaeological ornaments in other regions of the world. In this chapter, attention will be paid to concepts and instruments of analysis used to understand sequences of production and use modifications. Such a broad overview allows us to explore research methods that have thus far been only limitedly applied by Caribbean archaeologists. Based on this review, the methodology used in the present thesis for assessing the biographies of ornaments will be presented, alongside the studied raw materials and experiments conducted.

5.1 – Ornament analysis: macro- and microscopic approaches

The different approaches to the analysis of ornaments have been organized in two groups below: manufacture and use. Within these groups, they are further divided according to the levels of magnification employed for analysis. The research strategies, type of evidence and results that can be reached by each one will be briefly presented in order to construct a panorama of the field of ornament studies.

5.1.1 – Approaches to manufacture

In the literature, approaches regarding ornament technology can be divided between those focused on the observation of artefacts and production debris primarily with the naked eye and those that make use of microscopy. While both address similar questions and rely on experiments, different types of informations are generated and different uses are made of the data when interpreting archaeological contexts. The division presented below serves primarily an explanatory purpose: in fact, these approaches do not exclude each other and can be used in combination.

The first approach is based on observations of artefacts with the naked eye and, in some cases, with the non-systematic use of a stereomicroscope. These types of analyses are generally conducted for the study of workshop contexts, where abundant debitage[44] is available. A technological analysis is carried out in which the different artefacts recovered from a site are divided according to their raw materials and organized in hierarchical sequences. This analysis may be similar to traditional flint-knapping studies in that they follow sequences of flake removals as evidenced by scars on artefact surfaces (*e.g.*, Falci

44 The term debitage is used here in the Anglo-American sense, which refers to flaked production debris (Whittaker 2007, 20). In the original French sense, *débitage* refers to a production stage in which a core is flaked in order to remove blanks that will be further modified or directly used as tools; "*débitage* products" would refer to the debris of such stage (cf. Inizan *et al.* 1999).

2012; Goñi Quinteiro *et al.* 1999; Pelegrin 2000b; Rodet *et al.* 2014a; 2014b; Roux 2000; Roux and David 2005; Tsoraki 2011a; Wright *et al.* 2008) or are more concerned with changes in shape that point out to stages of production, such as blank acquisition, shaping, and perforation (Bar-Yosef Mayer 1997; Barge 1982; Coutet *et al.* 2014; Mayo and Cooke 2005; Migliacio 2006; Suarez 1981; Taborin 1991; Vargas Arenas *et al.* 1997; Vidale 1995). Other artefact types recovered from the same archaeological contexts are also taken into consideration, as they may integrate the production toolkit: hammerstones (Miller 1996; Mayo and Cooke 2005), grinding stones (Miller 1996; Wright *et al.* 2008), drill-bits (Fabiano *et al.* 2001; Falci 2012; Haviser 1990; Miller 1996; Narganes Storde 1999; Wright *et al.* 2008), capstones (weights) for bow-drills, and anvils (Carlson 1995; Wright *et al.* 2008). Experimental archaeology, that is, the controlled replication of artefacts using techniques and tools likely used in the past (discussed below), allows an insight into possible production sequences, and the time, labour input, and craftsmanship required. This data has often been directly connected to discussions of craft specialization, emerging social complexity and elite prestige (*e.g.*, Brumfiel and Earle 1987; Carlson 1995; Costin 1991; Miller 1996; Spielmann 2002; Wright *et al.* 2008).

The second approach can be referred to as microwear research. Traditionally dedicated to functional studies of archaeological implements, this approach gained popularity in the late 1960s as part of processual archaeology. In this context, microscopic techniques of analysis were seen as providing direct evidence on the function of prehistoric tools (Keeley 1974; Keeley and Newcomer 1977; Plisson and Van Gijn 1989). Archaeologists were thus able to generate objective assessments regarding tool functions, rather than relying exclusively on artefact morphology. Over the decades, analysts have become increasingly aware of the limits of inference involved in the analysis (Newcomer *et al.* 1986; Van Gijn 1990; 2014a). Nevertheless, microwear analysis can give insight into perishable materials worked, how different crafts were interconnected, and to ancient technological systems and toolkits (Hurcombe 2008; Van Gijn 2012; Van Gijn *et al.* 2008). A focus on the interrelatedness of different *chaînes opératoires* and on artefact biographies can be an effective approach to the understanding of technological choices and of cultural practices and preferences (Brysbaert 2007; Van Gijn 2010; 2014a; Van Gijn *et al.* 2008).

For ornament studies, microscopic analyses provide the means to observe traces that would otherwise remain unnoticed. This is because the focus of study is not the production debris, but finished ornaments and preforms. Such artefacts have their early manufacture traces (partially) erased by grinding and polishing during the finishing stages (Miller 1996). Therefore, microwear analysis may be the best option in order to draw technological information from ornaments. This is also the case when archaeologists are faced with contexts in which debitage related to bead production was not recovered, beads were found as single items, or without context. Traces observed on the surfaces of beads and pendants can provide evidence for the successive stages of their *chaîne opératoire*: how and with which tools they were shaped, ground, polished, and perforated (Van Gijn 2006; 2014b).

Different instruments of analysis are encompassed by the denomination microwear, which can provide different sorts of data to archaeologists. This difference was present in early discussions between scholars dedicated to low power and those advocating high power optical microscopy (Grace 1993; Keeley and Newcomer 1977; Odell 1975; Plisson and Van Gijn 1989). The first made use of a stereomicroscope with magnifications of up to 100x and generally relied on edge-removals and fracture mechanics for functional interpretation. The latter have relied on incident light microscopy (metallographic microscopes) capable of higher magnifications (up to 1000x) and focused on polish formation, striations and surface topography (Keeley and Newcomer 1977; Van Gijn 1990). Over the last two decades, these two approaches became complementary by the combination of information from different levels of magnifications (Odell 2001; Sidéra and Legrand 2006; Van Gijn 1990; 2014a).

The stereomicroscope can provide a focus on changes in shapes, manufacture traces and use-wear patterns in ornaments (Alarashi 2010; Beldiman and Sztancs 2006; Bonnardin 2008; Taborin 1993; Vidale 1995). The stereomicroscope provides an understanding of the patterns of wear and their distribution before a more in-depth analysis with the metallographic microscope is conducted (Van Gijn 2014a). The insights the stereomicroscope gives into production sequences are often incomplete and require the use of higher magnifications (Sidéra and Legrand 2006). The high power microscope offers insight into contact materials and the toolkit used in ornament production, such as grinding stones and drills (Groman-Yaroslavski and Bar Yosef Mayer 2015; Lammers-Keijsers 2007; Van Gijn 2006; Van Gijn *et al.* 2008; Verschoof 2011; Yerkes 1993). The observation with the metallographic microscope operates through analogy, i.e. it is based on the comparability between traces observed on archaeological specimens and those present in experimental ones whose production sequences and uses are known (Lammers-Keijsers 2005; Rots and Williamson 2004; Van Gijn 1990). It also allows the observation of residues, such as ochre and resins left on the surfaces (Cristiani and Boric 2012; Lammers-Keijsers 2007). Finally, the combination of both levels of magnification may be more successful in understanding stages in the life of an artefact, i.e. not only production and use, but also episodes of recycling and re-use (Rots and Williamson 2004).

In practice, however, it is not possible to look at entire artefact surfaces with the metallographic microscope given the high magnifications achieved and the need for a 90° angle between the incident light and the surface of the artefact (Van Gijn 2014a). Another instrument available for microwear analysis, but not based on optical light microscopy, is the Scanning Electron Microscope (SEM). This equipment provides wider depth of field than optical light microscopes, thus allowing a longer working distance and higher resolutions and magnifications (Borel *et al.* 2014). Conversely, the SEM is more time consuming and expensive than optical light microscopy, as it requires vacuum conditions and sample coating for the generation of images of excellent quality. The protocols associated with the use of a metallographic microscope are simpler, as they do not rely upon coating or mounting of samples (which may damage some of the studied materials), do not often rely on the creation of replicas, and are more portable (Borel *et al.* 2014).

The SEM has been commonly used for the analysis of ornaments, often in combination with a stereomicroscope (*e.g.*, De Vega *et al*. 2010; Melgar 2010; Solís and Martínez 2010; Vidale 1995; Velázquez-Castro 2011; 2012). As the SEM allows good visibility of curvilinear surfaces, it can be used for examining and assessing perforation techniques (De Mille and Varney 2003; De Mille *et al.* 2008; Melgar 2010; Gorelick and Gwinnett 1989; 1990; Gwinnett and Gorelick 1979). Replicas are generally made in order to see the inside of perforations and to avoid the application of conductive coatings on the original artefacts (De Vega *et al.* 2010; Velázquez-Castro 2011; 2012). The investigation of the type of drilling device, drill-bit raw material, and the presence of abrasives is made through the observation of the micromorphological features of the hole (*sensu* Vidale 1995). The shapes of the wall of perforation and leading edge, and the pattern of striations (concentric abrasion rings) are observed on artefacts or moulds and later compared with those of experimental specimens. Such studies also provide researchers with data on performance (number of revolutions, perforation depths, and time-input) of drilling devices and raw materials. The combined SEM and experimental investigation is necessary for a thorough assessment, especially since most components of drilling devices are made of organic materials and do not survive in archaeological contexts (Gorelick and Gwinnett 1989).

Alternatively, a micro-CT scan (X-ray computed tomography) has been used to investigate glass and stone beads (Ngan-Tillard *et al.* 2014; Yang *et al.* 2009; 2011). It is a non-destructive technique, capable of creating a 3D image of the bead. The virtual model can be sectioned in multiple planes, in order to provide visualization of the profile and micromorphological features of the hole and of the different components of the bead. Similarly to other methods, experimental replicas are to be compared with archaeological specimens. Evidence for techniques, tools, motions and recycling can be investigated, as well as the extension and characteristics of use-wear inside the perforation (Ngan-Tillard *et al.* 2014).

5.1.2 – Approaches to use

In order to understand the biography of an artefact, it is also necessary to focus on its use life. Use-wear analysis has been limitedly conducted before in the Caribbean region (*e.g.*, Breukel 2013; de Ruiter 2009; Kelly 2003; Kelly and Van Gijn 2008; Lammers-Keijsers 2001; 2007; 2008; Lundberg 1987; Van Gijn *et al.* 2008; Walker 1983). The only research focused on ornaments was conducted by Y. Lammers-Keijsers (2001; 2007), who provides only a few references to use-wear traces on this artefact type. The present research aims to overcome this perceived lack by exploring the evidence present on beads and pendants.

Similarly to manufacture traces, the examination of use-wear traces on ornaments can be conducted on different scales of magnification. Use-wear traces are generally present in the form of deformations and notches on and adjacent to the rim of the perforation, which are caused by the tension of the string. Rounding and polish are also observed, especially on the rim, ridges, and edges. While some traces may be apparent with the naked eye, their visualization is largely improved by the use of a stereomicroscope, especially if different light configurations are used. These diagnostic features provide insight into the positioning of strings, the general attachment system of the ornament, and whether there were knots or other beads associated with it. This approach has been widely used for the study of bodily ornaments, especially those made of shell, bone and teeth, which are soft and more prone to present these types of use modifications (Beldiman and Sztancs 2006; Bonnardin 2008; Polloni 2008; Taborin 1993; Vanhaeren and D'Errico 2003). For large assemblages with artefacts of the same type, archaeologists have organized chains of use-wear (*chaînes d'usure*). In other words, ornaments are placed within sequences of use: from unused to extremely worn, broken, and recycled (Bonnardin 2008; Sidéra and Giacobini 2002; Sidéra and Legrand 2006). The observed use-wear data has been contrasted to ethnographic and ethnohistoric evidence in order to suggest ways in which ornaments could be composed in a garment or on the body (Bonnardin 2008; Cristiani and Borić 2012; De Vega *et al.* 2010; Vanhaeren *et al.* 2013).

Higher magnifications are used in the assessment of the nature of polishes and to determine if they were caused by handling and skin contact (Breukel 2013; D'Errico 1993), by contact with other beads (Verschoof 2011), or constant contact with plant material or fabrics (Wentink 2006). This is, however, an underexplored field in ornament studies, which is related to the broad range of materials a bead could be in contact with throughout its life. The numerous possibilities can hardly be contemplated by a single experimental programme. In fact, many studies using the SEM approach seem to be conducting a low-power analysis, but with a high-power instrument. This is to say that the features observed with the SEM (such as use notches and the inside of incisions) are the same as observed with a stereomicroscope. One cannot ignore the benefits and in-depth observations higher magnifications allow for, but this procedure certainly differs from the concerns of more traditional high power microwear analysis.

While chains of use-wear have been proposed for certain ornament types, asserting stages of use for beads is less straightforward. A few studies trying to evaluate degrees of wear have been conducted, from wearing a string of ornaments for months (D'Errico *et al.* 1993; Minotti 2014; Verschoof 2011) to simulating the suspension of a string on power-tools (D'Errico *et al.* 1993; Vanhaeren *et al.* 2013). The type, intensity, and presence of striations will likely vary according to the string materials used, both whether it is of plant or animal origin, and variations therein (*e.g.*, siliceous vs. non-siliceous plants). However, the wearing of stone beads by researchers has proved not long enough to provide sufficient evidence comparable to archaeological materials (Verschoof 2011). The replication of wear with power tools, while a possibility for looking at traces, is not a replication of the same activities and motions that these objects would have been subjected to or to comparable time estimations.

5.2 – Research methodology

Before presenting the analysis, it is necessary to define the terms employed in the following chapters. These definitions provide the structuring framework for analysis. The *chaîne opératoire* and the artefact biography concepts will provide the starting point and general questions to approach artefacts with.

5.2.1 – Ornament typology

The definition of ornaments here forth used is typological and takes into consideration only artefacts with perforations, which were not apparently made for another known function (such as spindle whorls or ceramic vessels). Except for preforms, only perforated artefacts will be included in the analysis (which does not necessarily mean the others were not used as ornaments[45]). The focus of this research is not on typology and therefore the artefacts were not separated in several hierarchical types and subtypes by the use of precise shape variations and measurements. Types and subtypes were nevertheless used as a means of separating between the end-products that can result from each production sequence. These types are considered "pre-analytical": they do not necessarily match the actual function or mode of attachment of the artefacts. They were defined as a primary classification, whereas use configurations will be discussed later, on the basis of microwear data.

Beads and pendants are defined in relation to the position and number of perforations and, therefore, to how each artefact would hang when strung in terms of symmetry and weight distribution. A *bead* is defined as an artefact with a perforation in its centre, on the axis of rotation. When strung, all the parts of a bead are symmetrically distributed around the string. Basic elements in a bead are the *face*, i.e. the surface perpendicular to the perforation, where the diameter is measured; and the *cross-section*, parallel to the perforation and perpendicular to the face. Given the variation in sizes on each specimen, both

45 One cannot ignore the variety of non-perforated ornaments, such as labrets, ear-plugs, and notched pendants.

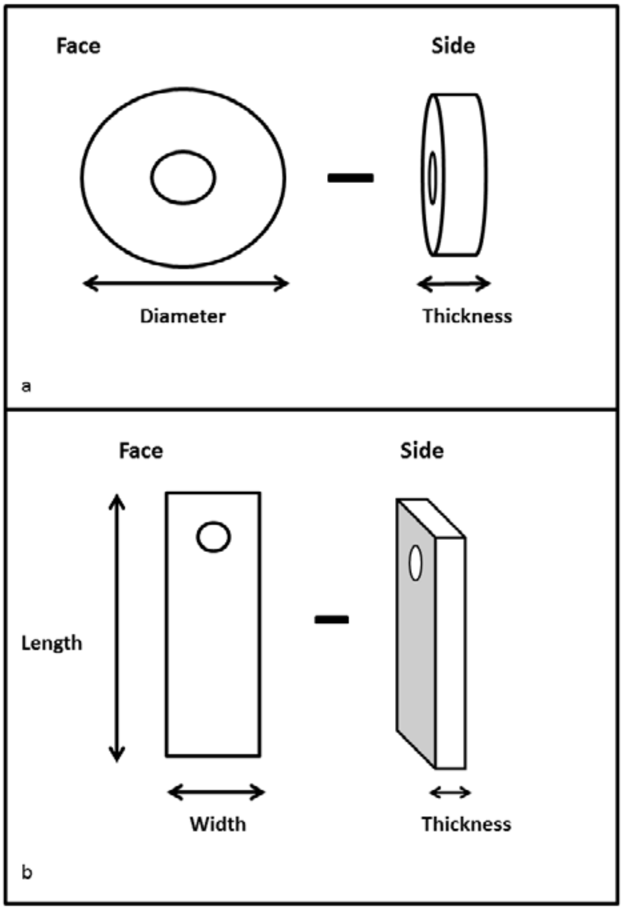

Figure 2: Bead and pendant terminology.

length (largest diameter) and width measurements were taken. Thickness (or height) is measured on the cross-section (figure 2, a). Five types of beads are present in the analyzed collections: disc, tubular, spherical, barrel- and frog-shaped (figure 3). Disc beads have a thin and flat cross-section, whose value is below that of the diameter. They can be further divided according to variation in the relative value between the diameter and thickness (Barge 1982). For instance, thin and small disc beads used for embroidery are commonly referred to as "seed beads". However, I opted for a simpler typology, in which such sub-divisions are not used.

Thicker beads with a cylindrical shape are referred to as tubular beads. They have a larger thickness value than the diameter. Three subtypes of tubular beads are used in the next pages: normal, double-perforated and "false". Normal refers to cylinders with a perforation along the thickness, while double perforated refers to beads that, in addition to such perforation, have a second, perpendicular one. Long cylinders with one perforation at each end of the bead were called "false" tubular beads. These are not real beads, as they do not have a perforation along the thickness. The third bead subtype is spherical, i.e. almost completely rounded beads. Barrel-shaped is a used for spherical beads whose faces are

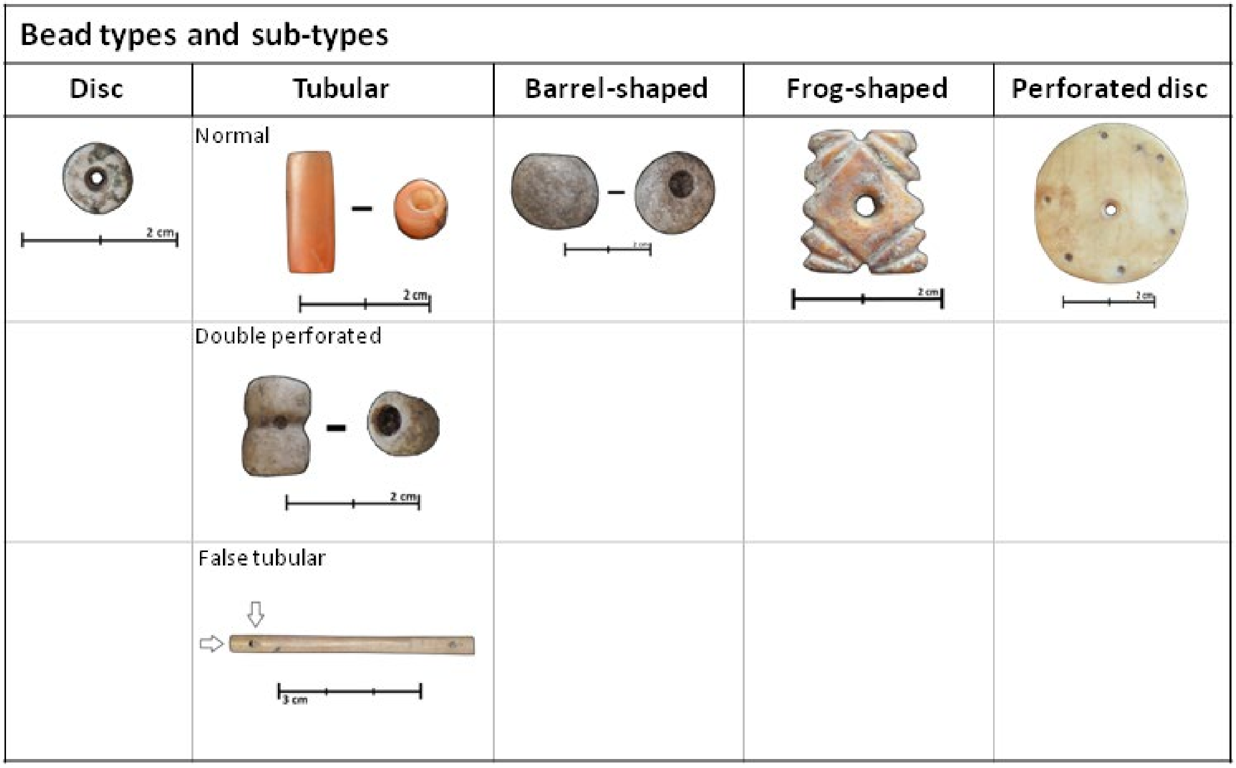

Figure 3: Bead types and subtypes in the studied assemblages.

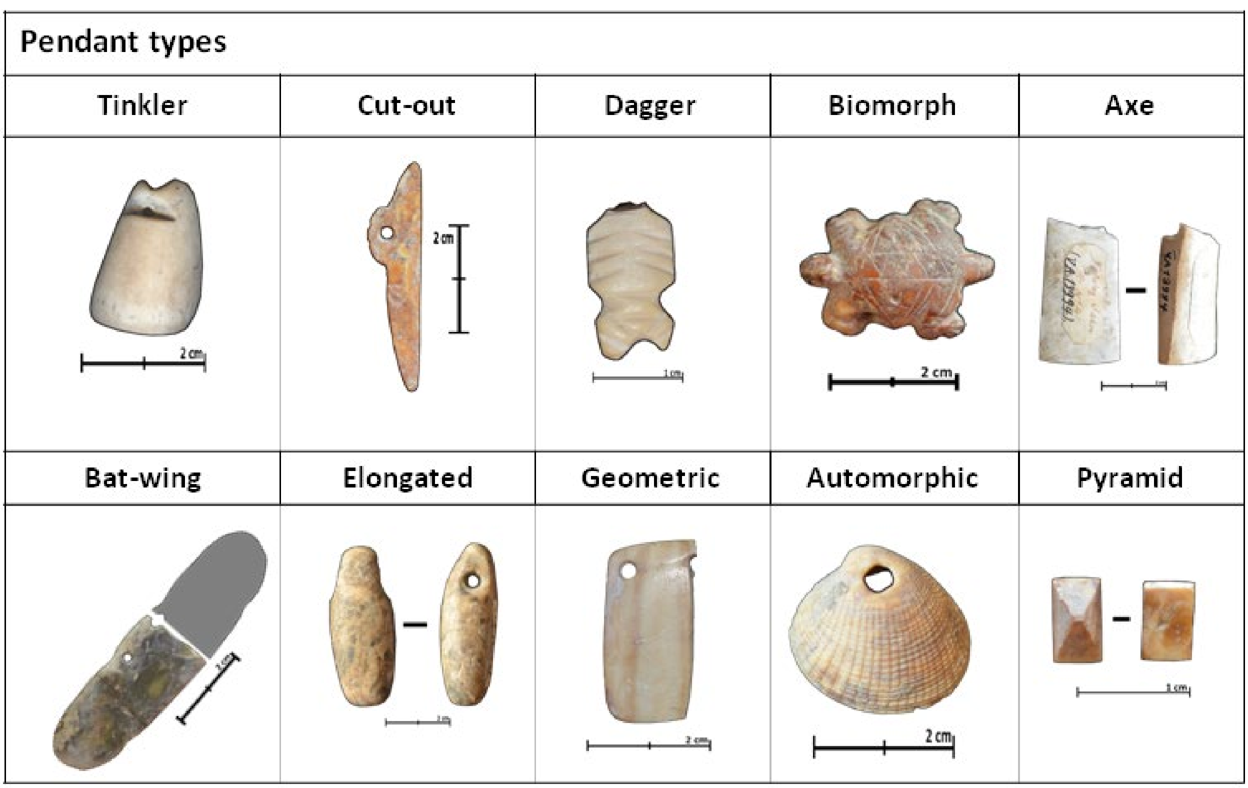

Figure 4: Pendant types in the studied assemblages.

flattened. Finally, frog-shaped refer to ornaments with a flat and generally convex cross-section, whose sides are carved with the folded frog legs motif. They have a perforation on the centre, displaying equal weight distribution to all sides. Another subtype that fits the bead definition above is a large disc with a perforation in the middle. Artefacts such as this are often not considered beads, as the diameter is larger than on most beads. This difference is highlighted here by referring to these specimens purely as *discs*, rather than as beads.

A *pendant* is an artefact with one or more perforations that, when strung, hangs asymmetrically, with an uneven distribution of weight, and generally with the same side facing forward (Barge 1982; Falci 2012; Watters and Scaglion 1994). A range of different artefacts with decentralized perforations are encompassed by the term pendant. Up to two typological levels were assigned to pendants (*e.g.*, zoomorphic, frog-shaped). Length was also measured on the face of perforation, but according to its probable orientation when strung, regardless of being the largest value or not. Width was the perpendicular value on the same plane (figure 2, b). The pendant category encompasses varied geometrical subtypes (figure 4): round, triangular, diamond-shaped, oval (elongated), and rectangular. It also includes two special varieties of rectangular pendants: axe-shaped and bat wing, which were kept as separate types due to their distinctive shapes and recurrence in the literature. Bat wing pendants are flat rectangular pedants with rounded sides and two perforations on the middle (Perera 1979; Wagner and Schubert 1972). Pendants made of whole shells, with little modification, were included in a general automorphic subtype (*sensu* Lammers-Keijsers 2007; Linville 2005; Vargas Arenas *et al*. 1997).[46] Within this subtype, tinklers were included (Lammers-Keijsers 2007; Turney 2001; Van der Steen 1992).

For some Valencioid pendants, the types suggested by Bennett (1937) were used: dagger-shaped and cut-out. According to Bennett (1937, 122-23), "dagger" is part of a group of 4 cut-out "bead" subtypes. It has a thin rectangular shape with one end shaped in a point and the other rounded and separated from the rest of the body by side notches. The "dagger-shaped" type is used here in a broader sense, including what he includes under "simple", "dagger" and "figure". The small differences between these subtypes are not very relevant in this research, although some of them are seemingly more anthropomorphic than others. The term "cut-out" pendant is being used to refer to the fourth of his subtypes ("flat cut-out"). Another pendant subtype is biomorphic, which encompasses pendants of varied shapes and sizes, all depicting zoomorphic or human-like beings. The last subtype, "pyramid", constitutes a distinct group of small artefacts with a three-dimensional pyramidal shape. Even though they do not present perforations, the pyramids were considered potential preforms and included in the analysis.

46 Automorphic is opposed to xenomorphic. The latter encompasses artefacts produced from blanks removed from a material and/or that involve significant transformations to the original shell morphology (Lammers-Keijsers 2007; Linville 2005).

5.2.2 – Making (sense of) ornaments: operations and techniques

An idealized production sequence of a bead/pendant is proposed, based on terminology developed for lithic reduction and ground stone studies (Inizan *et al*. 1999; Pelegrin 2000a; Wright 1992). The terms and schemes provided by these studies were contrasted with and complemented by those dedicated to bead technology (Barge 1982; Falci 2012; Miller 1996; Pelegrin 2000b; Wright *et al.* 2008), in order to improve the terminology.

The first stage in a *chaîne opératoire* is the procurement of raw materials, which can be made from a source (an outcrop, the sea, a beach, etc.), a river bed, or indirectly through exchange with other communities. From the moment the unprocessed raw material is obtained to the moment an ornament is completed, at least three stages will take place. The first stage is referred to as *débitage* (*sensu* Inizan *et al.* 1999, 59), which consists in modifying the raw material (stone block or whole shell, for example) in order to create smaller pieces that can be further transformed into ornaments. This stage is going to be termed blank acquisition[47] in the present research, after its desired products, i.e. the *blanks*. It can be carried out by different techniques, such as splitting, flaking and sawing. Splitting can be used in the quarrying process, in order to remove a fragment from the bedrock (Wright 1992). Flaking a nodule or shell (*percussion perpendiculaire lancée;* cf. Leroi-Gourhan 1971, 48) is the fastest way of separating a part of the material that will serve as blank and of eliminating undesirable portions (Antczak 1998; Inizan *et al.* 1999; Wright 1992). However, depending on the properties of the worked material, it may not allow high predictability of the products. Sawing involves the use of a two-directional linear movement with the edge of a tool in direct contact with the material.[48] Different materials can be used for sawing, such as flint, sandstone, a plant-based string, and also organic tools, like wood and bone. Sawing can also be executed in two stages: the creation of an initial groove with a hard material, such as flint, followed by sawing with a different, less brittle material, which functions through abrasion (Beek and Mason 2002; Kelteborn 1988; Tsoraki 2011b). In addition, sawing generally works through the mechanism of cut-and-break (or groove-and-snap) in which the areas to be broken are sawn only to a certain depth on one or two sides (Tsoraki 2011b; Wright *et al.* 2008). The remaining portion is then snapped along the groove by hand or by pounding the area with a chisel and a hammerstone. The groove-and-snap technique is quite efficient, especially when working materials that have a blocky, laminar structure, such as certain types of hard stone (Miller 2007b, 58).

During the next stage, shaping (*façonnage*), the blank is further modified in order to approximate its morphology and volume to those of the desired end-product.[49] This

47 This stage corresponds to what Wright (1992) denominates "primary reduction".

48 According to Leroi-Gourhan (1971, 178), sawing is a form of *percussion punctiforme oblique*, as it involves the use of a number of small blades (the teeth in the edge of a tool) that cut the material.

49 Wright (1992) divides this stage in multiple operations: secondary reduction (roughout), thinning and grinding. As this

operation leads to the production of *preforms*. The blank can be modified by a variety of techniques, such as flaking, cutting/sawing, pecking and grinding (Barge 1982, 68). Cutting is executed by applying a unidirectional linear movement with the sharp edge of a tool, in order to dislodge particles (*percussion perpendiculaire posée linéaire longitudinale*; cf. Leroi-Gourhan 1971, 48-52). In the archaeological specimens, it is often not possible to delineate the distinction between cutting and sawing. For this reason, the technique will be referred to as cutting/sawing. A specific method of using this technique is notching. This term is used to refer to the grooves made on the side of artefacts, in order to create complex shapes. Pecking refers to short direct percussions made against an immobile surface, in order to crush and remove small fragments of material in a short period of time (Wright 1992). It can be used for making irregular and pronounced areas blunt and as preparation for grinding and polishing of a surface (Inizan *et al.* 1999).

Grinding is also considered a shaping technique in the production of ornaments. It operates through the abrasion of material by rubbing it against a coarser surface (*percussion oblique posée diffuse*, cf. Leroi-Gourhan 1971, 57-60). A smooth surface texture is created by wearing down, removing particles, and levelling the asperities of the surface (Adams 2014). Grinding is performed by direct contact with a (immobile) platform or with a mobile tool (the ornament being immobile in this case). The tools used for grinding are generally coarse-grained stones, but the in the Americas, other materials such as stony corals (Clerc 1974; Kelly 2003) and coarse ceramic sherds (Ribeiro 1988) have been used. It is often suggested that grooved abraders were used for grinding beads in the final stages of production (Adams 2002; Wright *et al.* 2008). Bead making is a more standardized process than the production of pendants: many beads can be produced from the same long blank, which is ground, perforated and sawn into smaller beads, or be strung and ground together at the same time (Barge 1982; Ribeiro 1988; Yerkes 1993). Mixtures such as water and sand are often added in order to accelerate the abrasive process and lubricate the object, resulting in changes to the surface (Hodges 1971; Miller 2007b). Significant portions of material can be removed by grinding in a slow pace and controlled manner (Beek and Mason 2002; Prous *et al.* 2002, 180). The technique can also be applied to remove undesired features from the material, such as natural protrusions and other irregularities.

The perforation can be executed by different techniques and in successive stages. Drilling is the most commonly used technique and works through the combination of perpendicular pressure exerted by the point and oblique percussions by the lateral ridges of the drill that performs an alternate circular movement (*percussion circulaire*; Leroi-Gourhan 1971, 55). Different mechanisms have been used for producing the movement of the drill bit: a drill can be hand-held or hafted on a wooden shaft. The shaft can be rolled

thesis encompasses multiple types of ornaments, it was decided to maintain a more general definition of the stage.

between the palms or on the thigh (Leroi-Gourhan 1971; Yerkes 1993). Alternatively, more complex mechanisms can be used with the shaft: a string and pressure exerted by the mouth which holds the shaft (Haudricourt 1987), a bow and a weight (bow-drill), or another stick inserted perpendicularly and attached to a string, also with a weight (pump-drill; Barge 1982; Price 2012).[50] Drilling is a risky stage of the manufacture, as it can lead to breakage, especially in the case of long perforations made on narrow preforms. It requires knowledge of the best gestures, techniques and tools for the task at hand.

Depending on the material used for the drill bit, the bore hole will have different characteristics (Gwinnett and Gorelick 1979; Hodges 1971). The drill bit can be a massive/solid material, such as stone, shell, teeth and wood, generally with a sharpened point. The resulting hole will have a cone-shaped profile, with a narrow tapering leading edge (due to the wearing of the material). The solid drill, if made of hard materials, tends to work more through cutting, while softer varieties (wood, bone and teeth) function through a mechanism of abrasion (Hodges 1971, 107). It produces thin and concentric striations on the wall of the perforation. A hollow drill (made, for instance, of reed) also functions through abrasion and generates a hole with a cylindrical shape and little tapering. The hollow drill mechanism is very time-consuming, but is regarded as more efficient for perforating hard materials, as less material needs to be worn away (since the middle cylinder is just broken) (Leroi-Gourhan 1971, 168). Other techniques can also be used for creating perforations on shell materials: sawing, grinding, pounding, and pressure (gouging). Pounding can be applied as a direct percussion on the shell or indirectly, with the use of a chisel as intermediary. While it is a fast and simple technique, it requires knowledge of the ideal point to strike against, in order to avoid breakage of the specimen (Barge 1982; Francis 1982). Pressure involves pressing a pointed tool against the area to be perforated, together with a slight twist. Certain shells, on the other hand, display natural perforations which can be directly used (Barge 1982; D'Errico *et al.* 1993).

Ornaments can present complex shapes and features on their surfaces which were grouped under the general term "decoration". The term refers to the creation of anatomical features (i.e. separating limbs, head and tail in the biomorphic figures) and adding "purely geometric" motifs (lines and dots). The techniques used are generally the same as for shaping: cutting/sawing and drilling. In addition to notching, which is used for making complex shapes (being at the same time shaping and decorative technique), other methods of application of cutting/sawing are used, namely incising and excising. The former involves the execution of shallow grooves on the material in order to create motifs (Wright 1992); the latter is a combination of multiple incisions, leaving areas in relief or isolated from the rest of the ornament. Excising involves considerable planning, volume

50 More information on the different drilling mechanisms observed throughout the world are described and illustrated in works such as Barge (1982), Haudricourt (1987), Hodges (1971), and Leroi-Gourhan (1971).

control and, for this reason, is evidence of highly skilled performance. The term carving is also occasionally used to collectively refer to these techniques (i.e. notching, incising and excising). Unfinished drilled perforations are also often used in decoration.

The final stage is polishing. Similarly to grinding, it operates through abrasion, but generally using fine-grained stone or soft materials (*e.g.*, cotton, leather, leaves, or wood), with the addition of water or clay loam. The goal, rather than being the removal of material, is the production of a smooth surface through the erasure of irregularities left by previous stages of production (Barge 1982; Prous *et al.* 2002; Wright 1992). It is also used to flatten the worked surface and to bring out desired colours and produce reflective surfaces.

The order of the sequence should not be regarded as mandatory. Ornament production sequences may be longer and more complicated, involving, for instance, several episodes of heat treatment of the raw material (Pelegrin 2000b; Kenoyer *et al.* 1991). For instance, the order between coarse and fine grinding, the perforation and polishing can vary. There is no reason to assume that a second grinding stage would not follow drilling. An exception to this general sequence is the automorphic pendants. In these cases, whole shells are used as blanks and the modification is often restricted to a perforation (Barge 1982; Francis 1982). Therefore, with the exception of blank acquisition, which always must take place, the other stages in ornament making may be performed in a different sequence or simply may not exist. Production sequences are not necessarily direct and linear, involving a single artisan producing one object at a time. People may produce several objects at the same time, help each other and apprentices, abandon a project and return to it afterwards, divide it over periods of months, and also recycle production wastes or broken pieces (*e.g.*, Bonnardin 2008; Dupuis 1992; Holdaway and Douglass 2011; Koch-Grünberg 2005; Polloni 2008).

5.2.3 – Protocol of analysis

Beads and pendants in finished and nearly-finished states were analyzed (*n*=161), including partially broken specimens. Two main microscopes from the Laboratory for Material Culture Studies in Leiden University (The Netherlands) were used: a Leica M80 Stereomicroscope (7.5 to 64x) with led light (Led 5000) was used for the observation of features under lower magnifications, equipped with a Leica MC120HD camera for photographs; and, for higher magnifications, a Leica DM 6000m Metallographic microscope (50x to 200x) was used. It is equipped with a camera Leica DFC 450 and allowed for the creation of Z-stack photographs. A portable Dino-Lite Pro AM-413T microscope was used for preliminary analysis during fieldwork in the summer of 2014. Further photographs were taken with a Nikon Coolpix camera equipped with macro-lenses.

The first stage of analysis consists in scanning the artefacts under the stereomicroscope to look for possible archaeological residues (Van Gijn 1990; 2013). If no residues are observed, the artefacts are cleaned so that traces on the surface can be clearly identified. As acid solutions may have lasting effects (see Van Gijn 1990, 11), their use on artefacts from museum and private collections is not prudent. The use of an ultrasonic tank with water is an efficacious alternative for cleaning; however it may also damage some fragile pieces, such as those made of shell (Cuenca Solana 2013). Artefacts can also be cleaned with just water and detergent, although some dirt may be impossible to remove with this method. It was therefore decided to only use the ultrasonic tank for stone and coral artefacts.[51]

Several variables were taken into account for the observation of each artefact: dimensions (length, width, and thickness), weight, typological classification (type and subtypes), raw material, translucency, colour, perforation (number, type, dimensions, and traces inside it), primary technology (blank acquisition), surface treatment, tool marks, post-depositional surface modification, post-excavation damage, craftsmanship, decoration (presence and techniques), interpretability, degree of wear, fixation (attachment mode), presence of wear from body, clothes or other beads, evidence of recycling, and presence of residues. The standard Use-wear Form and MS Access Database for ornaments (appendices 01 and 02) served as basis for the analysis. Each artefact was copy-scanned on both faces in order to provide large images of the surface, on which notes were made regarding the types, attributes, and location of microwear observed. Striations, grooves, notches, and perforations are indicative of the different production techniques depending on their location, disposition, quantity, and morphology. The manufacture data gathered from individual ornaments was organized in technical schemes, i.e. idealized reconstructions of the choices made by people according to raw material type and production sequence (Balfet 1991b; Karlin *et al.* 1991). The analysis with the metallographic microscope proceeds by recording the location, distribution, texture, brightness, topography, width, and directionality of polish and striations (Keeley 1974; Keeley and Newcomer 1977; Van Gijn 1990).

Different levels of technological achievement in the craft (skill levels) can be assessed through the presence of technical errors (breakage and misplaced perforations) and “sloppiness”, as opposed to a well-made finishing and the use of difficult, risky, and time-consuming techniques. In order to make this evaluation, the constraints of the worked raw material and the intended end product are also considered. On the basis of this evidence, it was possible to assign three levels of craftsmanship to individual ornaments. High skill corresponds to artefacts which present complex shapes and/or use of elaborate techniques, such as excision and long perforations. Artefacts perceived as well-made but with no outstanding skill demonstration were considered medium. Low skill refers to ornaments in which there is evidence of mistakes or of sloppiness. “Sloppiness” can

51 While this procedure was applied to most artefacts from the Dominican Republic, artefacts from the Alfredo Jahn collection were not cleaned, as requested by the Ethnologisches Museum in Berlin.

only be subjectively defined and may have been of no concern for people in the past: *e.g.*, erasing misplaced cut marks, eliminating irregularities and symmetry. While a single artefact should not serve as basis for ascertaining the skill level of the maker, it is possible to use it as indication of the skill invested on it. This data also should not be regarded in isolation: a lower level of technological achievement can only be defined in contrast with a more developed performance in the same assemblage (*e.g.*, Högberg 2008; Roux *et al.* 1995). This information can be summarized in order to make sense of the composition of crafting groups, in terms of the presence of (highly) skilled craftsmen and apprentices. These assessments, however, must be contrasted to larger assemblages, so that their representability can be evaluated. In the case studies here discussed, they offer subjective insights into the variability in technical performance, but should not be regarded as absolute and objective statements.

Evidence for the use of ornaments was observed in the form of specific wear patterns on the surfaces. Each artefact can have one or a combination of these features: 1) polish and rounding on the rim of perforation; 2) deformation of the rim to one side; 3) scratches entering the rim of perforation; and 4) polish and rounding close to the edges of the artefact (on either or both faces). Such traces are created by contact with the body, its fluids, other ornaments and strings during use. The first three are generated by friction with a string or other objects in close contact with the rim of perforation; the second is often a development from the first. The fourth can be caused by friction between ornaments attached together or with a surface (body, clothing, or a band). Bodily fluids and the impregnation of strings with substances that are acid or carry abrasives have an important role in the formation of use-wear on shell ornaments (Vanhaeren *et al.* 2013). The presence, distribution, and intensity of these features on the surface can also provide data regarding the length of usage: lightly, medium and highly worn, in addition to worn indetermined (i.e. when the intensity of wear is not clear) and indetermined (when it is not clear if there is use-wear). Ornaments without use-wear (with a fresh and sharp appearance) were interpreted as "presumably unused", but it is not possible to know whether use-wear has not developed on an artefact due to its specific material or insufficient length of usage.[52] The wear patterns cannot be considered on their own: they must be regarded in relation to other artefacts of the same raw material. In this sense, these are relative degress of wear. The way in which the patterns relate to time of usage can only be speculated, since it would require an extensive experimental programme. As reference for specific attachment systems, online museum catalogues, figures of Amerindian peoples and specialized publications (Ribeiro 1986; 1988; Travassos 1986) were consulted in order to understand how individual beads and pendants could be integrated in Amerindian composite ornaments. This procedure was however performed unsystematically.

52 In other words, it is not possible to know for certain if fresh artefacts were not used at all.

Interpretation in microwear studies works through analogies and inferential leaps whose limits must be acknowledged (Van Gijn 2010; 2014a). Several processes through which artefacts undergo can impair the recognition of traces on their surfaces. The biographies built for artefacts are, in this sense, always incomplete. First of all, during ornament manufacture and use, new traces are created on top of previous ones, erasing them. In addition, modifications that happen after artefacts are left on the ground may also considerably affect their surfaces (*e.g.*, formation of sheen, bright spots, edge damaging). These post depositional surface modifications may mimic some attributes normally interpreted as use-wear (Hurcombe 1992; Lévi-Sala 1986; Van Gijn 2005; Roberts and Ottaway 2003). Likewise, post-excavation damage, i.e. cleaning, ink markings, nail polish, and stringing beads together for exhibitions, can impair analysis. The extent and characteristics of use-wear generated by new strings are still not clear. Distinguishing their traces from the ones left by ancient strings may be a problem.

In addition, experiments reproduce activities in a mechanical way that offers limited comparison to the complex activities that take place in a real social context (Van Gijn 2014a). Therefore, traces on experimental pieces are not exact replicas of those on archaeological artefacts. The variety of situations to which ornaments may have been subjected can only be partially grasped by experiments. Other limiting factors are related to difficulties in positioning artefacts under the metallographic microscope, to the impossibility of looking at entire artefacts, and to the fact that analysis is dependent upon the analyst's interpretation and skill. Finally, our preconceptions regarding how objects were used in the past can also lead to biased analysis and interpretation (Van Gijn 2010; 2014a). In the case of ornaments, these assumptions may result in exclusive attention to areas where traces are expected (rim of perforation and edges) and in overlooking artefacts which are not typologically categorized as ornaments. The task of interpreting ornaments is further complicated by the fact that some specimens, such as inlays, could have also been attached to the bodies of animals and objects. Finally, the extrapolation of observations made from individual artefacts to the level of the assemblage or the site is also a problem in terms of representability. These limitations are practical cautions to be kept in mind during analysis and interpretation.

5.3 – Raw materials analyzed

Varied raw materials have been used by the indigenous societies of the Americas for the production of ornaments (*e.g.*, Cody 1991b; Loren 2010; Ribeiro 1986; 1988). This was also the case for the beads and pendants studied in this research: shell and stone predominate as raw materials, but coral, jet, ceramics, and bone were also made into ornaments. An overview of the general properties of the materials will be made in the following section, as they are relevant for understanding the artefact biographies, i.e. how they were gathered, modified, manipulated and impacted by use, and finally their preservation in the archaeological context.

5.3.1 – Shell

The mollusc phylum encompasses invertebrate animals, some of which secrete oval and convex calcareous shells to support and protect their internal organs (Ruppert and Barnes 1994). Shells have been targeted by pre-Colonial populations in the Caribbean for the production of many types of artefacts, including ornaments. Amerindian interest on shells was probably related to their varied shapes, textures, and colours, and also to their properties, such as ease of working, sufficient, but not extreme hardness (3-4 in the Mohs scale), toughness, homogeneity, and broad availability in freshwater, marine, and terrestrial environments (Clerc 1974; Turney 2001; Van der Steen 1992). The shells have a laminate structure, being composed of numerous layers of calcium carbonate ($CaCO^3$) in the form of aragonite and calcite which can be organized in different microstructures depending on the species (Claassen 1998; Sutty 1990). Their outermost layer, called periostracum, is pigmented and made of an organic protein, conchiolin. It generally erodes after the animal dies, thus not being often observed in archaeological specimens (Abbott and Dance 2000; Claassen 1998, 23). The difference in microstructures can lead to differences in the formation of use-wear traces (Cuenca Solana 2013).

The species used for ornament making belong to two classes of mollusc: gastropods and bivalves, which also constitute the most numerous living mollusc species (Abbott and Dance 2000). The shell of gastropods only possesses one valve, being spiralled, asymmetric, and more compact and resistant than those of other classes. Commonly used species are *Lobatus gigas*, *Oliva* sp., *Conus* sp., and *Cypraeacassis testiculus*. The *Lobatus gigas* shell has a cross-lamellar microstructure, giving the shell considerable toughness that certainly played a role in its selection for the manufacture of tools, both “formal” and “expedient”, and ornaments (Kamat *et al.* 2000; Lammers-Keijsers 2007; O’Day and Keegan 2001). The shell has large dimensions and a wide distribution from South Florida to the coastline of Brazil, being normally found grazing on eel grass on shallow waters (Sutty 1990). It has 4 stages in its life: juvenile, sub-adult, adult and old. The flaring lip developed by mature individuals has been regarded as the most appropriate for artefact manufacture, due to its sufficient size and thickness. As it continues to be secreted throughout the life of the animal, the lip of old specimens tends to be too thick and brittle for applying most techniques, while the rest of the body is considerably deteriorated (Antczak 1998; O’Day and Keegan 2001). Other parts of the animal have been widely used as well, such as the body whorl, the columella (inner column), the spire, and nodules (Serrand 1999).

Another commonly used species belong to the *Oliva* genus, which is composed of gastropod shells that live close to the shore or on submerged sand banks in greater depths.

These molluscs possess bell-shaped shells, having 4 to 9 cm of length and varying colour patterns (Abbott and Dance 2000; Sutty 1990). This long shell with narrow aperture is best represented in Caribbean assemblages by the *Oliva reticularis*, which displays a white/creamish colour with brown patches. The genus has been used for the production of beads, pendants, and tinklers (Antczak 1998; Robinson 1978; Van der Steen 1992).

The bivalve class, also called Pelecypoda, encompasses molluscs with a shell divided in two similar and convex valves which are connected by an elastic protein ligament (Ruppert and Barnes 1994). This ligament is positioned below a dorsal protuberance called umbo, present on each valve. Some of the species commonly used for ornaments are *Tivela mactroides*, *Spondylus americanus*, *Chama sarda*, and *Pinctada radiata*. The natural cross-section of bivalves can still be noticed on the artefacts made from them, resulting in ornaments with a convex and coloured face opposed to a concave one, with white colour and/or mother-of-pearl. Bivalve shells may be thick and large depending on the species, such as the *Spondylus americanus*, also notable for its bright reddish colours and thorny appearance with long spines (Sutty 1990; Turney 2001).This species can be found offshore on cliffs 10 to 50 m deep and can vary from 10 to 20 cm in length (Abbott and Dance 2000; Turney 2001). Shallow water specimens, however, present only a few, blunt spines when compared to the ones from greater depths (Sutty 1990). Another species distinguished by its reddish colours and used by Amerindians throughout the circum-Caribbean for bead making is the *Chama sarda* (Carlson 1995; Lammers-Keijsers 2007; Ostapkowicz 2013). This species is generally smaller (ca. 2,5 cm), has crude teeth in the hinge and also a rugged surface with smaller leafy spines. One of its valves is normally attached to rock surfaces, being found on shallow (3 – 50 m deep) tropical waters (Abbott and Dance 2000).

Several studies have focused on the identification of techniques used for the manufacture of shell ornaments, both in the circum-Caribbean (Carlson 1995; Clerc 1974; Lammers-Keijsers 2001; 2007; Serrand 1999; 2003; 2007; Turney 2001; Van der Steen 1992; Vargas Arenas *et al.* 1997; and others) and elsewhere (*e.g.*, Barge 1982; D'Errico *et al.* 1993; 2005; Prous 1986/1990; Suarez 1981; Taborin 1991; 1993; Velázquez-Castro 2011; 2012). Since it is a relatively soft material, use-wear develops extensively on shell ornaments, often providing evidence of the modes of suspension (Bonnardin 2008; Taborin 1993; Vanhaeren and D'Errico 2003; Vanhaeren *et al.* 2013). Experimental archaeology has been crucial especially in the recognition of man-made perforations as opposed to natural ones, caused by predatorial, wave, and sand activities (Cadée and Wesselingh 2005; Çakirlar 2009; D'Errico *et al.* 1993; Francis 1982; Joordens *et al.* 2014). Natural modifications may be present in used shells, for instance when a beach-worn specimen is collected, and also in freshly harvested shells left in the archaeological context. Similarly, post-depositional mechanical and chemical processes, which take place depending on the conditions, type of soil and presence of water, may eliminate use and manufacture traces, thus confusing and impairing analysis (Cuenca Solana 2013; Dittert *et al.* 1980). They may lead to patination, (micro-) breakage, micropolish formation, encrustations, and dissolution of aragonite, giving the artefact a "chalky" appearance (Claassen 1998; Dittert *et al.* 1980).

5.3.2 – Rocks and minerals

Most microwear studies have focused on hard, homogenous and isotropic materials, such as flint tools, in which use-wear traces tend to be located on the edges. Studies dedicated to the function of ground stone tools have been developed more recently, despite the large size of tools (which normally is a problem in terms of working distance), the often lack of technological modification, large grain size and heterogeneity (Adams 2002; 2014; Adams *et al.* 2009; Dubreuil and Savage 2014; Van Gijn and Houkes 2006). Stone beads and pendants are generally included in ground stones assemblages, as the same materials and techniques are often used for both ground stone and ornament technologies (Adams 2002; Tsoraki 2011a; Wright 1992; Wright *et al.* 2008). In addition, knapping generally has a more peripheral role in the production of both technologies.[53] Heterogeneity and coarseness are problematic characteristics when choosing materials for knapping as they affect the spread of fracture fronts (Inizan *et al.* 1999). However, in ground stones, these can be desirable attributes: the texture of a surface (its granularity, cohesion and porosity) and its durability are important factors in terms of desired performance characteristics for specific tool types (Adams 2002; 2014; Adams *et al.* 2009). Nevertheless, the study of ornaments has certain particularities, especially the central role of the perforation and the differential patterns of use-wear (Dubreuil and Savage 2014). While many soft lithic materials (steatite, calcite and certain types of serpentinite) have been used for ornaments, harder rock varieties (5 – 7 in Mohs scale), are also very common, despite requiring considerable effort in time, force, and tools (Groman-Yaroslavski and Bar Yosef Mayer 2015; Rapp 2009; Roux 2000).

The lithic materials[54] analyzed in this research have not been subjected to geochemical investigation, which hampers inferences regarding their provenance and the strategies used for their collection. The artefacts from the Dominican Republic were discussed with the geologist A. Knaf, allowing preliminary separation of general groups. Beads from this context were assigned to two groups: calcite and igneous rocks. Calcite is a soft mineral (3 in Mohs scale), composed of $CaCO_3$, generally white in colour and translucent. It can be collected in the form of crystals, displaying a rhombohedral cleavage (Rapp 2009, 111). Due to its softness and homogeneity, calcite can be easily worked through abrasive techniques, such as cutting/sawing and grinding. Among the igneous rocks, the most commonly found is diorite, which is a medium to coarse-grained plutonic rock with

53 This is of course a generalization; the studies mentioned on section 5.1.1 are cases in which knapping procedures in bead making are quite extensive. This may be related (but not reduced) to the use of harder rock varieties, in which knapping can be performed with a high degree of control and grinding may be considerably time-consuming.

54 In this thesis, for practical reasons, I will refer to both rock and minerals as a group by using the term "lithics".

low silica content (Rapp 2009, 51). The predominant mineral is plagioclase and the most common mafic minerals are hornblende and biotite. Diorite is hard and heterogeneous, thus crafting is time-consuming and it does not respond well to flaking. Nevertheless, it has been worked through abrasion techniques in different regions of the world (Rapp 2009). Its colours vary from greenish to black and white, according to the mineral inclusions.

Varied rock types are present in the Venezuelan collections, including metamorphic and igneous rocks. For many materials, there is no information regarding their nature, as only one or two artefacts are made of them. One recurrent type is a metamorphic rock, which has been referred to as slate by previous authors (Osgood 1943).[55] It is a local greyish rock with varying degrees of mica and a metallic sheen. It is a fine-grained metamorphosed shale, composed of quartz and stable sheet silicates which give it the distinctive foliated planes of cleavage (Rapp 2009). The cleavage planes allow the natural fracture of the material in sheets with flat and parallel sides. Some pendants in the assemblages were made of serpentinite. It is a metamorphic rock, generally the product of the alteration of mafic igneous rocks. Similar serpentinite pendants, found in the Venezuelan Andes, are mainly composed of antigorite, which is a variety of the serpentine mineral with a flaky and sheet-like structure (Rapp 2009; Wagner and Schubert 1972). They also include minor amounts of talc, magnetite and carbonates (Wagner and Schubert 1972). Some varieties from those contexts were also predominantly composed of talc, being therefore identified as steatite. Serpentinite is a relatively soft material (2,5 – 3,5 in Mohs scale), generally not good for flaking and often worked through abrasive techniques (Rapp 2009). Further remarks concerning the lithic materials used for ornament making in the studied collections will be made in the next chapters.

5.3.3 – Coral

Coral is a widely available material throughout the Caribbean region. It belongs to the phylum Cnidaria which encompasses radially symmetrical animals with a basic body plan: a saclike structure in the form of either a polyp or a medusa, with a single opening, a mouth, surrounded by tentacles (Abbott and Dance 2000; Walker and Wood 2005). The corals exploited by Amerindians are known as hard corals, after the calcium carbonate skeleton that is formed around the polyp for protection. This skeleton is called corallite and is continuously secreted by the animal, which thus grows in size. As the skeleton grows at a fast pace, the polyp is pushed upwards, so that it always remains on the surfaces of the colony (Walker and Wood 2005). In the aquatic environment, corals may be subjected to modifications caused by sand, water, and predators, resulting in erosion, fracturing and perforations. When removed from this environment, corals may be affected by erosion, encrustation of sediment particles, and chemical changes (Sipe *et al.* 1980). These latter

55 Osgood (1943, 39) refers to this material as "slate-gray phyllite".

modifications may pose problems in the recognition of traces on artefacts.

The use of certain species as tools (*Porites porites*, *Acropora palmata* and *A. cervicornis*) has been already suggested (*e.g.*, Clerc 1974; Steenvoorden 1992; Sipe *et al.* 1980), but only a few publications have further explored this assumption by means of experiments and microscopic analysis (Breukel 2013; Kelly 2003; Kelly and Van Gijn 2008). Corals could have been employed for a wide range of activities, such as grinding, polishing, scraping and drilling shell, wood, stone and clay, and also as blanks for three-pointers (Kelly 2003; also Breukel 2013). Evidence of grinding can be found in striations, flattening of the corallite ridges, and in the presence of concretions of mineralised calcium carbonate on the surface (Breukel 2013; Kelly 2003). The concretions are formed by the combination of water and dislodged particles, which also serve as an abrasive. While *Acropora palmata* corals were probably used in the production of shell ornaments as grinding platforms (Carlson 1995; Clerc 1974; Kelly 2003; Lammers-Keijsers 2007), coral ornaments are rarely reported. The known beads are made of *Acropora palmata*, *Porites porites*, *Diploria* sp. and *Montastrea* sp. (Mattioni 1990; Steenvoorden 1992; Kelly 2003).

5.3.4 – Miscellaneous materials

A few beads made of other raw materials were also studied. These will be briefly discussed in this section.

Potsherds are generally the most common artefact type in Ceramic Age sites in the Caribbean. Their production has been achieved through the firing of pastes with low temperatures (below 1000°C) without the use of kilns (Hofman *et al.* 2008b; Rice 1987). The paste is constituted by clay and either the inclusion or removal of materials. The inclusions (temper) can be used to manipulate its properties, such as plasticity, mechanical resistance, and porosity (Bronitsky and Hamer 1986; Rice 1987; Rye 1981; Schiffer and Skibo 1987; Skibo 1992). It has been suggested before that ceramic sherds were used by Amerindians as tools for scraping clay in the manufacture of new vessels in the Early Ceramic Age of Guadeloupe (Van Gijn and Hofman 2008). Similarly, potsherds were recycled and used for the production of disc beads through knapping, grinding and perforating in Curaçao, Bonaire, and the Valencia Lake Basin (Haviser 1990; Osgood 1943). Haviser (1990) also mentions ceramic beads that were modelled from clay and afterwards fired, calling them “untempered-clay beads”. In southern India, these beads were made by modelling the clay around a wooden stick and removing it when the artefact had hardened (Kelly 2012). They were not produced in cooking fires, but together with other terracotta objects.

A range of animal parts was used for making ornaments. Specimens from Paleolithic contexts have been widely studied, including teeth (incisors and canines) and ivory (Sidéra and Giacobini 2002; Sidéra and Legrand 2006; Vanhaeren and D’Errico 2002; 2003; White 1992; 2002). Other animal bones, such as bear and horse phalanges, fish operculum and bone, and long bones of mammals, have also been used for the production of ornaments, figurines, tools and weapons (*e.g.*, Beldiman and Sztancs 2005; Christidou *et al.* 2009; Cristiani and Boric 2012; D'Errico 1993; Kelly 2012; Legrand and Sidéra 2007; Miller 2007b; Prous 2009; Van Gijn 2005; 2006). The external white layer of osseous tissues in animal bones is called compact or cortical bone and is largely constituted of calcium phosphate (hydroxyapatite), which gives its hardness, and collagen, which makes it more plastic and tough (Mays 1998). Bone material can vary in toughness and hardness, but in general it is easily worked: its relative hardness allows the use of percussion and groove-and-snap techniques for blank acquisition and shaping, while its softness, in comparison to certain stone types, makes abrasion techniques not extensively time-consuming (Miller 2007b, 95-6). In addition, since long bones are hollow and possess a great quantity of compact bone, presenting spongy tissue only in the interior cavity, they are commonly used for the production of artefacts, including beads. The analysis of bone artefacts is complicated, due to their degradation as a product of taphonomic processes and the action of scavengers. These modifications can be mistaken for anthropogenic activities (D'Errico 1993; D'Errico and Villa 1997; Van Gijn 2005).

In the circum-Caribbean region, pendants made of the canine tooth of a range of species, such as dogs, jaguars, and rodents, have been recovered, as well as bone flutes and items related to the inhalation of hallucinogenic drugs (Antczak and Antczak 2006; Bercht *et al.* 1997; Laffoon *et al.* 2013; 2014; Narganes Storde 2005; Osgood 1943). Likewise, from ethnographic contexts in the South American lowlands, several ornaments are composed of relatively hard animal parts (shell, teeth, nails and bones) and perishable ones (from birds: feathers, head and even the whole bird; from beetles: elytra and jaws; cf. Ribeiro 1988). Bone ornaments have been recovered from sites in the northwest of the Dominican Republic, such as beads, an earplug, and pendants of potentially stingray dentition and a fish jaw (T. Breukel, pers. comm. 2014).

The last material included in this research is jet, which is a fossilized wood generally from the Araucariaceae family. It is produced by the accumulation of plant and animal materials and their incomplete decomposition due to anaerobic conditions in a sedimentary environment (Pedersen 2004, 39-41). Instead of decomposition, a process of carbonization takes place, producing the carboniferous rock.[56] It is a black coloured material with natural polish that is easily worked due to its softness. Two varieties are available, one which is harder and produces a conchoidal fracture when knapped and another one, which is softer and has its own planes of fracture that render its carving difficult (Van Gijn 2006; 2014b). Jet is also a very light-weighted and compact material that can easily get scratched over time. Jet and jet-like materials (such as coal, cannel coal, shale, torbanite and asphalt – see

56 It was decided to keep jet separated from other stones since it has a different provenance and specific technological and use patterns which I want to highlight.

Allason-Jones and Jones 2001 for definitions) have been made into ornaments in the past and were the focus of several publications (*e.g.*, Allason-Jones and Jones 2001; Brück 2004; Frieman 2012; Sheridan *et al.* 2002; Van Gijn 2006; 2014b). Jet was noted as raw material for few artefacts from pre-Colonial Venezuela, which encompasses two penis-sheaths (one of which has a snail-like shape) and a number of beads and pendants from the Valencia Lake Basin (Antczak and Antczak 2006; 2011). This material, either raw or worked, probably came from the states of Apure, Amazonas or Bolívar on the south and west of the country, where it is still collected from river beds and used for the production of ornaments and small figurines (Cirimele 1989).[57]

5.4 – Experiments

On the basis of experiments, microwear analysts create and test hypotheses concerning the production and use of artefacts. These are known as “process and function experiments” and focus on how certain features were achieved (Outram 2005; Reynolds 1999, 159). The resulting traces, products of specific and reproducible conditions, serve as analogues to those on the surfaces of the archaeological specimens (Bamforth 2010; Keeley 1974; Lammers-Keijsers 2005; Mathieu 2002; Van Gijn 1990). A reference collection, including the traces of specific techniques and tools or usages on a given contact material is thus necessary. In the case of ornaments, a reference collection for amber beads and pendants was available in the Laboratory for Material Culture Studies. Previous experiments with Caribbean shells were also part of the collection.[58] For the present research, other experiments had to be carried out, in order to fit the variability of the assemblages and my own research questions. The choices regarding worked materials and techniques were a product of observations and inquiries prompted by the analysis process itself.

The experiments were conducted on two occasions: in May 2014, during a fieldwork in Horsterwold, the site of a reconstructed late Neolithic house (Pomstra and Van Gijn 2013). Experiments were conducted on this occasion during 4 days, under the supervision of Prof. Dr. Annelou van Gijn and with the help of Diederik Pomstra. These first experiments were exploratory (or hypothesis-forming), as different sets of techniques were tried on several materials, even those not found among the studied assemblages (cf. Adams 2010; Lammers-Keijsers 2005). The second set of experiments took place at the Laboratory for Material Culture Studies in January and February 2015. The experiments

57 Petrullo (1939, 260-61) mentions “*azabache* figures” (jet in Spanish) carved with a knife by the Yaruros of the Capanaparo River in the Apure State. He refers to realistic carvings of birds, fishes and other animals, often perforated and strung in necklaces. According to him, the figures were only made by men, who gave them to their wives. Cirimele (1989) argues that the carving of jet into ornaments and its medical and mystical associations would be a product of Spanish influence on the indigenous groups. This is nevertheless a matter that goes beyond the present study.

58 Most amber experiments were performed by W. Verschoof’s in the context of his MA research with Dutch TRB ornaments (2011). The shell experiments were conducted by Y. Lammers-Keijsers (2007), during her PhD research with Ceramic Age materials from Guadeloupe.

were *goal-oriented* (or hypothesis-testing), as they were directed towards answering specific questions raised during the analysis of the archaeological collections discussed in this thesis. The objectives of the experimental programme were neither to reproduce ornaments found in the assemblage, nor to replicate entire production sequences. Rather, the focus was to assess the toolkits used during ornament making, their performances and usefulness on a number of materials. The duration of each task was recorded, except on a few occasions. Little to no control of other variables such as pressure, gesture directionality, number of rotations or strokes, was maintained, as they were not perceived to be relevant for my specific interests. Documentation was carried out by filling standard forms (see appendix 03) and keeping photographic record of the activities, tools and blanks. On both occasions, the experiments were conducted in collaboration with Tom Breukel, who is applying a similar approach to other Caribbean collections.

The materials and tools used were selected by four means: 1) looking at what ethnographically known Amerindian communities use for similar tasks (or even peoples from elsewhere in the world), 2) referring to ethnohistoric descriptions of early colonial indigenous communities, 3) investigating what is found in the sites or is locally available in the regions, and 4) what other archaeologists in the Caribbean have found evidence for. The objective was to find references to tools and techniques used in ornament production, rather than to create an exhaustive list of possibilities.

5.4.1 – Literature review: materials and tools

In order to organize a work-plan for relevant experiments and to restrict the possible contact materials and techniques applied, the focus was restricted to informations from lowland South America and the circum-Caribbean.

Only a few authors made informed suggestions regarding the manufacture and toolkits used in bead-making in the Caribbean. Archaeologists commonly focus on the use of hard and brittle materials for drilling (mainly flint, but also rock crystal). Possible drill bits have been recovered in association to ornament-making debitage (Carlson 1995; Haviser 1990; Littman and Keegan 1991; Narganes Storde 1995; Rodríguez 1991a). The main experimental programmes in the region were conducted by Lammers-Keijsers (2007), Carlson (1995), and De Mille, Varney and Turney (De Mille *et al.* 2008). While the former two focus on the use of flint drill bits for erforating shell (hafted, non-hafted and bow-drill), the latter use a toothpick mounted on a power tool (with the addition of slurry) to drill calcite. Lammers-Keijsers (2007) also tried to use fishbone and wood to perforate shell, but her experiments were not successful. According to Ostapkowicz (2013, 297), Las Casas (1967, 317) describes the use of flint, fish spine and bone for drilling shell beads for cotton embroidery among the "Taíno".

From ethnographic contexts, the use of sharpened wooden sticks of *Socratea* *exorrhiza* or the leaf shoot of the wild plantain, with sand as abrasive is mentioned for the perforation of quartz crystal pendants by Tukanoan communities from the Upper Rio Negro at the beginning of the 20th century (Koch-Grünberg 2005; Roth 1924, 79). Drill bits made of sharpened monkey bones or teeth from both mammals and fishes have also been noted in the Guianas and the Upper Xingu, attached to a palm drill mechanism in order to perforate beads made of seed, fruit shells, teeth and nuts (Miller 2007a, 78; Ribeiro 1988; Roth 1924, 78). Lithic drill bits are also described among Carib communities of the Upper Xingu (Ribeiro 1988). While wood and bone may seem too soft to perforate the harder and tougher materials used for ornament-making, abrasives such as quartz sand play an important role. Hollow bamboo or reed drills, for instance, were used in China for perforating nephrite (Sax *et al.* 2004), and in Mexico together with obsidian powder to perforate shell (Velázquez-Castro 2011). The good performance is related to the greater pressure exerted due to the smaller contact surface of the drill. The organic drills would, however, have to be changed constantly as they wear and get dull really quickly (Koch-Grünberg 2005; De Mille *et al.* 2008).

As grinding platform and abrader in the pre-Colonial Caribbean, most authors suggested the use of *Acropora palmata* (Clerc 1974; Carlson 1995; Lammers-Keijsers 2007). The use of this species as abrader for grinding the lip of the *Lobatus gigas* shell was considered effective by Kelly (2003), as the coral particles detached during the process create an abrasive paste. However, a similar experiment with *Chama sarda* was not effective (Kelly 2003). A grooved *A. palmata* platform was recovered in an archaeological context from the island of Los Testigos, located off the northern coast of Venezuela (A. Antczak, pers. comm. 2015). The artefact was found in association with a cylindrical blank of *Lobatus gigas*, which could have been used for the production of several beads. Grooved platforms of this same coral species have also been reported from the Valencia Lake Basin. Coarse-grained stones are also suggested: Lammers-Keijsers (2007) refers to hard stone and beach rock, with the addition of sand and water; Kelly (2003) suggests the use of sandstone as grinding platform for *Chama sarda* shells. In the Venezuelan Andes, stones of banded gneiss were possibly used for grinding serpentinite pendants (Wagner and Schubert 1972). Sandstone is mentioned in both ethnographic (Koch-Grünberg 2005; Roth 1924) and ethnohistoric contexts (Léry 1994 [1578]) for grinding shell and stone beads in Brazil and the Guianas. Amerindians from the lowlands also use high-silica leaves, such as *Curatella americana* and *Cecropia peltata* for polishing seed and nut beads (Miller 2007a; Roth 1924, 79). Ribeiro (1988) mentions the practice of stringing shell fragments together and placing them on a cane section where they were turned and polished with a pebble or a pot sherd.

Cutting and sawing also played a role in ornament making for the production of blanks or for creating decorations. In the archaeological literature, hard and brittle materials, such as flint and obsidian, are commonly cited as potential sawing tools (*e.g.*, Kelterborn 1991; Velázquez-Castro 2011; 2012); likewise, suggestions of the use of ropes (string sawing) are recurrent (Lothrop 1955; Rodríguez Ramos 2007; Sax *et al.* 2004). Verschoof and Van der Vaart (2010) used a cotton string to saw amber in order to produce decorative notches. As mentioned in Chapter 2, the use of cotton rope to saw "green stone" blanks has been suggested by Rostain (2006) for the coast of Suriname, based on ethnohistoric evidence. Other authors suggest the use of different stone types for sawing, such as sandstone, considering that flint is rather brittle and that observed traces are not as V-shaped as expected with flint (Beek and Mason 2002; Corrêa 2011; Hodges 1971; Kelterborn 1991; Tsoraki 2011b).

5.4.2 – Materials chosen

The materials chosen to be worked as "bead blanks" for the experimental programme were: *Lobatus gigas* lips, *Spondylus* sp., *Oliva* sp., calcite, limestone, diorite, jet, serpentinite, mica-schist, amethyst, and *Acropora cervicornis*.[59] With the exception of amethyst, these materials were selected because of their presence in the studied assemblages. Certain materials could not be obtained and thus were not experimented with (*e.g., Chama sarda*). Others were available only in small numbers, which allowed for a minimum number of experiments (*e.g., Oliva* sp.). Some stones and minerals were obtained in a mineral fair in The Hague, such as mica-schist, serpentinite, Mexican green calcite and Brazilian amethyst. Part of the materials used during the experimental programme of 2015 were collected by the author in the northwest of the Dominican Republic in the summer of 2014, including limestone, diorite and flat blocks of sandstone.

Not many contact materials were chosen, given the limitations of time and availability of Amazonian or Caribbean materials. Flint, Caribbean hard wood (*Guaiacum officinale*), and mammal bone were chosen as drill bits. Flint was widely available in the laboratory and, given its reported efficiency for drilling, was used in a large number of experiments. During the experiments of 2014, different drilling mechanisms were attempted: a handheld flint drill, a palm drill, and a bow drill. For the last two activities, a small hole had to be started with the handheld flint drill, so that the drilling mechanisms could be stabilized. As both bone and wood seemed quite inefficient, even with the use of a bow drill, for the next set of experiments (2015) mechanical hand drills were used. On the tip of these drills, the desired bit (wood or bone) was attached. In order to mimic the movement of a bow drill, the mechanical drills were turned back and forth. This mechanism is comparable to a bow drill in terms of speed and downward pressure and it can be easily controlled by non-craftsmen. The mechanical drill with wood and bone proved to be effective for drilling,

59 The shells and corals, collected in Guadeloupe, were already part of the collection of the laboratory. The genera/species identification was made with the help of A. Antczak.

provided that a previous perforation or irregularity on the material was present in order to stabilize the drill. For grinding experiments, *Acropora palmata* slabs were chosen as grinding platforms, alongside a range of relatively flat stone blocks, including sandstone. Finally, for the incising/sawing experiments, flint was used, as well as a flake of *Lobatus gigas*, guaiacum wood, and a cotton-based rope. The last two required constant addition of water and sand as coolant and abrasives, and an initial cut made by flint.

The individual experiments performed are listed in appendix 04. The list includes the experiment number, the materials used, the activity performed, slurry, time-input, and whether it proved effective or not. The evaluation of a certain task as efficient or not based on the necessary time-input may be misleading: it is often more indicative of the knowledge and skill of the person experimenting and the quality of the materials used (Kelterborn 1991; Reynolds 1999). Therefore, whether a technique and tool were *qualitatively perceived* as efficient was included in the list. Experiments labelled “very good” surpassed preliminary expectations of efficiency, resulting in a high development of traces in a short period of time; “good” (or “effective”) refers to experiments that had a normal performance, taking a certain amount of time; finally, “ineffective” refers to experiments that did not meet the established goal in a period of time considered reasonable. The experiments and relevant results will be further discussed in Chapters 6 and 7, where they will be contrasted to the evidence observed on the archaeological assemblages.

Chapter 6 – Analysis: Valencia Lake Basin

In this chapter, the data produced during the analyses of the Valenciod collections will be presented, encompassing general descriptions of raw materials, types, production and use traces. Comparison with experimentally reproduced manufacture traces will also be made in this chapter. An interpretative leap is conducted in order to move from traces on the surfaces of individual artefacts to production and use patterns. Further, in Chapter 8, other interpretative leaps will be made to allow the construction of individual and collective biographies of artefacts.

In total, 115 artefacts from two collections from the Valencia Lake Basin were analyzed. In tune with the technological approach taken thus far in the present thesis, microwear data will be organized according to raw materials used to make the ornaments, rather than per typology. This follows the assumption that different raw materials, displaying a varied set of properties and affordances, require from a craftsperson different postures and responses, which may lead to the use of varied sets of techniques and tools. This is nevertheless an underlying assumption to be tested against the data collected here (i.e. whether different materials actually demanded different treatments). Likewise, the organization per raw material also allows us to focus on processes rather than on final products. This is not to say that the final products and their representational character were not important; rather, I argue that starting from technology may shed new light into this very issue.

6.1 – Alfredo Jahn collection

The part of the Alfredo Jahn collection analyzed in the present research encompasses 62 artefacts. The majority of artefacts was made using marine shells as raw material (49 artefacts; 79%). Lithics were the next predominant category, including 10 artefacts made of varied rock types (16,1%) and one made of chalcedony (1,6%). The other two artefacts were made of jet and ceramic (tab. 2). Further differentiations within shell and stone raw material types will be discussed below.

Regarding general ornament types, 11 artefacts were characterized as beads (17,7%), 50 as pendants (80,6%), and one could not be preliminarily assigned to any known category (1,6%). Stone and shell were used for both pendants and beads. Both chalcedony and ceramic were used in the production of beads, while jet for a pendant. In relation to colour, 39 artefacts (62,9%) were white or creamish/beige, which is not surprising given that the majority of the assemblage was made of shell (tab. 3). The difference between white

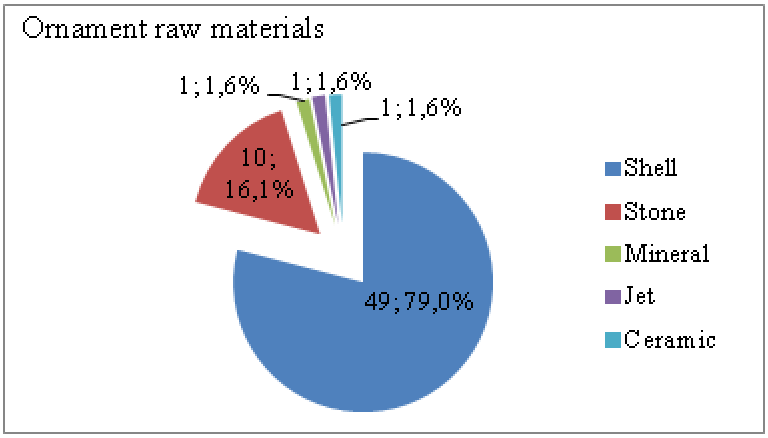

Table 2: General raw material types in the Jahn collection

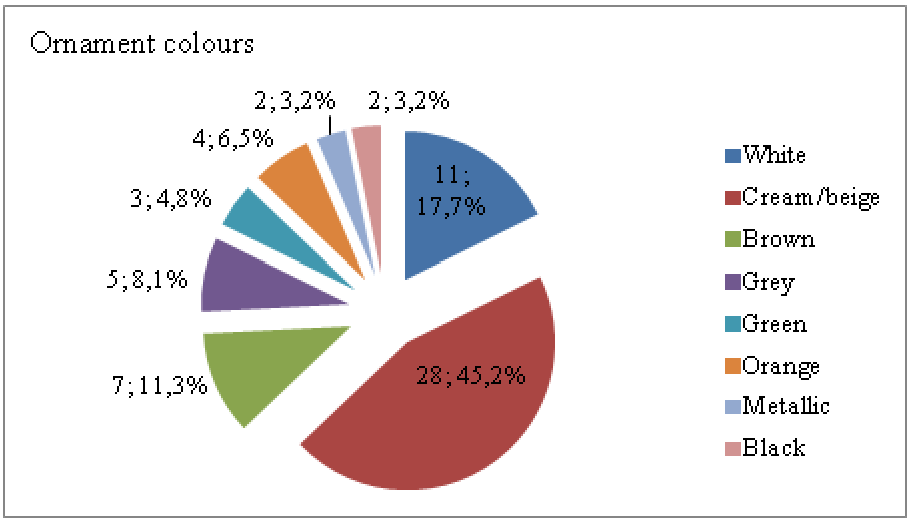

Table 3: Ornament colours in the Jahn collection

and creamish/beige is most likely related to differential preservation of shell specimens. Brown was also a common colour, being associated to the natural shades of certain shell species (*e.g.*, *Oliva reticularis*). A few shell pendants also had, in association to their white interior layers, orange on one or both sides. Orange was also present in the chalcedony bead. The other colours are less common and also linked to the selected raw materials: green was observed on serpentinite pendants, black on the jet pendant and on the ceramic bead, grey and metallic on slate pendants and in a fragmented nacre pendant. A shiny or reflective surface may also have been selected for in mica-rich slate pendants, nacreous layers, or in partially translucent serpentinite pendants.

The artefacts length varied between 7 and 76 mm, while the width varied between 4 and 86 mm. Thickness, the value parallel to the axis of perforation, varied from 1 to 25 mm. More than a half of the artefacts, nevertheless, had thicknesses equal or shorter than 10 mm (37; 59,6%). Of the 62 artefacts, 15 present some type of breakage, preventing the assessment of its original dimensions. In terms of preservation, the conditions of the artefacts in the Jahn assemblage varied considerably, sometimes preventing a detailed microscopic analysis (tab. 4; figure 5). Artefact surfaces were not only affected by natural degradation processes, especially in the case of shell artefacts, but also by varied curatorial practices. All artefacts were subjected to at least one of the modifications mentioned below.

Several artefacts (30; 48,3%) presented different degrees of surface erosion, which was commonly observed as detachment of an upper coloured layer of shells or pitting of surfaces (in shell and stone). A white and chalky surface is present on artefacts that were probably exposed on the surface of the sites, undergoing dissolution through changes in the water level of the lake (A. Antczak, pers. comm. 2015). Likewise, 31 artefacts (50%) presented sediment from the archaeological deposits encrusted on their surfaces. This could have been partially removed if the artefacts were cleaned in an ultrasonic tank. However, as agreed with the Museum in Berlin, this procedure was not performed. Some shell artefacts were in fact too fragile for the tank.

Other damage to the surfaces is related to excavation, transport, curation or storage. A few artefacts (4; 6,4%) presented fresh breaks, i.e. breaks in which the patina is fresher and of a different colour than the overall artefact. This indicates that breakage occurred recently, either in depositional or (post-) excavation contexts. One artefact displayed freshly made scratches. It is not possible to know how these breaks or scratches happened. Most artefacts look like they were cleaned at some point after excavation, with the exception of some tinklers (*Oliva* sp. pendants) which had sediment inside of the hollowed body whorl. Evidence of curatorial practices were the remains left by systems of identification of artefacts, such as stickers (8; 12,9%), nail polish (16; 25,8%) and ink writings (30; 48,3%). Both stickers and ink markings were sometimes observed on the same artefact, which is likely related to successive recording episodes. The ink marking has the identification number of each artefact (*VAnumber*) and the stickers often include *Katalog Jahn* in cursive letters and a different number. A freshly broken artefact, a serpentinite bat wing pendant,

Table 4: Number of artefacts with secondary surface modifications per raw material in the Jahn collection

	Shell	Lithic	Jet	Ceramic
Erosion	8	1	1	_
Encrusted sed.	30	1	_	_
Fresh breaks	1	3	_	_
Nail polish	7	8	1	_
Ink	12	11	1	1
Sticker	4	4	_	_
Glue	_	1	_	_
Pencil lines	4	2	_	_

a. Erosion of upper layer of shell and dirt attached to the surface (VA14019

b. Fresh break on stone artefact (VA14001)

c. Ink and nail polish on stone artefact (VA63024)

d. Detail of nail polish flaking off from the rim of perforation (VA14001)

e. Artefact with sticker on top of the surface and with a fresh break glued together (VA14002)

Figure 5: Types of surface modification observed in the Valencioid Jahn collection.

was glued back together.

Products such as glue, nail polish and ink create a thick and reflective layer on top of the surfaces of artefacts. The analysis of these areas with a microscope is rendered difficult or, in the case of higher magnifications, impossible. Areas where stickers are or were at some point display adhesive residue remains. Pencil lines, generally following the outline of artefacts, were also noted a number of times (6; 9,6%). These are related to the drawing of artefacts; while they do not occupy large surfaces, the pencil lead cannot be removed without damaging the artefacts surfaces. Finally, stringing artefacts and storing them together in small containers may also have caused damage, as their traces can be mistaken for production or use-wear evidence. None of the aforementioned practices rendered the analysis of the artefacts impossible, although certain traces and residues (such as striations next to perforations) have to be considered with caution. Sometimes, artefacts of a same type present different preservation rates; for instance, certain tinklers are better preserved than others. This difference may be associated to specific contexts of deposition or to different curatorial treatments.

6.1.1 – Shell

Marine shell ornaments, produced of bivalves and gastropods, account for 79% of the ornaments in this assemblage. A significant part of the ornaments were made using species of the *Oliva* genus as raw material (17; 34,7%[60]). These were all used for making automorphic pendants, usually interpreted as tinklers. The other common shell belongs to the *Lobatus* genus (probably *Lobatus gigas*), which was used in the manufacture of 16 xenomorphic artefacts, encompassing a broad range of types. The *Spondylus* bivalve was used for nine xenomorphic artefacts. The other two bivalves are the two opposing valves of probably the same specimen and were used to make automorphic pendants. They were probably made of *Tivela mactroides*. The nacre pendant is a fragment and therefore its species cannot be identified. It was not possible to assess if the remaining three artefacts were made of *Lobatus* or *Spondylus* shells, as there is no characteristic curvature or colour.

Three sub-types of beads were part of this collection: disc, tubular and frog-shaped (tab. 5). Only two beads are considered disc beads, one made of *Spondylus* and the other of *Lobatus*. The bead made of *Spondylus* presents an irregular face, with natural holes entering the material. These were probably caused by the attack of a natural predator of the shell before it was collected by the Amerindians (Claassen 1998). The fact that such surface was not regularized by grinding may suggest an interest in this rough texture. Only one long tubular bead (with a much larger thickness than diameter), made of *Lobatus gigas* is part of this collection. The most common bead subtype is the frog-shaped bead (*n*=5). A

60 All percentages mentioned in this section of the chapter refer to the total of 49 shell ornaments and not to the 62 artefacts in the Jahn collection – unless otherwise specified.

Table 5: Ornament types and shell raw materials in the Jahn collection

		Oliva	Lobatus	Spondylus	Chama	Bivalve	Nacre	?	**Total**
Beads	Disc	_	1	_	1	_	_	_	**2**
	Tubular	_	1	_	_	_	_	_	**1**
	Frog	_	_	5	_	_	_	_	**5**
Disc		_	1	_	_	_	_	_	**1**
P	Tinklers	17	_	_	_	_	_	_	**17**
E	Cut-out	_	_	_	_	_	_	3	**3**
N	Biomorph	_	2	3	_	_	_	_	**5**
D	Pyramids	_	10	_	_	_	_	_	**10**
A	Axe	_	1	_	_	_	_	_	**1**
N	Triangle	_	_	1	_	_	_	_	**1**
T	Umbo	_	_	_	_	2	_	_	**2**
S	Unknown	_	_	_	_	_	1	_	**1**
Total		**17**	**16**	**9**	**1**	**2**	**1**	**3**	**49**

large disc with a perforation in the centre was made of the lip of *Lobatus* shell.

Eight pendant subtypes were noted. Most pendants are tinklers (17; 34,6%) made of *Oliva* sp., followed by pyramids (10; 20,4%). Three artefacts (6,1%) were assigned to the cut-out type. Some artefacts depict living beings, especially animals (5; 10,2%); these were all grouped in the biomorphic type. In this type, pendants depicting a turtle, an armadillo, an owl, a mollusc valve, and an unidentified, presumably anthropomorphic, being are included. Two artefacts are automorphic umbo-perforated bivalve pendants (2; 4,08%). A broken nacre pendant is possibly an automorphic pendant, as the hinge teeth are still partially present, but it is not possible to know for sure. Finally, two other types were noted: one pendant with an axe-shaped morphology and a perforation on the butt-end; and one flat pendant with triangular shape. Most pendant categories are exclusive to one shell species, *e.g.*, the *Oliva* tinklers. A few artefacts can be made from different species, such as beads and biomorphic pendants.

The distribution of size and weight per type of ornament is presented in the table below (tab. 6). Only frog-shaped beads, tinklers and pyramids are present in sufficient numbers to draw conclusions from size variation. Among frog-shaped beads, size variation is minimal, especially with regards to thickness. This relative homogeneity was also noted for the pyramids: only one has a square-shaped base, being larger and heavier (0,86 g) than other specimens. For tinklers, there is more size variation, probably related to intra-species natural variability. A few specimens have been worked further than other ones, by grinding off of a larger portion of the body whorl. While there are only three "cut-out" pendants, size variation is apparent because one of them is markedly shorter and larger than the others. Regarding biomorphic pendants, there is considerable variation in morphology,

Table 6: Maximum and minimum size and weight per shell ornament type in the Jahn collection

		Length (mm)		Width		Thickness		Weight (g)	
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Beads	Disc	15	14	14	13	3	6	1,57	0,91
	Tubular	8	_	6	_	63	_	57,7	_
	Frog	19	16	17	14	2	1	1,41	0,68
Disc		35	_	33	_	2	_	7,14	_
P	Tinklers	36	20	24	12	22	9	10,29	1,25
E	Cut-out	43	24	10	10	2	2	1,37	0,83
N	Biomorph	76	30	48	16	12	3	31,63	3,00
D	Pyramids	10	7	9	4	6	4	0,86	0,18
A	Axe	43	_	22	_	11	_	19,82	_
N	Triangle	22	_	40	_	2	_	3,59	_
T	Umbo	24	24	27	26	7	4	2,37	2,35
S	Unknown	25	_	24	_	2	_	0,95	_

size and weight. Nevertheless, these pieces are generally heavier, three-dimensional and larger than most other artefact types. The minimum weight recorded on the table (3,00 g) is an exception and belongs to the single flat pendant of the category (the valve-shaped pendant, VA15522). The axe-shaped and the nacre pendants present breaks that affect their size and weight measurements. For tubular and disc beads, it is impossible to talk about variation in size as only a few of these are included in this assemblage.

<u>6.1.1.1 – Techniques and toolkit</u>

The use of several different techniques was attested in the shell assemblage. These will be divided according to the production stage in which they were used, i.e. blank acquisition, shaping, perforation, decoration and polishing. Certain techniques can be used for different stages, that is, they involve the same tools and gestures but can be used for achieving different ends. The division in stages of production aims at highlighting these different usages and the different intentions behind them.

Blank acquisition

It is not possible to assert which techniques were used for blank acquisition as most artefacts are (nearly) finished products and do not bear traces relating to this stage anymore. This was the case for 17 artefacts (34,7%), which display no clear evidence of how their blanks were originally obtained. One can only speculate based on the natural morphology of the shell, on blank sizes necessary for specific artefacts and on experimental results. Naturally fractured shells may have been collected from the beach sand, but this cannot be ascertained. The *Chama* bead with holes and cavities possibly made by a predator is the only artefact with evidence for the collection of a whole shell or fractured blank from the beach. In the case of automorphic artefacts, whole species were used as blanks, being subjected to little modification (shaping and perforating). This was the case for 19 artefacts (38,7%): the 17 tinklers and the two umbo-perforated pendants.

The only blank acquisition technique for which evidence was observed is cutting/sawing. A preliminary cut groove may have been followed by snapping the piece in two either with the hands or with the help of hammerstone and chisel. This operation, however, cannot be recognized unless an assemblage includes pieces that were not well-ground or that were abandoned in this stage of manufacture. Likewise, it is not possible to know whether the traces observed on archaeological artefacts are evidence of blank acquisition (i.e. cutting the shell in pieces) or of an initial shaping (breaking the shell with a hammerstone and later removing large undesired portions by cutting). According to the conducted experiments, sawing a blank of *Spondylus* with flint and breaking the remaining part is quite efficient, fast, and allows for the production of controlled and precise blanks (exp. 3043; 63 min). Flaking the valve is also possible and in fact faster; it is not, however, capable of producing carefully controlled blanks (exp. 3061-1). In a context in which such shells are not abundant as the Valencia Lake Basin, cutting/sawing may have been chosen in order to save material. The complex shapes desired for Valencioid pendants may have required this more time-consuming technique. On the other hand, sawing considerably damaged the edges of the flint tools used.

For the *Lobatus gigas* shell, on the other hand, sawing proved to be quite time-consuming with a flint tool: after 135 min, even though all the sides of the shell had been grooved, the task could not be completed and the edge of the flint was shattered (exp. 3055-1). The *Lobatus* shell is very thick and though, with a complex cross-lamellar microstructure, which prevents it from being easily cut and broken (Kamat *et al*. 2000).[61] Being time-consuming, however, does not mean that people in the past would not have used this technique at all. Flaking or breaking the shell against a surface is faster and more efficient, especially if the primary goal is to separate the lip from the body whorl or to open the whorl (Antczak 1998).

The cutting/sawing technique was identified in 13 artefacts (26,53%). These were all flat artefacts with relatively sharp sides, close to 90°, such as the frog-shaped beads, some of the biomorphic, and the “cut-out” pendants. In fact, the adjective “cut-out” refers to this technique, as Bennett (1937, 122) had already noted. It was used to cut the *Spondylus* shell in order to make eight ornaments, mostly flat ones. The raw material used for the three “cut-out” pendants was probably *Spondylus* as well, although it is not clear. This technique was also used for shaping a *Lobatus gigas* biomorphic ornament. On figure 6, it is possible to observe the cut marks on the edge of a frog-shaped bead (VA14021-IV; a) and

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61 While the fact that the two people involved in the experiments were not experienced artisans must not be overlooked, the general conclusion regarding the time-consuming aspect of the task is still valid.

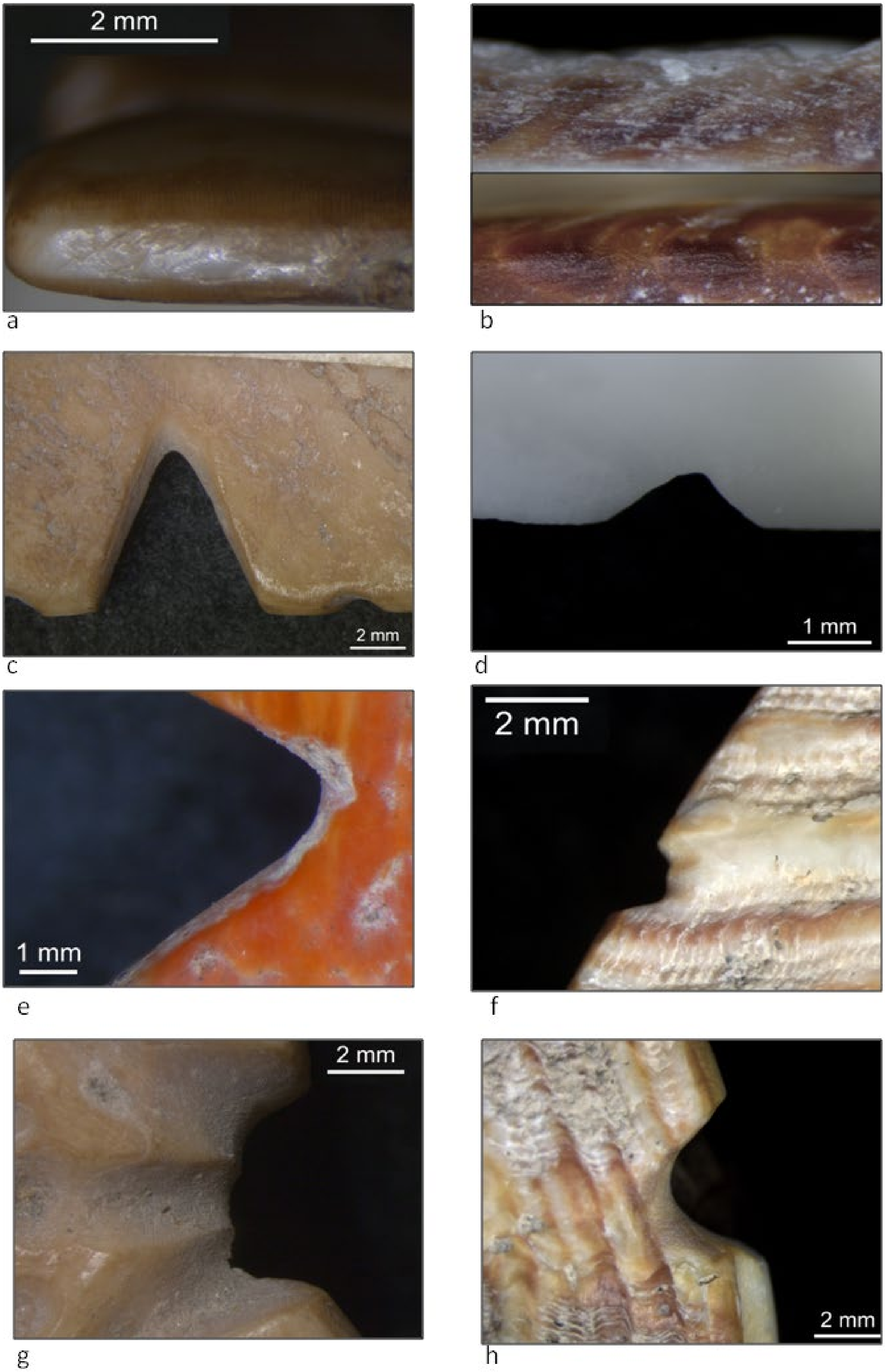


Figure 6: Cutting/sawing and notching on archaeological (left) and experimental (right) shell artefacts.

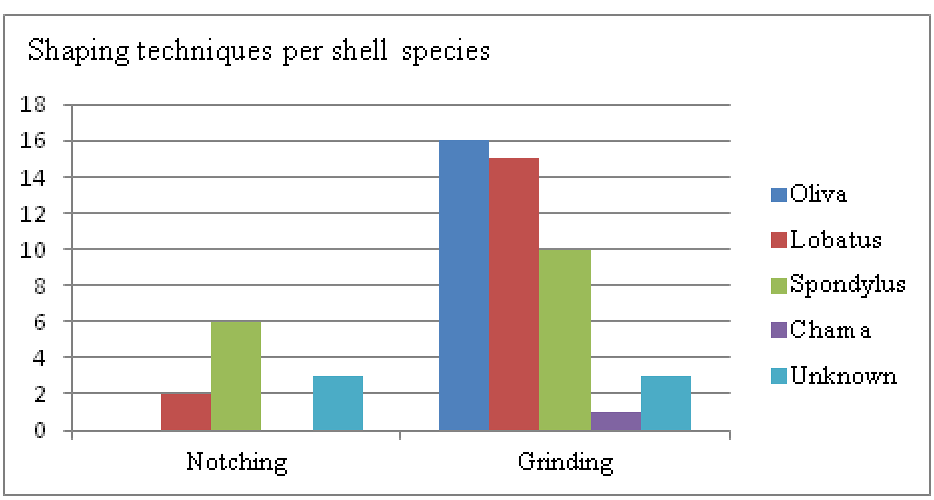
compare it to the experimental replications (b), before (top) and after grinding (bottom). As no cutting grooves remain from this stage, the only way to assess the tools used is by observing the traces on shaping and decorative features.

Shaping

Shaping techniques are generally applied to a blank to approximate its morphology to the desired end-product in terms of length, width and thickness. Under this operation, techniques such as sawing (as suggested above), grinding and scraping can be included (tab. 7).

Notching is a specific variety of sawing, which refers to the creation of an indentation on the side of an artefact to produce the desired shape. This procedure was observed on 11 ornaments (22,44%), half of them made of *Spondylus* (*n*=6). On seven artefacts (frog-shaped beads and "cut-out" pendants), the notches have a V-shaped section with deep striations inside (figure 6, c – f). It is possible that such notches were made with a hard lithic tool, such as flint, directly on the side of the artefacts. However, even on those specimens, some of the notches have a larger shape. Their morphology suggests that rather than just making one single notch on the side, the artisan could slightly change the position of the edge of the tool in order to carve adjacent areas, thus expanding the notch. Likewise, in order to make large notches, multiple incisions are carved on the side of an artefact adjacent to each other and later polished. In addition, it is possible that notches were started using a hard lithic point and later widened or polished with a softer and less brittle tool, such as a softer stone, wood or bone (Beek and Mason 2002; Kelterborn 1988). On biomorphic pendants made of both *Spondylus* and *Lobatus* (*n*=6), the notches are clearly U-shaped, also with deep striations inside (figure 6, g). This feature may have been produced by the widening of a notch with a "soft" tool.

Table 7: Shaping techniques per shell species in the Jahn collection



In order to use soft tools, slurries (*e.g.*, quartz sand and water) have to be added in great quantities: rather than by cutting, the groove/notch is formed through the abrasive capacity of the hard grains carried back-and-forth by the tool's edge (Miller 2007, 59). The tool serves as a vehicle for carrying the abrasives, while water serves as both lubricant and coolant (Hodges 1971, 105). The conducted experiments show that it is possible to make a U-shaped notch on the side of a *Spondylus* shell fragment with a wooden flake (exp. 3062-3; figure 6, h). However, it was only made possible by starting on top of a previous notch made with flint and further expanding it.[62] The addition of water and sand was also necessary. It is therefore likely that in most cases a combination of tools was used. Nevertheless, more experiments should be conducted. In terms of gesture, the notch seems to be made by entering the faces of the artefact, carving first both faces, before uniting the two sides by carving the middle. According to the experiments, this is the easiest way of making a notch, rather than just sawing against the thin side, where there is less support for the edge of the tool. It is easier to scratch the face first and only then slowly proceed to the side. Using this technique, several elaborate features are created on the pendants, such the wings of an owl and the tail of an armadillo.

Evidence of the use of grinding for shaping was found on all shell raw materials and artefact types.[63] On 45 artefacts (91,8%), it was recognized by the flattening of surfaces and striations, which are produced by the grains dislodged from the platform (stone or coral) and/or added abrasive grains. On 13 artefacts, a characteristic faceting of surfaces was also noted. The resulting polish, flat and striated, suggests the use of mineral hard materials for grinding (figure 7, a, c, e). However, both stone and stony corals are mineralized and hard. Experiments have shown that the artefacts on which stone was used together with sand were intensively flattened and displayed abundant regular striations (figure 7, d, f). Grinding with an *Acropora palmata* platform, as other authors have noted (Breukel 2013; Kelly 2003), is greatly facilitated by the addition of water, due to the formation of an abrasive paste by the dislodged coral grains. In my experiments, the specimens ground on coral presented less pronounced flattening and fewer striations (probably due to the lack of sand) (figure 7, b). While the experiments point towards a difference between stone and coral polish, at this stage it was not possible to distinguish the material used for grinding on the archaeological artefacts.

Grinding of *Lobatus gigas* shells has proven to be time-consuming, but efficient, on both stones and coral. This is in agreement with what was noted by Lammers-Keijsers (2007, 46-7), whose grinding experiment for the production of a celt took 9 hours. Grinding is considerably easier when performed on *Spondylus* (exp. 3045; 35 min) and *Oliva*. During

62 A previous experiment sawing calcite with the same wood variety (*Guaiacum officinale*) proved ineffective (exp. 2479-2).

63 The automorphic, umbo-perforated pendants were also made by grinding, which produced the perforations. They are not included in the table because they will be discussed later as part of perforating techniques.

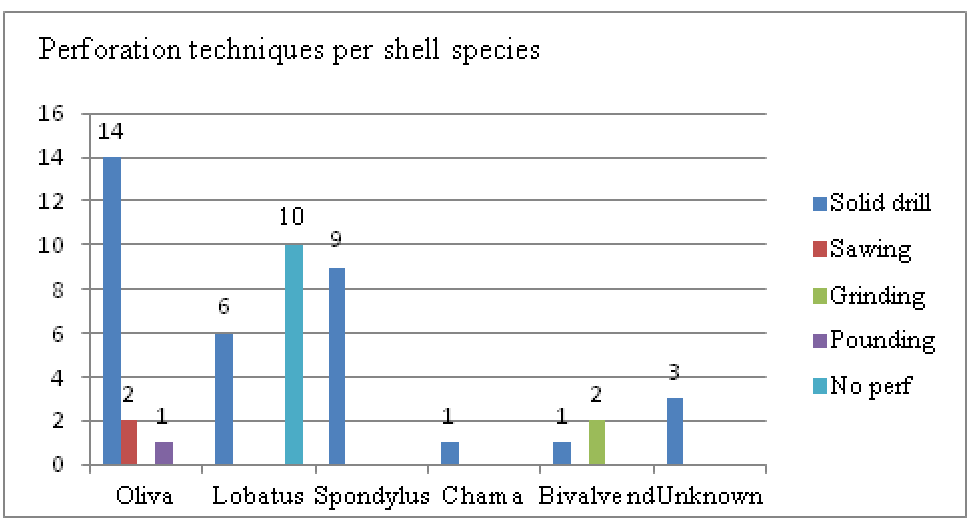
Figure 7: Archaeological (a, c, e) and experimental (b, d, f) grinding traces. Archaeological (g) and experimental (h) sawing on Oliva shell

the experiment, it became clear that as the grinding of the apex of the *Oliva* proceeds, the inner whorl starts breaking (exp. 2498-1; 60 min for grinding off the apex[64]). In the artefacts analyzed here, there is no evidence of the use of another technique in addition to grinding (figure 7, e). This of course may be the result of the grinding technique itself, which erased previous traces. Only in one *Oliva* tinkler the apex was removed by the use of a pounding technique (percussion with a stone).

Perforating

Different perforating techniques were used to create the suspension hole on shell ornaments. In contrast to shaping techniques, certain perforating techniques seem to be restricted to some artefact types (tab. 8)[65]. This is the case with automorphic bivalve pendants and the *Oliva* tinklers. The perforation on the bivalves is made by rubbing their umbo against an abrasive surface until a hole is formed. This use of grinding for the creation of holes is more time-consuming, but avoids the risk of breaking the fragile shell. The surface of the umbo may also be considered too convex for a stable placement of a drill point; however, the convexity of the surface was not a problem for the drilling of *Oliva* tinklers. This technique may have been performed using a stone or coral platform and has been identified elsewhere in the world, especially for the perforation of shells (*e.g.*, Barge 1982; Francis 1982; Price 2012).

Table 8: Perforation techniques per shell species in the Jahn collection



64 For this same procedure, Francis (1982, 714) reports taking 1 min and 40 seconds on a basalt rock, while Velázquez-Castro (2012, 244), using the same material as grinding platform, reports 50 min. It is not clear what product Francis (1982) was aiming for, but he mentions breaking through the actual hole with a point. Velázquez-Castro's (2012) goal was very close to mine, so it is possibly a reasonable time-estimate.

65 In this chart, the nacre artefact was included as non-identified bivalve. The table was also inverted (in comparison to the previous one), in order to highlight the different techniques used for each shell species.

Regarding the tinklers, three different perforating techniques were used for creating the side perforation (drilling, pounding and sawing). This is evidence that shells offer considerable possibilities for working, including the use of different techniques for attaining similar goals. Two techniques were only observed on the tinklers and not in any other shell artefact: sawing and pounding. Pounding was used to produce the side perforation of one specimen (VA14046b), creating a large hole with ragged edges. This hole is much larger (8 mm) than the ones observed on other specimens. The precise technique and tools used are not clear. Sawing can be identified by the distinctive elliptical shape of the hole (Francis 1982). While the use of hard lithic point can provide greater cutting effectiveness, the resulting groove can be quite narrow: after 60 min sawing the side of an *Oliva* shell, the resulting hole was small and the groove's shape narrow (exp. 2498-2; figure 7, h). When compared to the grooves on the archaeological pieces (figure 7, g), the latter are broader and have a more U-shaped bottom, with striations inside. This may be justified by three processes: the use of a different raw material for the tool, the widening of the groove with a different material (maybe an organic tool) or by progressive (use-related) wearing of the hole and groove.

The most common technique for perforating shell ornaments was drilling (34 ornaments), which was used on all shell species analyzed here. Experiments were carried out using different mechanisms and drill bits. Drilling of a *Lobatus gigas* lip was attempted with a handheld drill, with a hafted drill bit turned between the palms (palm drill), with a bow-drill, and with a handheld mechanical drill. The handheld flint was only used to start perforations, so that the drilling devices could be stabilized. In most experiments, the drill bit was made of flint and no abrasive or lubricant was added. They all proved to be effective, especially the bow-drill. The use of drill bits of organic materials proved efficacious only with the mechanical drill and addition of sand and water. Guaiacum wood and mammal bone were used to drill *Lobatus gigas* and *Spondylus* sp. respectively (exp. 2487-2 and 3061-2). Both were quite time-consuming, but nevertheless efficacious.

The perforations are overall cone-shaped, but with cylindrical walls and a rounded, but flat leading edge. In addition to thin circular striations, the walls also have large circular grooves (or furrows), sometimes quite narrow and sometimes almost globular (figure 8, a, b). These are also quite regular in their shape, in contrast to experimental working with a flint drill bit (figure 8, c, d). These features can be observed on all the drilled shell artefacts. The micromorphology of the experimental perforations made with wood matches the archaeological ones, including a slightly cylindrical shape of the hole, furrows, and a flattened leading edge (figure 8, e, f). The furrows could have been caused by both accumulations of abrasive powder and debris, and by the wearing of the wood, which would produce a blunt and larger edge. It is therefore likely that they were produced by a wooden drill bit. More experiments, however, need to be carried out to test this hypothesis.

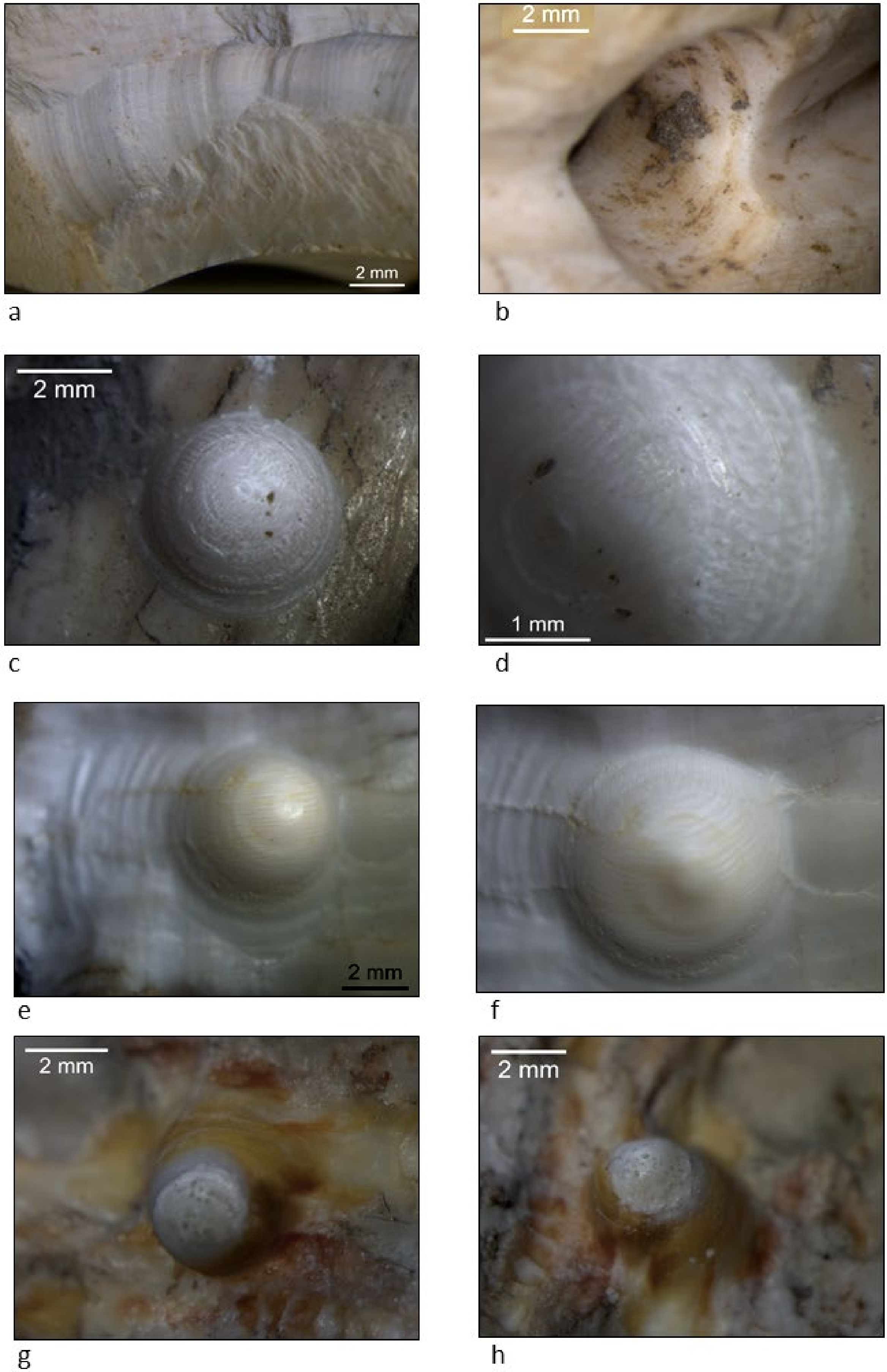
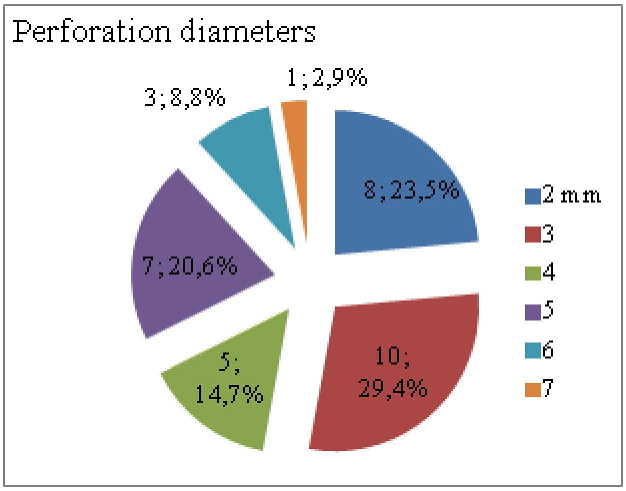


Figure 8: Archaeological (a, b) and experimental (c – h) drilled perforations on shell. c, d: palm drill with flint tip; e, f: mechanical drill with wooden tip; g, h: mechanical drill with bone tip.

Table 9: Diameter of drilled perforations (mm) in the Jahn collection



More than half of the drilled perforations on the archaeological shell ornaments have between 2 and 3 mm of diameter (52,9%) and only a few have between 4 and 5 mm (35,2%) (tab. 9). While this cannot be used as precise indication of the diameter of the drill bit (since the hole may have been enlarged by use), this suggests that the drill bits were quite small. It also points out to homogeneity among the drills chosen for this task, always of approximate sizes. In fact, there is little to no correlation between the choice of drill bit diameter and the type of ornament to be perforated.

Perforations are predominantly biconical, that is, they were made from both sides with the two cones meeting in the centre. This suggests the use of massive drill bits, as opposed to hollow ones. Considering the difference in depth of most cones, it seems that the perforations were made primarily from one side and only then finished from the other. The only artefact type whose perforations were predominantly conical, that is, made from only one side, were the tinklers. This is expected given that it is not possible to reach the inside of the shell without breaking the body whorl. The rim of perforation of the frog-shaped beads is severely damaged, which may justify the conical appearance of one of them. Finally, the perforation of the tubular bead (VA15406b) is certainly cylindrical, but it is not possible to assess if it was made from one or both sides. In fact, it is not clear how such a long perforation (63 mm) was made without breaking the blank. This will be further discussed in the section on the La Mata collection.

The perforation of the tubular bead presents cut marks on its rims, possibly made with a hard stone tool; this may have served to widen the rim and also guide the string of attachment (figure 9, a). Other three shell ornaments also display grooves next to their perforations, made in order to guide the string: the owl-, the turtle-, and the bivalve-shaped pendants (figure 9, b, c). Such grooves served to keep the string in place and better accommodate it deeper into the shell, rather than protruding on the back of the pendants.

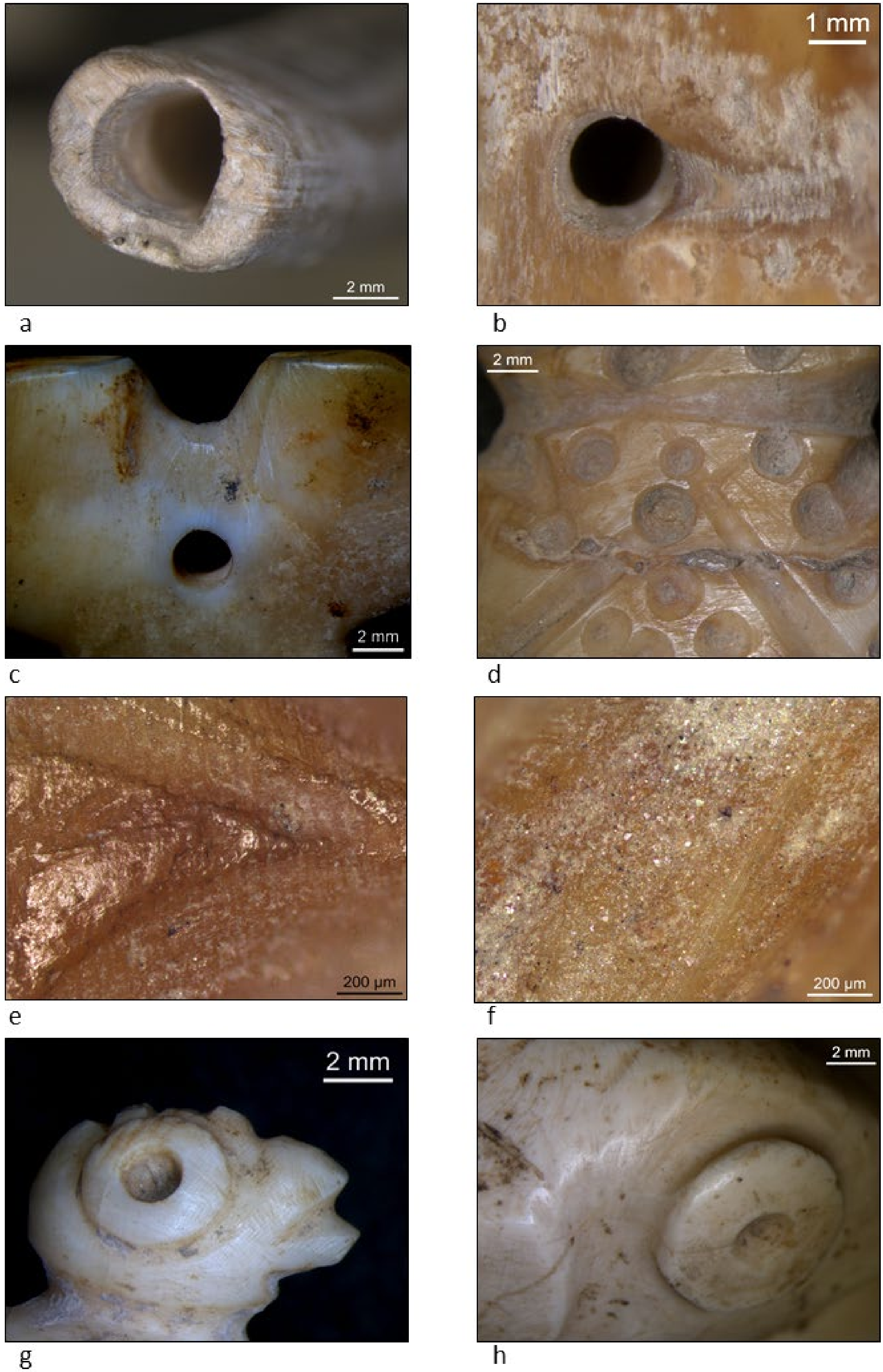


Figure 9: Grooved perforations (a, b, c) and decorative techniques (d – h).

Vargas Arenas and colleagues (1997) had already noticed these intentional grooves in some of the ornaments studied by them.

The positioning of perforations in pendants is normally associated to the way in which the ornament is to be worn. Four artefacts present more than one perforation, a feature most likely related to their specific systems of attachment. This is the case with two zoomorphic pendants (the turtle- and the armadillo-shaped ones), with the triangle-shaped and one of the umbo-perforated ones. In the case of the latter, it is possible that the second perforation was naturally produced by a predator of the shell, as it displays no characteristic features of man-made perforations.

Decoration

In total, 11 shell ornaments presented decoration. Drilling, used to produce dots, eye sockets and mouths, was observed on six artefacts. This operation makes use of the same procedure and toolkit as the perforation of ornaments with the difference that the perforation is only started, leaving a stepped circle on the artefact. Incision is a form of cutting/sawing and produces the same traces (U-shaped grooves with striations). The main difference is that, whereas before the intent was to separate two parts of a block, here it is just to produce a line on the surface. It was the most common technique (n=9) and was used to carve lines marking morphological features and decorations on the bodies (figure 9, d – f). Regarding the gesture, on the archaeological pieces incisions are generally thicker on the middle than closer to the edges of the artefact. This may seem strange if it is assumed that the gesture started on the side and from there, proceeded towards the centre of the face. However, during the experiments, it became apparent that when working a convex surface (especially with an inflexible flint tool), it is easier to cut the more pronounced area on the middle first, before being able to proceed to the sides. The middle is where a greater number of cuts will be made and where the groove will be deeper and thicker. After making the groove in the middle, the notches on the sides can be made towards the middle (figure 10, a). This is made by changing the position of the artefact, resulting in side notches on top of the incision grooves.

Excisions are produced as the outcome of multiple incisions and notches, “carving out” an area which one desires to isolate from the rest of the artefact: this is how heads, tails and eyes were produced (figure 9, g, h). It was not very common, being present only on three biomorphic artefacts. Notching, as described above, also has an important role in the creation of shapes of the artefacts. Decoration techniques are not always isolated on the artefacts, but are often found in combinations: incising and drilling (n=1); incising, excising, notching and drilling (n=3); and incising and notching (n=5). Not all the artefacts that displayed decorations were depicting biomorphic figures; both the triangle-shaped pendant and the perforated disc had decorations applied to their surfaces: drilling and

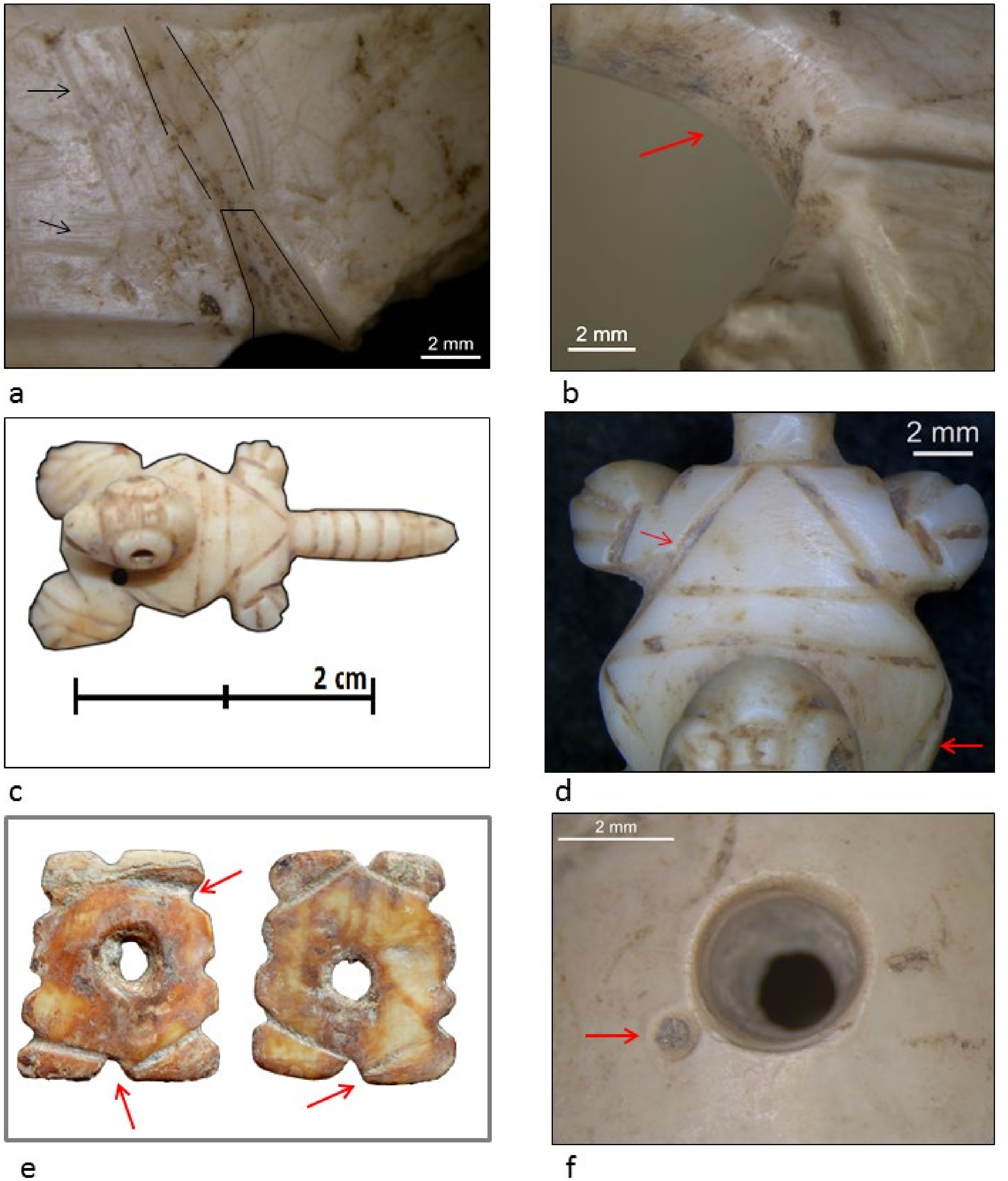


Figure 10: Performance (a, c – f) and polishing (b).

incising in the case of the former and only drilling for the latter. All the techniques were applied both to *Spondylus* and *Lobatus*; the difference between the two species does not seem to have been a factor in the selection of decoration techniques or features used.

Polishing

The identification of polishing in this collection is complicated, as considerable part of the microwear polish on the surface of an ornament may be the result of contact with a surface (skin or clothing) during its use. It was therefore only possible to identify the use of the polishing technique on artefacts in which traces from previous stages of manufacture were deliberately erased. This was the case with the four zoomorphic ornaments, in which a soft material was used to erase the groove marks from the notching of the sides (figure 10, b). This process is different from the one described above for notching (expanding and polishing with an organic tool) as rather than uniting notches to produce a larger one, it aims at smoothing the whole surface of the notch, eliminating the individual "strokes" of the preceding tool. The presence of misplaced or old incision grooves on the surfaces of many ornaments suggests that there was not much concern with this stage.

6.1.1.2 – Performance and technical accidents

The complex and three-dimensional shapes of the ornaments and the long perforations executed without breaking are clear evidence of the high craftsmanship of Valencioid shell working. However, rather than just arguing for this, my goal is to look for variation within this broad assertion, i.e. elements that indicate high and lower skill levels, in order to assess the composition of the social groups involved in the craft (tab. 10). An evidence of high skill is the use of excision. This technique demands considerable planning in order to make a three-dimensional feature through the application of successive incision grooves. For

Table 10: Levels of skill investment per ornament type in the Jahn collection

		High	Medium	Low
Beads	Disc	_	1	1
	Tubular	1	_	_
	Frog	1	2	2
Disc		_	1	_
P	Tinklers	_	15	2
E	Cut-out	_	3	_
N	Biomorph	4	1	_
D	Pyramids	_	9	1
A	Axe	1	_	_
N	Triangle	_	1	_
T	Umbo	_	2	_
S	Unknown	_	1	_
Total		**7**	**36**	**6**

instance, in the case of the armadillo-shaped pendant, it required selecting a blank that is long and thick enough, so that the complex features could be detached from the bulk of the body such as the protruding head and tail (figure 10, c). This implies that the maker knew how to manipulate the volume and properties of the "lump" in order to produce the figure. The positioning of the incision grooves marking the limits of the body suggests that they were made before the body was cut into shape (figure 10, d). It indicates the "drawing" of an outline before the actual production of the piece. This concern stands in stark contrast to the production of cut-out pendants or tinklers, which do not demand considerable planning or skill.

Comparing different specimens of a same type can help differentiate the investment of time and care on individual pieces: comparing the frog-shaped beads, one of them is clearly more finelly-made than the others, as it is carved symmetrically on both sides. The other specimens are carved on only one face without care for the number of side notches and for the careful placement of incisions (figure 10, e). In the case of tinklers, the choice for perforating the side by pounding rather than drilling or sawing is perceived as a "sloppy" solution (even though it is not possible to know the actual reasons behind it). The presence of a previous, misplaced perforation, before the correct one on a tinkler is an evidence of a technical mistake (figure 10, f). On the anthropomorphic pendant, misplaced cutting marks were not "erased" and no concern was invested in the distribution of decorative perforations: they are placed too close together and some even overlap (figure 9, d). Misplaced cut grooves can also be seen on the owl-shaped pendant (figure 10, a).

The significance of such "mistakes and sloppiness" has nevertheless to be placed in the context of the whole artefact and of the whole collection, i.e. it must be ascertained in terms of comparison with other pieces. For instance, in the armadillo-shaped pendant there is a misplaced cut mark on the eye. This is not surprising giving the small size of the artefact; additionally, this small mistake or lack of interest in erasing such a small trace has little significance when compared to the overall complex execution of the artefact. This is to say that the levels of skills presented here are informed suggestions rather than objective and absolute classifications – and therefore should not be over-interpreted.

Regarding breakages, with the exception of two artefacts, none of the breaks observed in the shell collection (n=6) seem to be related to manufacture. The exceptions are the axe-shaped and the nacre pendants, both of which have old breaks on their perforation and no clear signs of having been used. The perforation on the axe-shaped pendant is parallel to its width (22 mm) and biconical (although the cones have cylindrical walls). The difficulty in this task may have caused the break, even if in other artefacts longer perforations have been made (*e.g.*, the tubular bead). It was still considered of "high" skill because the perforation is complete. As for the nacre pendant, the conditions under which it broke are not clear.

6.1.1.3 – Use-wear

The table below presents the number of artefacts on which use-wear traces were observed (tab. 11). On the first columns, the number of artefacts with use-wear evidence is listed (in bold); the numbers presented for the features are only for artefacts included in the Use-wear – Yes column. The only exception is one of the pyramids, which presents contact polish all around its ridges (number in red on the table).

Polish and rounding on the rim of perforation is the most common type of use-wear trace observed on the shell artefacts (26 out of 33 artefacts: 78,7%); it is caused by the contact of the string of attachment with the rim of perforation (figure 11, a, c, d). It could not be observed on artefacts in which the rim was severely damaged, covered by sediment or by post-excavation features such as on the frog-shaped and disc beads. On a few occasions, stringing left scratches entering the rim (*n*=3), which may have been caused by the material the strings were made of, such as high-silica plants. Deformation of the rim of perforation, either producing a "sunken", lowered area or deforming it to a particular side was noted on 11 artefacts (33,3%). It was caused by extensive contact between the string and adjacent areas, probably connected to the usage of an ornament for a long period of time. Deformation was clearly observed on the cut-out pendants, which displayed groove-like sunken features on both faces, extending from the perforation to one of the edges of the artefacts (figure 11, e). This is indicative of strings being tied on both sides of the pendant.

Contact with surfaces, such as the body and clothing, caused a distinctive polish around the edges of artefacts on the non-decorated, concave faces (*n*=8) and on both faces (*n*=10) (figure 11, b). At this stage of the research, however, it is not possible to distinguish

Table 11: Number of shell ornaments with specific use-wear traces per type in the Jahn collection

		Use-wear		Polish on rim	Rim deformed	Scratches	Polish sides		Wear other ornaments
		Yes	**No**				1	Both	
Beads	Disc	**1**	1	1	_	_	_	_	_
	Tubular	**1**	_	1	1	_	_	_	_
	Frog	**5**	_	_	_	_	5	_	_
Disc		**1**	_	_	_	_	1	_	_
P	Tinklers	**15**	2	15	2	_	_	6	_
E	Cut-out	**3**	_	3	3	_	_	3	3
N	Biomorph	**3**	2	3	3	1	2	_	_
D	Pyramids	_	10	_	_	_	_	**1**	_
A	Axe	_	1	_	_	_	_	_	_
N	Triangle	**1**	_	_	1	_	_	_	_
T	Umbo	**2**	_	2	1	2	_	_	_
S	Unknown	**1**	_	1	_	_	_	_	_
Total		**33**	16	26	11	3	8	10	3

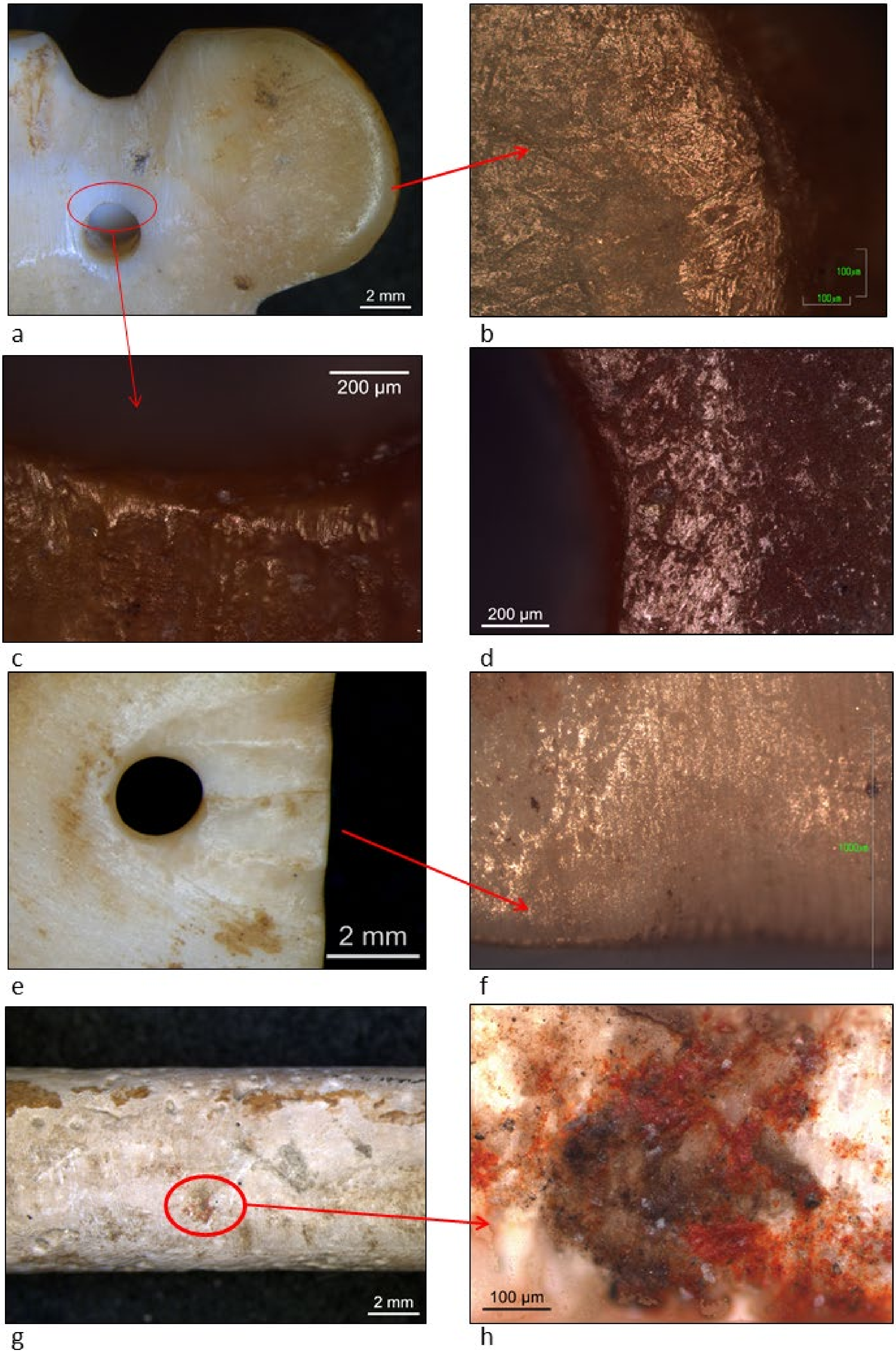


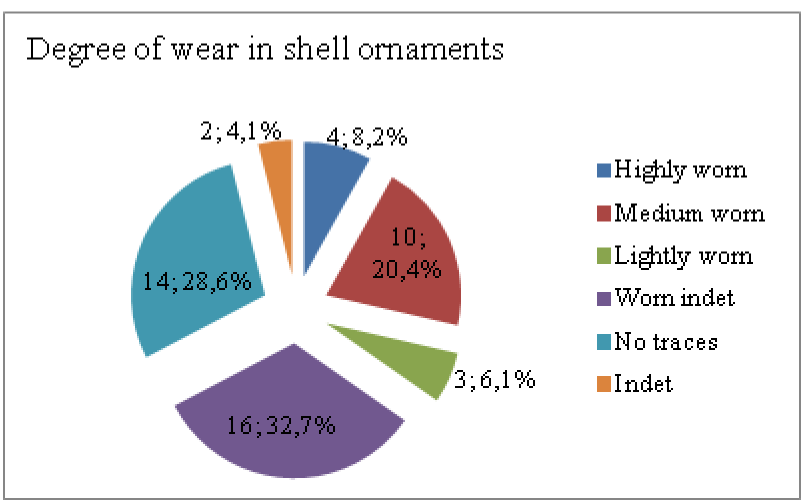
Figure 11: Use-wear on shell ornaments: polish (a – f), striations (c), deformation (e, f) and red residue (g, h).

between polishes caused by skin and clothing. Nacre remains on concave surfaces, alongside the common presence of nail polish and ink, limit considerably interpretation.[66] A similar problem is associated to the interpretation of wear caused by contact with other ornaments closely attached to these ones in a composite piece. The three cut-out ornaments present polish along their faces, which, considering their systems of attachment, could not have been caused by contact with body/clothing, but by contact with pieces closely attached to them.

Based on this evidence, degrees of wear are suggested for each shell ornament in the collection, from bearing no traces to highly worn (tab. 12). Artefacts which presented evidence of use, but whose time of usage could not be assessed were considered "worn indetermined" (16; 32,7%), whereas the artefacts in which evidence of wear was not clear were referred to as "indetermined" (2; 4,1%). As the table illustrates, most shell artefacts in the assemblage were used to some degree (33; 67,3%); in addition, most of the artefacts whose length of wear is known were considered "medium worn". Only a few artefacts were considered "highly worn" (4; 8,2%) and "lightly worn" (3; 6,1%). Under the former denomination are included two tinklers, the turtle-shaped pendant and one of the cut-out pendants; under the latter, two tinklers and the perforated disc. A large percentage of the assemblage did not display use-wear traces (16; 32,7%), including the ten pyramid-shaped artefacts which have an overall fresh appearance and do not present perforations.

A grainy reddish substance, reminiscent of a colouring material such as ochre, was observed on one spot on the face of the tubular bead (presumably the surface that would not be in contact with the body, but facing the outside). It is in fact visible with the naked eye, although its structure only became clear with use of higher magnifications with cross-

Table 12: Degrees of wear in shell ornaments of the Jahn collection



66 In order to tackle with the specificities of use-wear formation on ornaments, an exhaustive experimental programme needs to be conducted. This is however outside the scope of the present research.

polarized light (figure 11, g, h). The artefact was not subjected to chemical analysis, which prevents any further consideration. This residue should be regarded with caution, as it could be from the soil or from post-excavation processes.

6.1.1.4 – Recycling and reuse

Three artefacts present evidence of having been recycled and re-used. In two of them, the bivalve-shaped and the turtle-shaped *Spondylus* pendants, cut marks were made on top of an already used area (presenting use polish). In fact, the cut grooves seem to interrupt the previous polish on the area, around the rim of perforation (figure 12, b, d). As mentioned above, the making of cut grooves adjacent to perforations, in order to restrict the movement of the string, is a feature observed on other Valencioid pendants. In this case, the inside of the cut grooves and the surrounding higher areas present degrees of polish different from each other, suggesting that the former was not used for as long as the latter. Apart from the addition of the cut grooves, the ornaments did not suffer any significant morphological change.

The final evidence comes from a tinkler with a drilled perforation deformed on the top (i.e. in direction to the siphonal canal). Its body whorl was broken, leaving the rounded ragged edges of the remaining part of the whorl visible (figure 12, f). The fact that this is the only tinkler with deformed drilled perforation suggests a different usage, for instance as a pendant (rather than a tinkler *per se*, which needs a bell-shaped, hollowed interior cavity to produce sounds). The differential usage may have produced more intense pressure on the rim, deforming it (figure 12, e). The presence of polish and rounding on the break supports this idea as it suggests that the piece was placed against a surface (body or clothing). It is thus possible that this was a broken tinkler that was reused as a "normal" pendant.

6.1.2 – Lithic

Lithic materials were used in the production of 11 artefacts from the Jahn collection (17,7% of the 62 ornaments). The materials have not been subjected to any type of geo-chemical analysis, which prevents a secure identification. There were only two recurrent raw materials: slate and serpentinite. The former was used in four ornaments and is a fine to medium-grained foliated metamorphic rock, one of which has small garnets and considerable mica. Its colours vary from dark to light grey, some displaying a metallic/silver appearance. It was used to produce flat ornaments with round and diamond-shapes. Serpentinite is a fine-grained metamorphic and tough rock, which was used for three artefacts. There is variation between the different "serpentinite" specimens in terms of colour, translucency and schistosity. In all cases, the serpentinite was used to produce bat wing pendants. Three rock types could not be identified: an igneous rock with light grey/

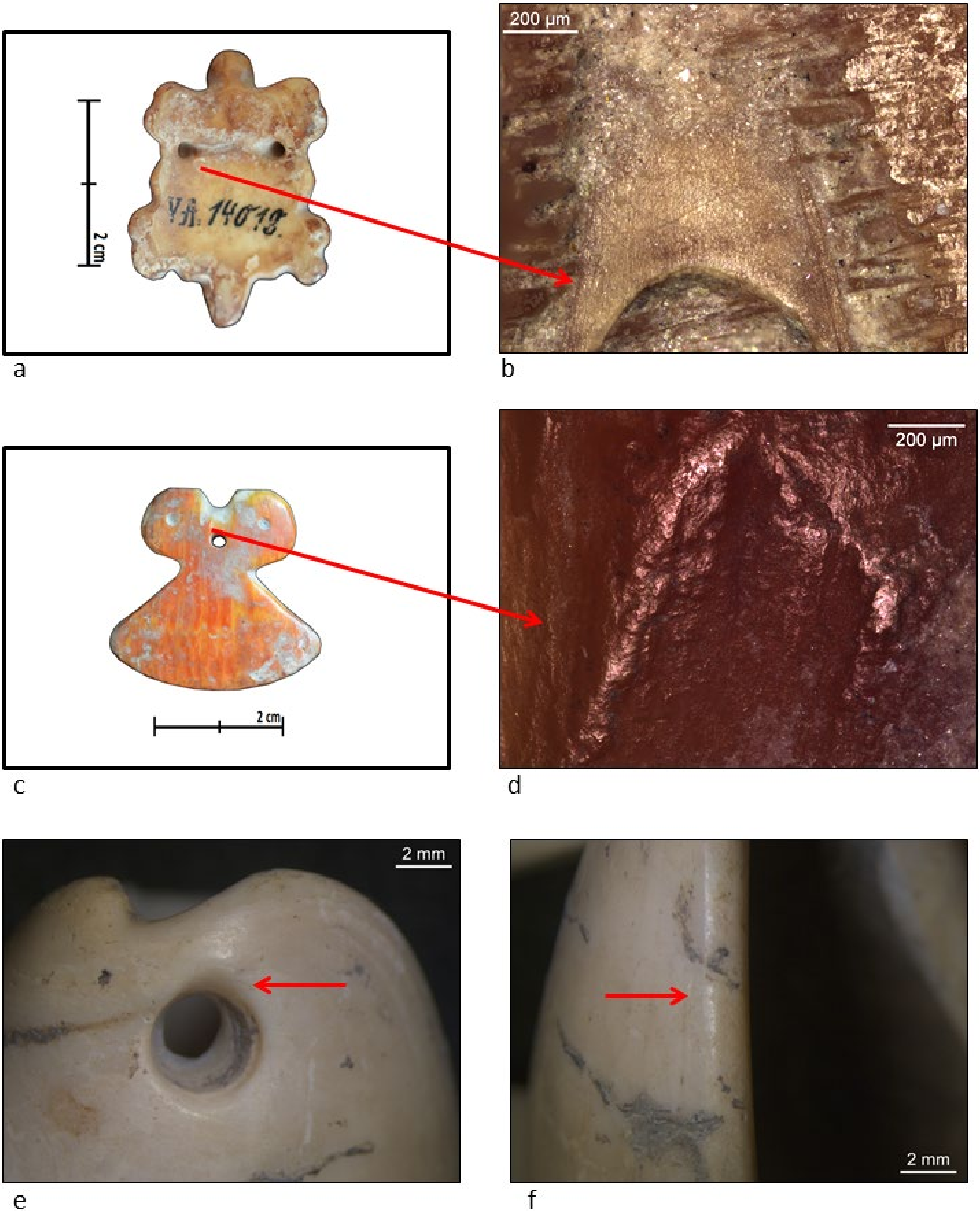


Figure 12: Possible evidence of recycling and reuse: cut grooves on top of polish (b, d).

creamish colour and presence of small red minerals; an unidentified light grey stone; and a brown heterogeneous and medium-grained unidentified rock. The first was used for the production of a heavy elongated pendant (VA14004); the second for the artefact with no assigned type with a strange “door knob” shape (VA11589L); and the third for a turtle-shaped pendant (VA14001). Finally, a tubular bead was made of an orange-coloured mineral, most likely chalcedony (VA15525).

At first, it seems that certain ornament types were only made from a same lithic raw material (tab. 13): serpentinite-like stones were used for bat wing pendants and slate for the rounded ornaments. However, bat wing pendants made of steatite and from the lip of the *Lobatus gigas* shell have been reported (Vargas Arenas *et al.* 1997; Wagner and Schubert 1972). In addition, slate is used for different types of ornaments and even within the “round” category there is some variation. Both shells and other stone types, besides the one used in VA14001, were used for the production of stone turtles (see La Mata section).

In table 14, the maximum and minimum dimensions and weight values per ornament type are presented. For the bat wing pendants, some of the values are in bold: these values represent incomplete specimens, broken in half along their lengths (which therefore affects the minimum width and weight). The whole bat wing specimen weights considerably more (17,04 g) than the other two (2,40 and 4,56 g), even if these are multiplied per two. Given that its length and thickness are not that different from the others, the difference in weight may be related to the composition of the material. The slate pendants are homogeneous in their dimensions and weight, in spite of differences in their morphologies. Except for the diamond-shaped one, all the slate pendants present breaks on their extremities, associated to the perforation. The heaviest artefact types are those made from the unidentified stones; this is probably related to their composition. These stone artefacts have comparable weight values to the heaviest among the shell ornaments, displaying inferior weights to the *Lobatus gigas* owl-shaped pendant (31,63 g).

Table 13: Ornament types and lithic raw materials in the Jahn collection

		Slate	Serpentinite	Chalcedony	Igneous	Brown	Grey	Total
Bead	Tubular	_	_	1	_	_	_	**1**
Pendant	Round	3	_	_	_	_	_	**3**
	Diamond	1	_	_	_	_	_	**1**
	Elongated	_	_	_	1	_	_	**1**
	Bat wing	_	3	_	_	_	_	**3**
	Turtle	_	_	_	_	1	_	**1**
Unknown		_	_	_	_	_	1	**1**
Total		**4**	**3**	**1**	**1**	**1**	**1**	**11**

Table 14: Maximum and minimum size and weight per lithic ornament type in the Jahn collection

		Length		Width		Thickness		Weight (g)	
		Max	Min	Max	Min	Max	Min	Max	Min
Bead	Tubular	6	_	6	_	19	_	1,86	_
Pendant	Round	30	28	32	19	3	2	5,74	2,09
	Diamond	33	_	28	_	2	_	4,82	_
	Elongated	49	_	20	_	15	_	24,02	
	Bat wing	22	14	86	**40**	4	1	17,04	**2,40**
	Turtle	46	_	30	_	13	_	28,34	
Unknown		28	_	29	_	25	_	21,55	_

6.1.2.1 – Techniques and toolkit

Different techniques were observed for the working of stone artefacts. This is to be expected as the materials in question are rather different from each other. Some techniques are the same used for shell and will be described only briefly or based on available experimental data. Conducting experiments that would be relevant for the interpretation of the traces on the stone material was complicated by the lack of raw material identification of most pieces. Experiments were carried out using a variety of serpentinite and a mica-schist with garnets (for the slate); however both of them are not from the area of study and their susceptibility to specific techniques may vary.

Blank acquisition

Similarly to shell, almost no traces of the blank acquisition techniques are observed on the lithic ornaments. Techniques commonly used worldwide include flaking and cutting/sawing (*e.g.*, Beek and Mason 2002; Falci 2012; Lothrop 1955; Pelegrin 2000b; Sax *et al.* 2004; Wright *et al.* 2008). The choice for a specific technique often depends on the characteristics of the materials to be worked, for instance, whether it is isotropic, brittle, tough, hard, soft, has natural planes of fracture, etc. Some lithic ornaments here discussed were possibly made using natural pebbles as blanks. This is conceivably the case with both the elongated and the turtle-shaped pendants. For both pieces, oval pebbles with a convex side opposing a relative flat one could have been selected and further ground in shape. It is not possible to know if the flat areas were produced by cutting/sawing. In the case of the elongated pendant (VA14004), there is a sticker glued on the flat surface which prevents any further investigation. As for the turtle-shaped one (VA14001), its back is partially covered by ink and nail polish, whereas the remaining parts display traces of later, shaping activities and use-wear.

The blanks for the slate artefacts were probably also similar to the desired final products. This material is available in the nearby region (A. Antczak, pers. comm. 2014) and is possibly collected as small flat and thin slabs that only need further shaping. During the experiments, sawing of a section of a mica-schist block was conducted, using a flint tool (exp. 3041). This proved to be a relatively easy task, although the large and hard garnet pieces on this particular block made it difficult to keep a straight line, as they could not be cut through. After 60 min of sawing, the piece could be snapped in two. A previous attempt at knapping (direct percussion) this foliated material in blanks did not succeed as the pieces were crumbling. This problem was also noted during sawing, as a first thin sheet of the material was detached separately before the rest of the block was cut. Taking into consideration the schistosity of the material, knapping may not have been used for blank acquisition.[67] Without knowledge of how the material is found nearby the Lake Valencia (blocks or flat and thin sheets), it is difficult to estimate whether the use of any blank acquisition technique would be necessary.

For the chalcedony bead, knapping was probably used as the mineral is as hard and isotropic as flint. However, no evidence remains on the artefact. Similarly to the previous ones, knowledge of where and at which state the material can be collected would help in discussing this further.[68] Pictures from the collection housed at the *Musée du Quai Branly* in Paris (http://collections.quaibranly.fr/), excavated by Marcano, present a long tubular chalcedony blank (8,2 cm), already ground, perforated and with a groove in the middle. This groove follows the entire circumference of the piece and is probably where the artefact would be further sawn and broken to become individual beads. Although this blank is larger (1,9 x 8,2 cm) than the bead analyzed here (0,6 x 1,9 cm), a similar technique may have been used.

Regarding the serpentinite pendants, no cut marks were observed. Wagner and Schubert (1972) report large slabs of this material with incised grooves from the Venezuelan Andes. These would be multi-pendant blanks for the production of the bat wing shapes. The authors do not offer any information regarding the tool used or the morphology of such grooves. It is also not clear if both raw material varieties (serpentinite and steatite) have evidence of cutting/sawing. The experiment of sawing serpentinite with flint was more time-consuming than expected (exp. 3058; 126 min). Without being aware of the properties of the Venezuelan serpentinite in comparison to the one used in the experiments, it is not possible to draw an informed comparison. Finally, for the artefact of unknown type, there is evidence of neither how the light grey rock was collected nor of how the necessary blank would look like.

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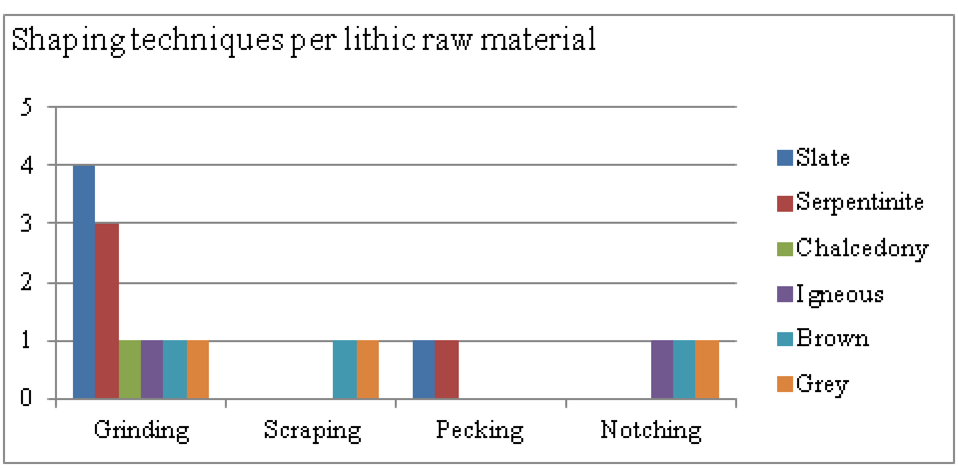
67 The difference between the mica-schist used for the experiments and the archaeological slate should not be ignored, as it may affect its response to the technique in an unexpected way.

68 Blanks for both amethyst disc and tubular beads were produced by Diederik Pomstra during the first experimental programme. As expected, this task proved to be fast and precise. He used pressure flaking with an antler punch. Whether this specific technique was used or not in the Valencia Lake Basin is not in question here (as I cannot assess it). Debitage from this operation would only hardly be recovered from an archaeological site, even with modern standards, as the flakes can be as small as 4 mm.

Shaping
In the table below (tab. 15), the shaping techniques observed on the artefacts are distributed according to the lithic raw materials. The same artefact may be represented in the table more than once, therefore the values are not cumulative; *e.g.*, on the turtle-shaped pendant (VA14001) there is evidence of grinding, scraping and notching. Grinding traces are present on all lithic artefacts in the form of striations, faceting and/or flattening of grains (figure 13, a – c). This combination of traces suggests the use of a hard, stone-like material. Grinding striations, while very common on shell artefacts, could not be observed on some of the lithics. On the slate pendants, grinding striations were not observed. Under the microscope, flattening of the grains of the stone was visible. Grinding striations are only apparent on the sides of the slate artefacts (figure 13, c). The experimental mica-schist, after being ground on a quartzite for only 3 min, displayed pronounced flattening, directionality and striations (figure 13, d). An assessment of the exact type of grinding platforms used will require further experimentation.

Potential pecking marks were observed on the edges of a slate pendant and on a serpentinite one. These appear as non-systematic interrupted flake scars on the sides, where they could serve the purposes of better delimitating the shape and eliminating undesired irregular or sharp parts in a fast way (as opposed to grinding). However, as these traces are unsystematically distributed on the edges of the artefacts, it is also possible that they were created accidentally during the use or deposition. In association to grinding traces, scraping marks were observed on the turtle-shaped artefact (figure 13, e). The use of this technique is associated to a further delineation of its sides and is also accompanied by the use of notching. While it is not clear which tool was used for scraping, the notches on this artefact were produced with a hard stone tool, such as flint, given its sharp V-shaped appearance (figure 13, f). Notches were also created on the elongated pendant made of the light grey igneous rock (VA14004), in order to straighten and narrow the area where

Table 15: Shaping techniques per lithic raw materials in the Jahn collection



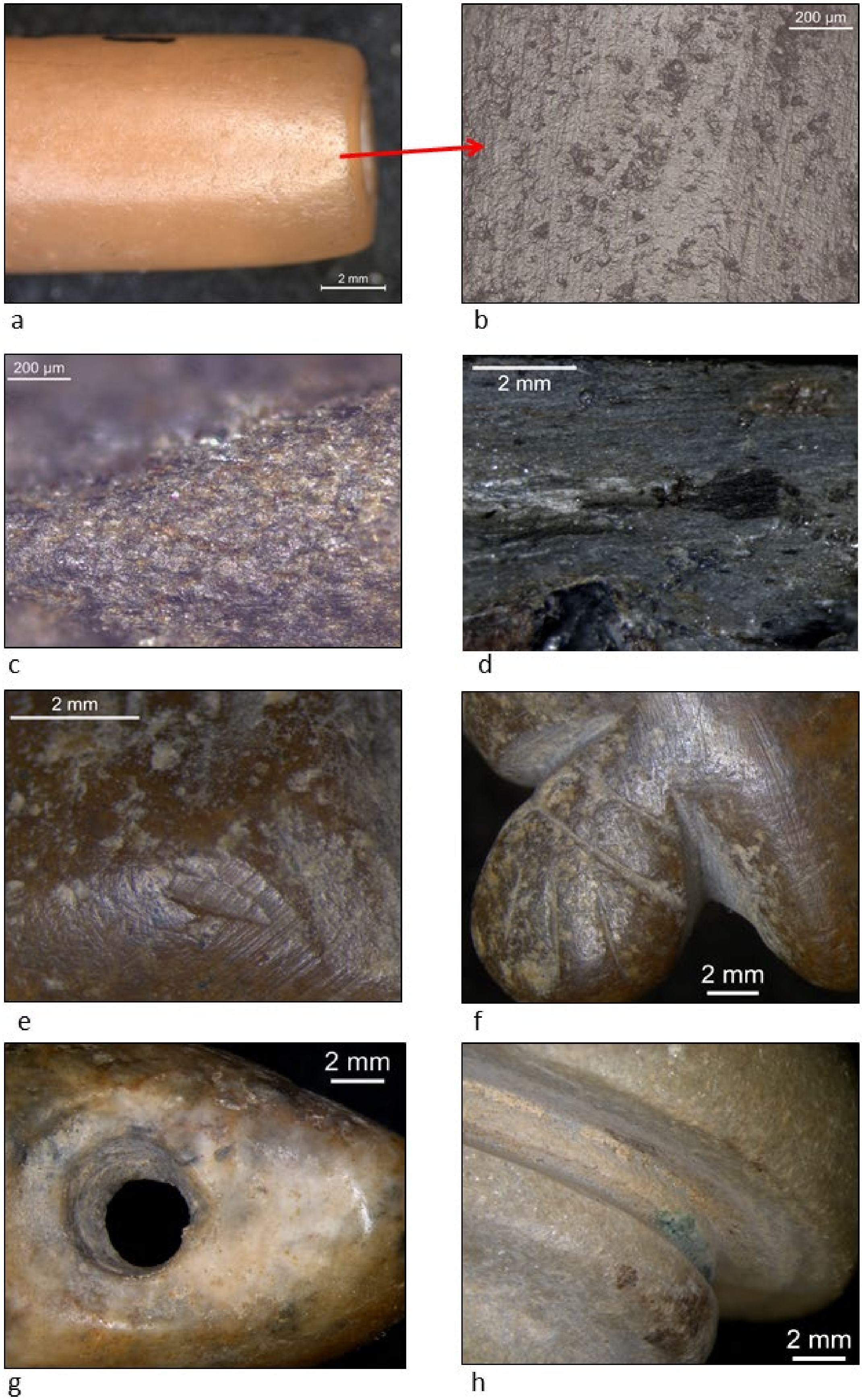


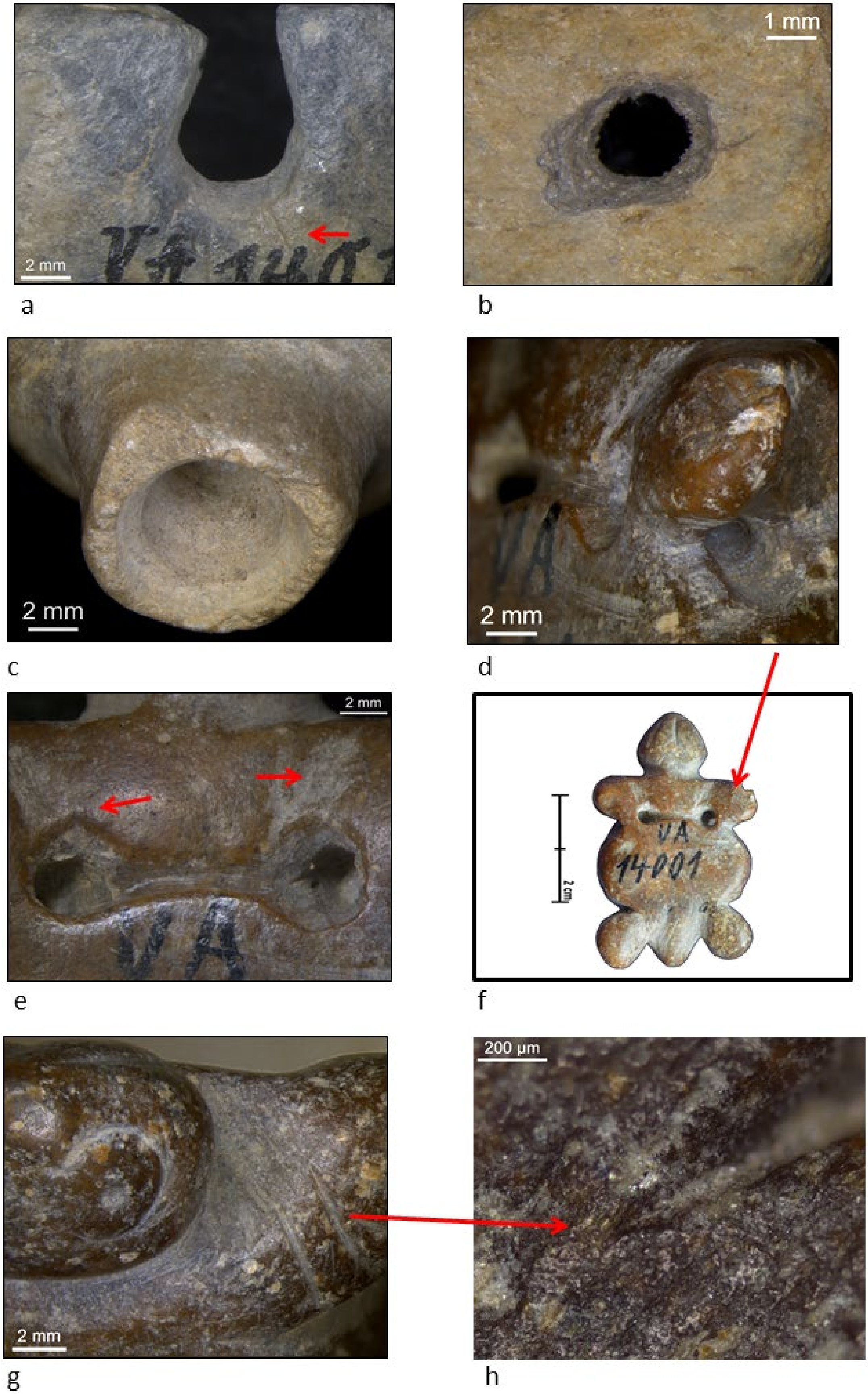
Figure 13: Grinding (a – c, f), scraping (e) and notching (f – h) on stone ornaments. Grinding experiment on mica-schist (d).

the perforation was going to be placed (figure 13, g). There are no visible cut marks on this area, probably due to erasure and superposition of traces associated to use-wear. The artefact of unidentified type (VA11589L) displays incision grooves and notching all around its circumference, producing a stepped appearance. In this sense, sawing (to produce notches), scraping and grinding were associated in order to create the complex "door knob" shape of the artefact (figure 13, h).

Perforating

All lithic ornaments in the collection present evidence of drilling with a massive drill point, producing a biconical perforation. The specific raw material of the drill bit is not clear and may have varied according to the worked material. The technique used for the slate pendants differed from the others, involving more than one stage. It is possible to observe (macroscopic) grooves entering the perforations of three specimens (figure, 14, a). Depending on the specimen, the grooves are sharper and the profile of the hole is more cylindrical. The perforation involved a combination of drilling and another technique (such as chiselling and/or sawing), both alternated in order to widen and break the hole. In fact, the "breakage" of the holes seems to be intentional: sawing may have been used to remove the material between the hole and the edge. This is evident in one of the artefacts (VA14016b), in which the grooves are on top of the drilled hole. Instead of pendants, these artefacts (at least the ones with round shapes) were nose rings. For the production of such pieces, the perforations had to be widened and expanded until (or almost until) the top edge, generating two separate points (or just a large circle) that could be placed in the nostrils and attached through a specific, organic mechanism. They are all, however, broken further than necessary for the use as nose rings. This suggests post-depositional or use-related breakage, due to the fragility of the pointy areas. In one of the slate artefacts (VA63024), a second hole (see "reuse and re-cycling" section below) presents ragged edges pointing to the use of chiselling as perforation technique (figure 14, b).

In the case of the chalcedony bead, thin circular scratches on the walls of perforation are evidence of the use of a hard stone drill, possibly flint. This is not entirely clear as both preform and drill would have the same hardness. More pieces of this type need to be investigated and more experiments need to be carried out. The serpentinite pendants have two associated perforations on the centre, with the exception of one broken specimen. On the latter (VA15536), it is not possible to know if there was a second hole. The perforations on this type are all biconical with circular scratches, probably produced by a massive drill of unknown material. The turtle-shaped pendant, similarly to its shell analogue, has two biconical perforations, one on each of its lateral ends. The holes start at the side of the object and continue to the back; in order to produce this oblique angle of perforation, at least two cones were made from each side (in each perforation). The perforation on the



a b c d e f g h

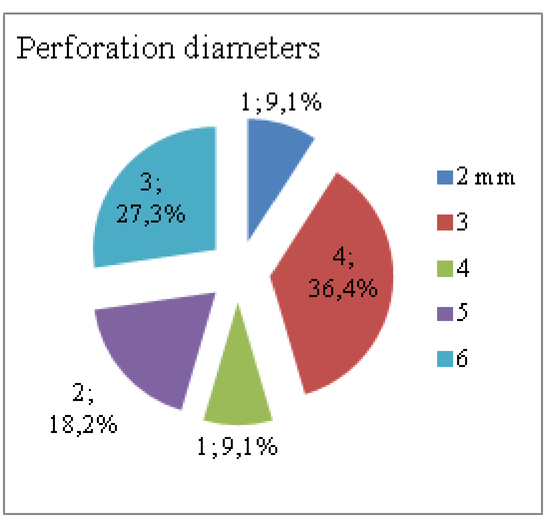
Figure 14: Perforations (a – e), cut grooves (a, e) and incisions (g, h) on stone ornaments.

artefact of unknown type was made by drilling inside the narrow tubular part, probably with the intention of creating a cavity rather than a hole (figure 14, c). It presents a conical shape with broad circular grooves inside. The purpose of such cavity (and of the artefact) is not clear. It is possible that something was inserted inside this cavity: the artefact may have been used as an ear plug through the insertion of a material that kept it attached to the body. On the other hand, this artefact may be too heavy for usage as an ear plug (21,55 g).

The perforation diameters varied between 2 and 6 mm, with 3 and 6 mm being the most common values (tab. 16). This contrasts with the shell ornaments, in which more than a half of the ornaments have perforation diameters of 2 or 3 mm. Here, a larger portion has diameter between 5 and 6 mm (45,4%). While the reduced number of lithic ornaments does not allow for generalizations, variation may be expected as both the raw materials and ornament types are quite different. As mentioned before, this difference may be an outcome of variation in drill bit shape and size (which may or may not be related to raw material). However, in the case of the slate round pendants, whose perforations were widened (diameters of 5 – 6 mm), this difference does not bear the same significance. The chiselled (second) perforation in VA63024 has, in contrast, a diameter of 3 mm; likewise, the perforation on the diamond-shaped pendant (VA14049) has 3 mm as well. The serpentinite pendants also present perforation diameters of 2 – 3 mm on all specimens. These diameter values may be indicative of how large the holes needed to be in order to fit the strings used in their attachment. The diameter of the cavity on the pendant of unknown type (6 mm) is included in the table, but should not be considered when discussing string diameter, as a string would not be passed through it.

Similarly to the shell ornaments, two lithic artefacts have cut marks on top of their rim of perforation, possibly made in order to restrict the movement of the string. One example is the turtle-shaped pendant which has cut marks on top of one perforation located

Table 16: Diameter of drilled perforations in lithic ornaments of the Jahn collection



on the back. In addition to these cut marks, a deep groove was carved between the two perforations on the back and more shallow grooves on the top of the perforations in direction to the shoulders (figure 14, d – f). There is no doubt that at least the groove between the holes was made in order to better accommodate a string, whose maximum diameter would be between 1 and 2 mm. Similarly to the grooves on other artefacts, this groove is U-shaped; this appearance was partially caused through wearing caused by the string itself. Cut marks were also made on top of the rim of perforation of the elongated pendant (figure 13, e), probably also with the purpose of "guiding" a string. The traces are V-shaped and could have been done with a flint-like, hard stone tool. On one of the broken serpentinite pendants (VA63025), there is a linear lowered area on the outer side of the (non-broken) perforation. It does not however bear clear evidence of being an intentional groove rather than just an accident or irregularity of the material.

Decoration

The only lithic artefact with decoration is the turtle-shaped pendant (VA14001). As mentioned above, sharp V-shaped notches were made to shape its form. This technique, together with sawing, was used to excise the turtle's head, limbs and tail. In fact, in this piece it is clear that rather than applying specific sequences of techniques, the maker applied different sets of techniques alternatively (i.e. scraping, grinding, and sawing), most likely using similar tools, in order to reach the desired shape and according to the affordances of the material. After the shape was complete, incisions were made on the head and limbs of the turtle, depicting eyes, mouth and fingers of the animal. These grooves also have a characteristic sharp V-shape with an overall fresh appearance (figure 14, g, h). Small (unfinished) holes were made on the centre of the eyes in order to depict the eye sockets.

Polishing

Similarly to shell artefacts, the polishing technique can only be identified with difficulty and with little to no insight into contact materials. The tubular bead (VA15525) and the elongated pendant (VA14004) have an overall polished appearance, but there is no evidence of a polishing technique, rather than just combination of the effects of grinding and use-polish. On the turtle-shaped pendant (VA14001), polishing can be identified not only on the general surface of the artefact (which produced its smooth and rounded appearance) but also under the sharp V-shaped notches. The surface was polished after the first set of techniques, partially erasing the scraping traces. Polishing could have been made with a soft material in order to reach small areas and generate a smooth, undulated appearance, rather than flattening the area. However, the general polish on the artefact, when looked at higher magnification, appears to have been produced by a hard, stone material. On the artefact of unknown type (VA11589L), polishing is visible on top of the rounded "knob"; this is associated to striations, pronounced directionality, flattening of the grains, and overall reflective and darker appearance. This points out to the use of a hard abrasive material, possibly a stone platform.

6.1.2.2 – Performance and technical accidents

Regarding the lithic ornaments, 45,4% displayed evidence of a high skill investment (tab. 17). This includes the turtle-shaped pendant, which required a controlled and fore-planned use of incision and excision. The difficulties in working the stone turtle can be noticed in the disposition of the incision grooves that form the eyes: the successive interrupted gestures disposed in a roughly circular way point out to the problem of drawing a circular shape with a hard and inflexible tool on an already hard raw material. The bat wing pendants are also the result of high technological achievement. Two of them have a polished appearance, with symmetrically positioned holes, little to no traces of manufacture and a uniform shape. The other serpentinite artefact (VA15536) has considerable breakage on its edges and is more irregular. Since it was made of a considerably foliated material, it is probable that the breaks and irregularities were only hardly avoidable. The grey artefact (VA11589L) has a complex stepped shape on the side and the highly rounded "knob", being thus considered of high skill. The tubular chalcedony bead was also considered of high skill, since it demands the execution of a long perforation in a hard material and presents a polished surface with almost no irregularities. The slate pendants required little skill and are sometimes irregular. For this reason, they were classified in either low or medium skill.

6.1.2.3 – Use-wear

In table 18, the presence and types of use-wear on the lithic ornaments are presented. All the ornaments have evidence of being worn, except for the ornament of unknown type, which displayed no characteristic trace that could be associated to use. Therefore, its function still remains a matter of speculation. The most common type of wear trace is polish and rounding on the rim of perforation (72,7% of the 11 artefacts). The presence of scratches associated to this polish, entering the perforation, was observed on two artefacts, namely

Table 17: Levels of skill investment per lithic ornament type in the Jahn collection

		High	Medium	Low
Bead	Tubular	1	_	_
Pendant	Round	_	1	2
	Diamond	_	_	1
	Elongated	_	1	_
	Bat wing	2	1	_
	Turtle	1	_	_
Unknown		1	_	_
Total		**5**	**3**	**3**

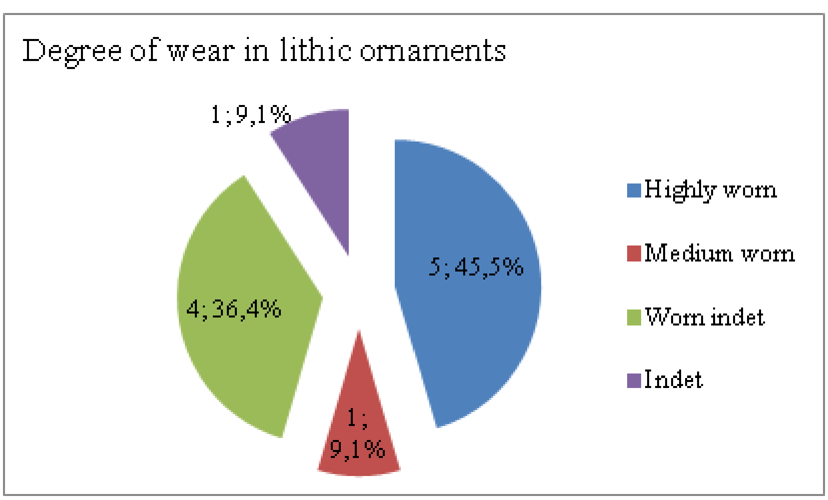
Table 18: Number of lithic ornaments with specific use-wear traces per type in the Jahn collection

		Use-wear		Polish on rim	Rim deformed	Scratches	Polish sides		Wear other ornaments
		Yes	**No**				1	Both	
Bead	Tubular	**1**	_	1	_		_	_	1
Pendant	Round	**3**	_	2	_	_	1	1	_
	Diamond	**1**	_	_	1	_	_	1	_
	Elongated	**1**	_	1	1	_	_	1	1
	Bat wing	**3**	_	3	2	1	1	1	_
	Turtle	**1**	_	1	1	1		1	_
	Unknown	_	1	_	_	_	_	_	_
Total		**10**	**1**	**8**	**5**	**2**	**2**	**5**	**2**

the turtle-shaped and one of the bat wing pendants (figure 15, a – c). The disposition of polish suggests that a string linked the perforations on both faces of the serpentinite pendant and also linked them with the edge of the artefact. Deformation of the rim by continuous wear was also noted on certain artefacts; sometimes this deformation seems to be formed by widening the man-made cuts that serve to "guide" the strings. This is the case of the turtle-shaped pendant and of the elongated one. For the latter, a broader deformation of the perforation area was possibly caused by another material: either small beads attached in contact with it or knots made on the sides of the pendant to keep it in place.

Many ornaments are heavily worn (45,5%), with the exception of the slate artefacts and one of the serpentinite pendants (tab. 19). Most of the others (36,4%) were considered "worn indetermined" because the degree of wear on their surfaces was not clear. The difficulty in interpreting the traces on the slate artefacts was at least partially related to their grain size. In addition, the round slate pieces were possibly nose rings rather than pendants: one of them has polish on a remaining pointed area of its top, which could be associated to such usage (figure 15, e, f).

Table 19: Degrees of wear in lithic ornaments of the Jahn collection



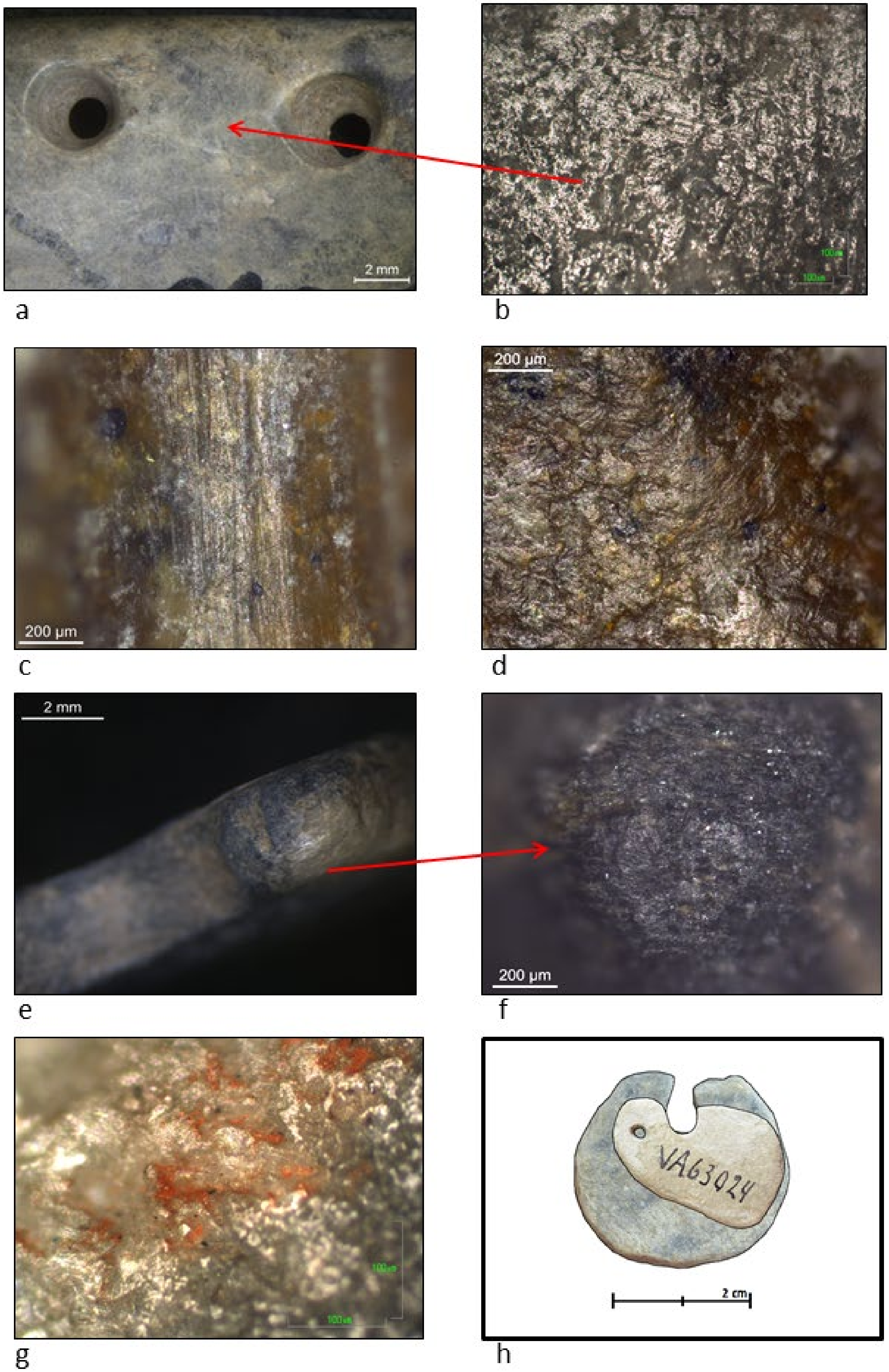


Figure 15: Use-wear polish and striations (a – f), residue (g) and evidence for recycling (h) on stone ornaments. h: superposition of the pendant on a nose ring.

One of the broken serpentinite pendants (VA63025) has remains of a grainy red substance, similar to ochre under high-magnification and cross-polarized light (figure 15, g). These remains are visible in two areas on the faces and are reminiscent of those observed on the shell tubular bead. Due to time restrictions, no chemical identification has been conducted. A black substance was observed on the side of the artefact of unknown type. Given the presence of ink and glue associated to a sticker, it was decided that the area is too affected to allow for further insight into the nature of this residue.

6.1.2.4 – Recycling and reuse

Only two artefacts present evidence of recycling and/or reuse. One of them, a round slate pendant, presents two perforations: a broken one presumably used in the nose; and a second small one made by chiselling. Together with the addition of a second perforation, the artefact also had one of its sides reground, in order to gain a more oval shape (figure 15, h). It is clearly a section of the old round shape of the "nose ring" that was recycled into a pendant.

The second artefact is the turtle-shaped pendant, which had a complex biography. The notches on the sides and the decorative incisions are sharp and fresh in comparison to the overall polished and rounded appearance of the artefact. The microwear around the rim of perforations does not suggest different use episodes like in the cases of the shell ornaments. In spite of the presence of clear use-wear traces on the pendant, it is rather difficult to suggest a system of attachment. The traces do not seem to match a single system: on the one hand, the areas between the two cones of a same perforation are rounded, suggesting that a string was tied around them and then passed between the two holes on the back; on the other, the cut marks made on top of the perforation suggest that strings passed on top of the shoulders of the turtle as well. Directionality in the polish on the shoulders partially supports this interpretation, although on a macroscopic scale the area is not clearly worn (figure 15, d). The evidence is not clear, but it is possible that the piece was subjected to two different episodes of wear, in which it had different ways of attachment (see Chapter 8). Before this second stage, the cut marks on the rim and the "refreshing" of the notches would have taken place.

6.1.3 – Jet

A single jet pendant was part of the Alfredo Jahn collection. The artefact has a black and shiny colour, and its cross-section displays a triangular shape with rounded ends. The dimensions are of 3,1 x 1,1 x 1,3 cm, with weight of 2,13 g. It has a small circular break on one of its faces, alongside several scratches which may be natural from the raw material. The analysis was rendered difficult by the presence of ink and nail polish partially covering the surface.

6.1.3.1 – Techniques and toolkit

A few techniques were observed on the pendant, suggesting a sequence of manufacture. Limited experimental research was conducted on this material and a few remarks will be made.

Blank acquisition

Despite being covered by nail polish, there are traces on one of the surfaces that suggest that the jet blank was produced by a cutting/sawing technique, probably by a mechanism of groove-and-snap (figure 16, a). The presence of three cut grooves in a triangular disposition points to an attempt at cutting the material. The cutting would have been done from the base of the triangle, shaping the sides. While the cuts appear to have V-shapes, it is not possible to examine them closer due to the layer of nail polish on top.

One sawing experiment was carried out using a flint tool to split jet (exp. 3049-2). At first, the experiment failed due to the presence of natural planes of fracture in the raw material, which led to uncontrolled breakage of the blank. Another attempt at cutting a small pronounced portion of the same piece was successful. In order to assess the blank acquisition technique, it is necessary to know how and on which state jet was collected. Currently in south and western Venezuela, it is collected from the rivers, probably as pebbles. Depending on their sizes and the presence and thickness of cortex, other techniques such as flaking may have been necessary.

Shaping

The main shaping technique was grinding, as suggested by the presence of faceting. However, the traces are not very clear, especially as the raw material has several natural scratches and small cracks, which are confused with grinding traces (figure 16, b). The same problem was observed in relation to polishing; the surface of the artefact is covered by polish which may be caused by use. The experiment of grinding jet on a sandstone platform (exp. 3049-1) for 30 min generated a dull and deeply scratched surface (figure 16, c). It does not look like the surface of the archaeological artefact, which may be related to the use of a finer grained platform or of substantial polishing. If the cut marks on the base are indeed traces from the first blank acquisition operation, this shows that the maker did not grind the artefact extensively.

Perforating

A perforation was made on the pointed and thinner end of the artefact, probably by a massive drill even though circular scratches are not visible inside. The perforation has 3 mm of diameter and is biconical, but was made in more than two stages as multiple cones are visible inside. The multiple stages permitted the creation of a perforation with a narrow

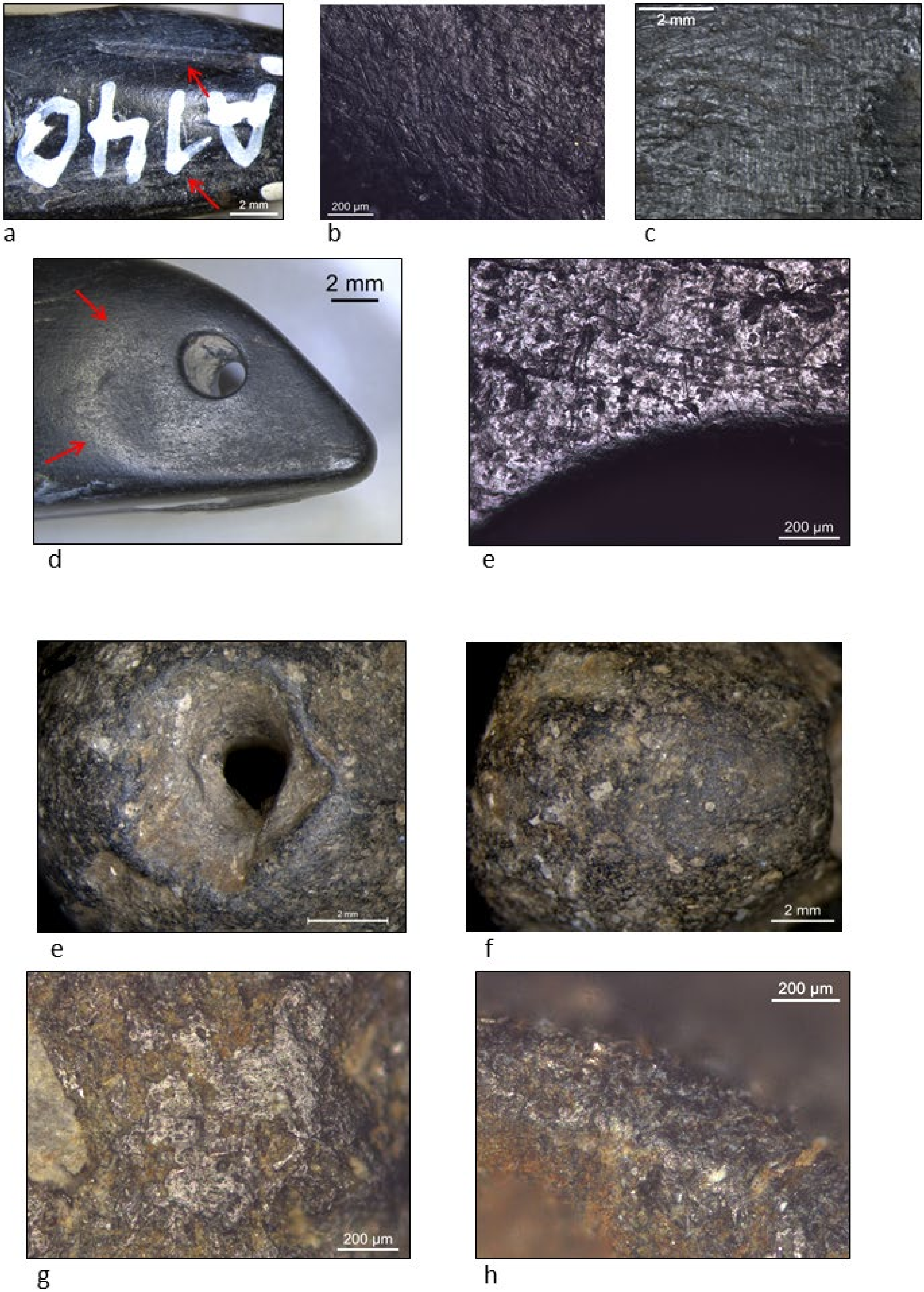


Figure 16: Manufacture and use-wear traces on jet (a – e) and ceramic (f – i). c: experimental grinding of jet on stone.

angle (less than 90°). It is not clear if this perforation was executed with the same drill bit material as other artefacts in the collection.

6.1.3.2 – Performance and technical accidents

Discussing performance and skill on the basis of a single artefact is rather problematic. The artefact was considered of "medium skill" as it is well-made, but at the same time does not require the use of elaborate techniques or considerable fore-planning. The sawing traces on the base were not erased, which suggests certain "sloppiness"; however, this may have been a strategy for preserving the natural shine of the jet.

6.1.3.3 – Use-wear

The surface of the artefact is highly polished and rounded, including the edges. In addition, the areas surrounding the hole on both faces have a sunken appearance (figure 16, d). These areas are also dull in comparison to the rest of the surface and were probably created by the presence of a notch or bead closely attached to this pendant. In addition, polish can be observed on the rim of perforation, associated with scratches. Some of these scratches may have been caused by stringing of the artefact with a metal wire in the museum; other scratches, associated with polish and rounding, are more likely related to the use of string in the pre-Colonial period (figure 16, e).

6.1.4 – Ceramic

Only one ceramic ornament is part of this collection: a globular bead with dimensions of 1,2 x 1,2 x 1,4 cm and weight of 2,19 g. The piece has an overall black colour, but it is partially covered on the side by an ink marking.

6.1.4.1 – Techniques and toolkit

The sequence of manufacture of an object made of ceramic differs considerably from that of the objects described thus far, as rather than being an extractive-reductive craft, it is a transformative craft: through firing, it passes from the plastic and mouldable clay to a hard material (Miller 2007b). It was not my intention to encompass all the stage of this process, as such an attempt would require studying other ceramic materials from Valencioid contexts. While talking about blank acquisition would not make sense here, it is worth noting that a microscopic examination of this artefact (but not a petrographic one) reveals a paste that is composed of large quartz fragments and other non-identified minerals. The presence of large mineral grains suggests a lack of interest in the removal of such pieces, despite the comparatively small size of the bead.

The irregular and asymmetrical shape of the bead suggests that a lump of clay was modelled by hand in a rough circular shape. In sequence, a stick of an unknown material was inserted in the middle of the bead successive times and from both sides. After removal of the stick, the excess of clay removed from the inside was pushed and folded to the side, creating a "crate" around the holes. This procedure also left a distinctive shape on the inside of the perforations: rather than being one circle, it is composed by two or three circles, impressions of the different times and positions in which the stick was inserted (figure 16, f). This also shows that the perforation was not regularized before or after fired. This process resulted in a perforation with around 0,3 cm of diameter. This technique also indicates that at the stage of perforation the clay was not leather hard, but soft enough to be easily removed from the inside and folded. In pottery studies, the colour of the paste is often (but not only) related to the firing conditions (Rice 1987). The black colour that predominates on this bead suggests that it was fired in a reductive atmosphere, i.e. with low circulation of oxygen. The bead is also burnished, displaying a flat polish on the higher and more pronounced sectors, associated with striations (figure 16, g, h). This was produced probably by contact with a stone platform after firing. It was not performed for long enough to create a more homogeneous and linked polish.

6.1.4.2 – Performance and technical accidents

The bead is roughly made, especially in terms of shaping and lack of care for grinding the irregularities of the surface produced during the perforation. This could be done when the clay was leather hard or after firing. There was also no concern for smoothing the inside of the perforation hole.

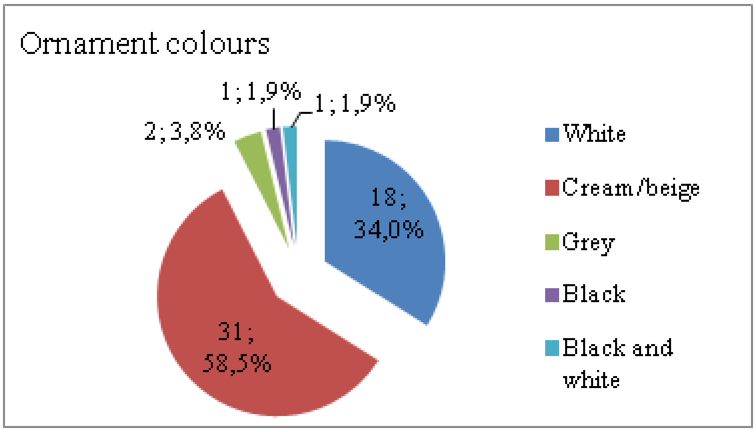
6.1.4.3 – Use-wear

The rim of perforation presents rounding and polish, which suggests that the bead was used. It was not extensively worn, since the different grooves made by the insertion of the stick to create the perforation are still clearly distinguishable. In other words, they have not been worn away by the presence of a string. Immediately below the rim, entering the perforation, it is possible to note polish and rounding (figure 16, i). This may have been caused by the presence of a small knot or bead, entering the perforation.

6.2 – Private collection from La Mata

The collection from the La Mata site includes 53 artefacts, mostly made of marine shells (50 artefacts; 94,3%) and a few of stone (3; 5,66%). Regarding general types, 14 artefacts (26,4%) were classified as beads, while the other artefacts were characterized as pendants. Most artefacts are made of shell and have creamish (31; 58,5%) or white (18; 34%) colours (tab. 20). The remaining shell artefact has a natural black and white colour, forming designs on the external surface of the shell. Generally, the artefacts that still have a creamish colour are better preserved than the completely white ones, which are chalky and under a process of degradation. The other colours (grey and black) are related to the three stone ornaments.

Table 20: Ornament colours in the La Mata collection



The intense black colour in one pendant is reminiscent of the reflectiveness of jet, although the material is not the same.

The length of the artefacts varied considerably, stretching between 5 and 56 mm, while the width between 4 and 36 mm, and the thickness, 1 and 29 mm. The most common length values are between 14 and 30, for the width between 7 and 18, and for the thickness, between 2 and 6 mm. The state of preservation varied significantly between artefacts (tab. 21). The breaks, observed in 42 artefacts, are generally old and not related to (post-) excavation activities. Only four artefacts display fresh breaks. Fresh scratches were observed on three artefacts, although their cause is unknown. Two stone artefacts had fresh breaks which have been glued back together.

The most common type of surface modification is erosion of the shell layers, which if sufficiently developed can leave the artefact with a chalky appearance. On certain artefacts, entire surface features, such as broken perforation cones, are not visible anymore due to this process. Both ink and pencil marks were observed on some pieces. While a pencil is normally used for drawing, which leaves a mark on its edges, most artefacts actually display isolated lines that are most likely the result of accidental contacts with

Table 21: Number of artefacts with surface modification per raw material in the La Mata collection

	Shell	**Lithic**
Erosion	28	1
Encrusted sed.	11	1
Fresh breaks	4	_
Ink	10	_
Glue	_	2
Pencil lines	8	_
Modern residue	1	_
Fresh scratches	3	_

a pencil lead. This is the same for ink, which in the case of this collection probably is associated to ballpoint pens rather than to ink used in curatorial activities. This kind of stain can occur due to the contact of the artefact with an ink stained skin. Only in one artefact the ink marking seems to be intentional, following the carved lines on the pendant. Finally, unidentified modern residue was observed on one artefact.

6.2.1 – Shell

Most artefacts in this collection were made of marine shells, including both gastropods and bivalves. Two artefacts, one made of *Fissurella* sp. and the other of a fragment of an unidentified shell, did not present clear traces of modification or use and were not included in the discussion below. *Fissurella* shells display a natural perforation on the apex and for this reason they were often collected from the Valencioid sites as potential ornaments (Kidder 1944). However, no man-made traces were observed on this specimen. Only 48 shell ornaments will be discussed in this section.[69]

The main shell species used as ornament raw material was *Lobatus* sp. (16 artefacts; 33,3%) and different bivalves (11; 22%), among which possibly *Spondylus* sp. or *Chama* sp. One artefact was made on the lip of a *Strombus raninus* or *S. gaius*, while another one from either *Cassis tuberosa* or *C. madagascariensis*. The genera of many artefacts could not be identified (12; 25%). *Oliva* sp. shells are less common in this collection (4; 8,3%) and the specimens that are included are fragmented. Other three species were noted here: *Nerita tessellata*, *Fissurella* sp. and *Cyphoma gibbosum*, all used for the production of automorphic ornaments.

Only three subtypes of beads were identified, including disc, tubular (both real and "false") and frog-shaped ones (tab. 22). Only a few pendant types were added to the typology used for the Jahn collection: dagger-shaped and rectangular pendants. While 11 dagger-shaped pendants (22,9% of 48 shell ornaments) were noted in this collection, only three "cut-out" ones were identified (6,2%). Many dagger-shaped pendants were produced of thin bivalves and at least two were made of a coloured bivalve, such as *Spondylus* sp. or *Chama* sp. The rectangular pendant is a flat artefact with a convex cross-section, made on a bivalve shell and shaped as a rectangle (VAS-28). Likewise, the round pendant (VAS-39) is an oval flat artefact, most likely produced from the lip of the *Lobatus gigas*. The biomorphic pendants depict birds and frogs. Two of the frog-shaped artefacts are broken in half and do not present perforations on the remaining parts. These were included under the "pendant" type because they are three-dimensional rather than just flat pieces like the frog-shaped beads. A few artefacts were considered of unknown type as they are fragments with no perforation: two of them are cylinders broken in half and the other artefact is a

69 From now onwards, all percentages will refer to these 48 pieces, unless otherwise stated.

Table 22: Ornament types and shell raw materials in the La Mata collection

		Ol	Lo	St	Ca	Bi	Cy	Ne	Fi	?	**Total**
Bead	Disc	_	3	_	_	1	_	_	_	_	**4**
	Tubular	_	8	_	_	_	_	_	_	_	**8**
	Frog	_	_	_	_	1	_	_	_	1	**2**
P	Tinklers	4	_	_	_	_	_	_	_	_	**4**
E	Cut-out	_	_	_	_	_	_	_	_	3	**3**
N	Dagger	_	_	_	_	6	_	_	_	5	**11**
D	Biomorph	_	1	_	1	2	_	_	_	3	**7**
A	Axe	_	1	_	_	_	_	_	_	_	**1**
N	Rectangle	_	_	_	_	1	_	_	_	_	**1**
T	Round	_	1	_	_	_	_	_	_	_	**1**
S	Automor	_	_	_	_	_	1	1	1		**3**
	Unknown	_	2	1	_	_	_	_	_	_	**3**
Total		**4**	**16**	**1**	**1**	**11**	**1**	**1**	**1**	**12**	**48**

decorated fragment of the lip of a *Strombus* sp. This artefact (VAS-40) is most likely a fragment of a larger triangular object, presumably a bat wing pendant. Finally, all the automorphic pendants are made on gastropod shells rather than bivalves and display varied shapes, according to the species they were made from.

The table below (tab. 23) displays the maximum and minimum values for shell ornament dimensions and weight. Of the 48 artefacts, 39 present some type of breakage (81,2%), most notably along the length (*n*=5), in half (*n*=10) and at one extremity (*n*=10). The latter was common among the dagger-shaped pendants, which broke on the extremity

Table 23: Maximum and minimum size and weight per shell ornament type in the La Mata collection

		Length		Width		Thickness		Weight (g)	
		Max	Min	Max	Min	Max	Min	Max	Min
Bead	Disc	14	5	14	5	7	2	4,59	0,006
	Tubular	12	4	16	5	52	22	8,71	1,19
	Frog	38	30	32	21	8	5	5,31	4,93
P	Tinklers	30	9	18	13	18	9	6,94	1,08
E	Cut-out	30	23	15	7	3	2	1,00	0,63
N	Dagger	32	18	21	6	6	2	5,75	0,79
D	Biomorph	42	12	34	7	29	2	16,9	0,35
A	Axe	42	_	18	_	12	_	16,0	_
N	Rectangle	30	_	15	_	2	_	2,13	_
T	Round	56	_	36	_	2	_	5,87	_
S	Automorph	30	13	22	10	10	1	1,50	0,63
	Unknown	48	16	35	8	8	3	4,01	1,10

where the perforation was placed. Breakage in half was observed on the frog-shaped pendants and on the tubular beads. This means that the minimum values for such pieces, at least in terms of length, should not be considered. This high rate of breakage prevents an assessment of the variability of dimensions within a same type.

The disc beads display the smallest sizes and weights of the whole collection. Within both tubular and disc beads there is a lot of variation in diameter and thickness, resulting in beads that are quite different from each other, even though they were assigned to a same type. The frog-shaped beads are larger than the ones in the Jahn collection and are also considerably different from each other. In fact, one of them is just the extremity of a larger piece, making its size estimation not representative. Similarly to the Jahn collection, the highest values in terms of weight correspond to the axe-shaped pendant (VAS-27; 16 g), which was made of a thick fragment of *Lobatus gigas* (more than 12 mm), and one of the biomorph pendants, i.e. a pelican-shaped pendant made on the prong (nodule) of a *Cassis* sp. (VAS-31; 16,9 g). Weight is more related to thickness than to length and width, especially in artefacts made of *Lobatus gigas*. Therefore, artefacts such as the round pendant and the tubular beads, despite being large, are relatively light weighted.[70]

6.2.1.1 – Techniques and toolkit

Similar techniques were noted in comparison to the previous collection. Therefore, these will be only briefly presented, providing supporting evidence from artefacts and of how representative they are in this group.

Blank acquisition

The only blank acquisition technique is cutting/sawing, noted on 17 artefacts (35,4%). This includes the dagger-shaped, cut-out, axe-shaped and rectangular pendants, in addition to one frog-shaped pendant and one frog-shaped bead. These are generally made of bivalves (*n*=7) or of indetermined shells (*n*=7, possibly bivalves as well), and to a lesser degree, of *Lobatus gigas* (*n*=3). In general, such artefacts have a flat and convex cross-section and display straight sides, features typically left by this technique; the cut-out pendants even have tilted sides. The technique has also been identified by the cutting traces left on the sides (figure 17, a). On 23 artefacts (47,9%), it was not possible to identify the blank acquiring technique, as there are no recognizable traces. This was the case with many of the *Lobatus gigas* and *Cassis* artefacts, as the shells were possibly flaked, which leaves no traces on the artefacts after shaping. Finally, whole shells were shaped into eight ornaments (16,6%). This was the case for the *Oliva* sp. tinklers and other automorphic artefacts.

70 As explained in Chapter 5, thickness corresponds to the height of a bead, while length and width to the diameter. Therefore, in the case of tubular beads, what makes them light-weighted is indeed the reduced length. It is in fact a matter of the total volume and density of an artefact.

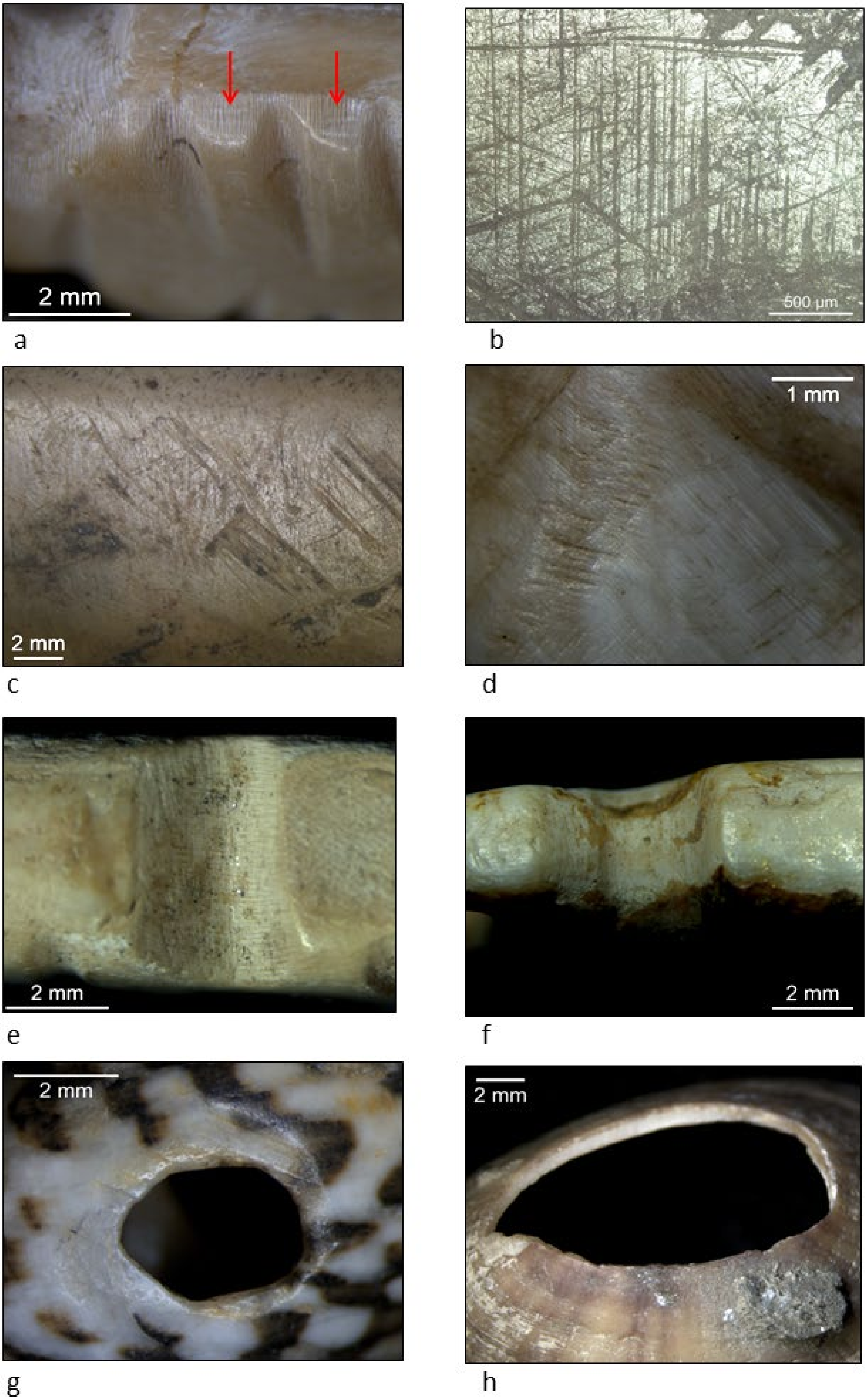


Figure 17: Cutting/sawing (a), grinding (b – d), scraping (c, d), and notching traces (e, f). Grinding (g) and pounding (h) to produce perforations.

Shaping

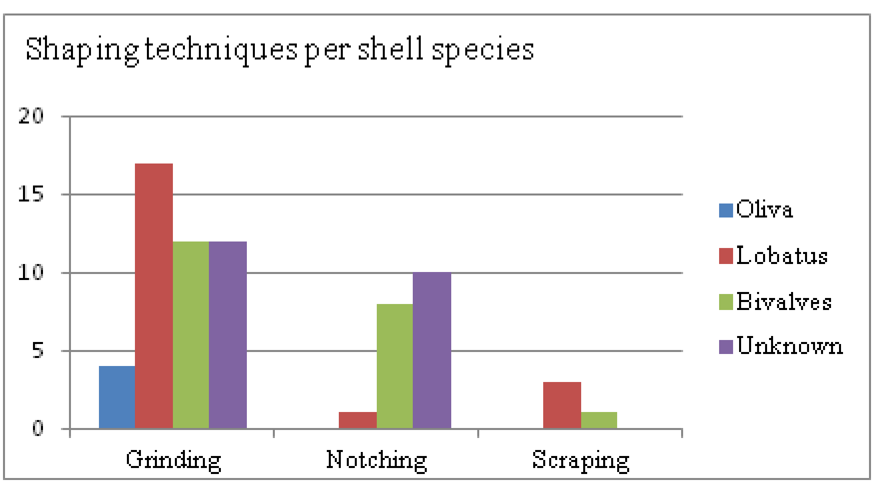
Table 24 displays the shaping techniques observed in the La Mata collection, according to the species worked. Most artefacts displayed evidence of at least one shaping technique. The *Oliva* tinklers are included in the chart because the grinding of the apex can be considered a shaping technique. The other automorphic artefacts are not displayed in the chart.

Just like in the Jahn collection, grinding is the most common shaping technique (45; 93,7%). Traces are easily observed in the form of continuous thick and deep striations and, on eight artefacts, also faceting. This technique was used, for instance, in the shaping of tubular beads, in order to remove irregularities of the shell and the nacreous layer (figure 17, b). The traces are similar to those produced by the use of hard mineral materials as platforms for grinding artefacts. Whether stone or coral platforms were used requires further experimentation. On two tubular beads, the axe-shaped pendant and on a frog-shaped pendant, grinding traces alternate with scraping traces (figure 17, c, d). It is not clear however whether scraping was used for a specific purpose, or if it was just alternated with grinding in order to make the process faster or to remove irregularities of the shell. The other observed technique is notching, used on 19 artefacts: the biomorphic, dagger-shaped and cut-out pendants. Most notches have a broad, U-shaped appearance (*n*=14), which suggests that they were either made with a soft, abrasive tool and/or that the notches were widened (figure 17, e, f). On three artefacts, the notches are V-shaped, while on two of them it is not clear. They were also generally made first on the faces, before directly sawing the side of the artefacts. Only on one artefact (VAS-29), some notches were made just as described and others, directly on the side.

Perforating

Not much variability has been noted in relation to perforating techniques. While on the Jahn collection, different techniques were observed for the perforation of tinklers, in

Table 24: Shaping techniques per shell species in the La Mata collection



this collection only drilling was observed. This difference between the two collections may however not be significant, as there are only four tinklers from La Mata. For the xenomorphic artefacts, drilling was also the only technique used, with the exception of the eight artefacts that did not display perforations. Other techniques were only observed on two artefacts: the *Nerita tessellata* and the *Fissurella* sp. On the former, grinding was used to produce a hole on the whorl (figure 17, g), while on the latter pounding was used to produce a large opening with ragged edges on the apex (figure 17, h).

Drilling, performed on 37 ornaments (77%), produced holes with the same characteristics observed on the shell artefacts of the Jahn assemblage: cone-shaped walls, a tapering but relatively flat leading edge, and thick and regular circular furrows not distributed in a systematic way. There is variation in the general morphology of the hole, sometimes with more pronounced conical walls (figure 18, a, b) and others, more clearly cylindrical (figure 18, c, d). The evidence suggests that the specific method for drilling and tool used were the same as for the Jahn collection. It is clear that a massive drill was used, possibly made of wood. Most drilled perforations presented biconical profile, thus evidencing its execution from two sides (27; 72,9% of the 37 drilled perforations). Only the three perforated tinklers and the *Cyphoma gibbosum* pendant (VAS-45) have conical perforations. Pounding was used to make a second perforation on the *Cyphoma gibbosum* pendant, in a position where the drill would not be able to reach (figure 18, e, f).

The perforation profiles of six artefacts were not clear: three real tubular beads, a disc bead, a cut-out and a frog-shaped pendant. The tubular beads display long perforations with straight walls, but are partially broken and it is thus not possible to assess whether they were made from one or both sides (figure 18, g). This long perforation would have required a long and thin drill of organic origin, which works through abrasion of material. It is possible that the beads come from larger, previously perforated blanks, which are split in fragments to create such pieces. This would explain why the perforations do not have clear profiles. The face of one bead (VAS-8), despite being partially ground, has a stepped appearance which suggests that it was broken from a longer blank (figure 18, h). The other, "false" tubular beads present two cones on each end, positioned perpendicularly to each other: one cone made from the face and other from the side. In this case, they are clearly biconical and made in a similar way to the other perforations in the collection.

Cut grooves were often made on top of the rims of perforations in order to restrict the movement of the string. This was noted on six ornaments from La Mata. On tubular beads, cuts are made both on the face perforation (figure 19, a, b) and on the side ones. It is possible that the cuts also served to widen the rim of perforation. In one pendant (VAS-14), in addition to the grooves to maintain the string in place, a larger circular feature was carved on top of the perforation for an unknown reason. It could be an accidental breakage,

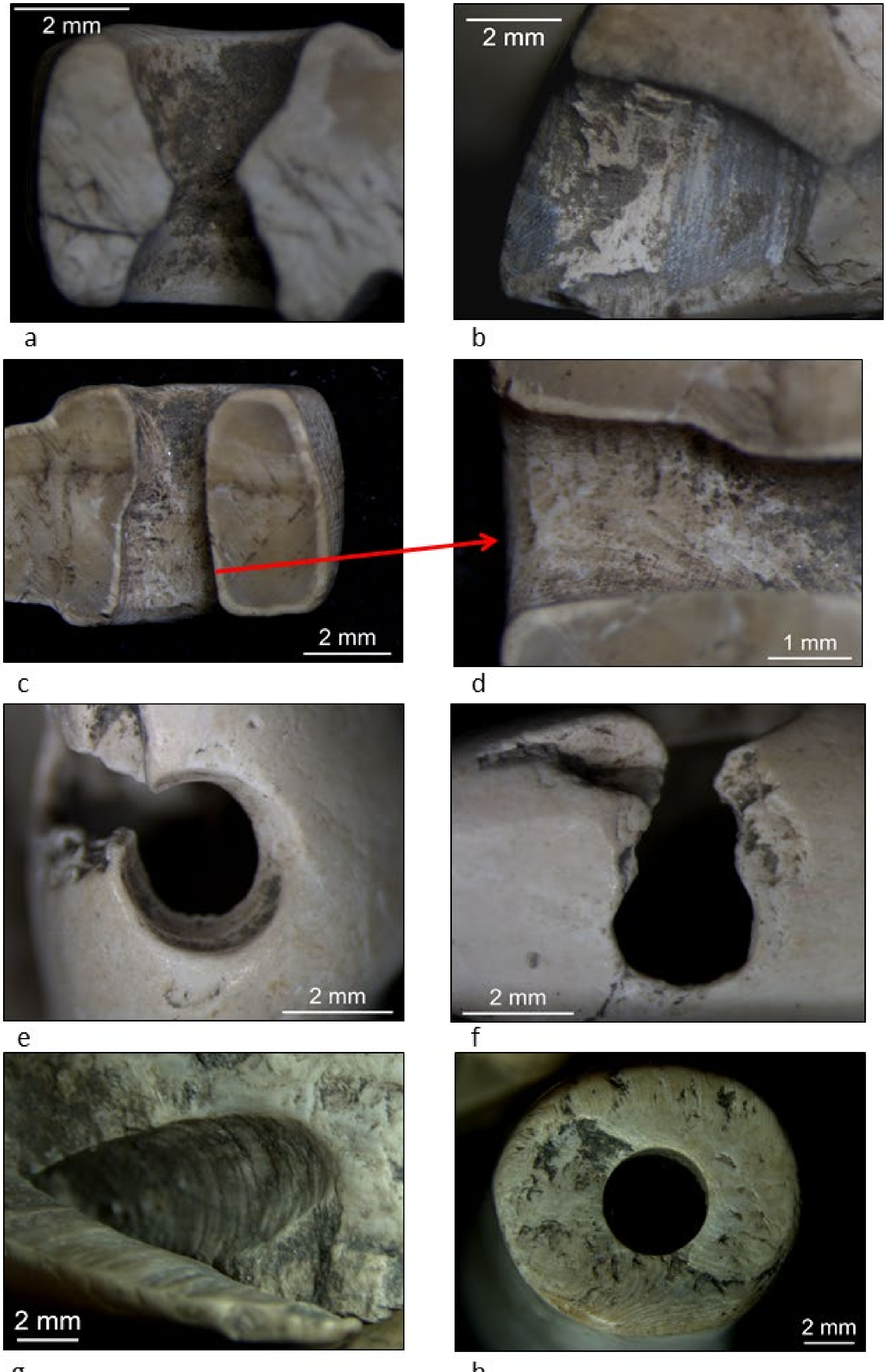


Figure 18: Conical (a, b, e) and cylindrical (c, d, g, h) drilled perforations. Pounded perforation (f).

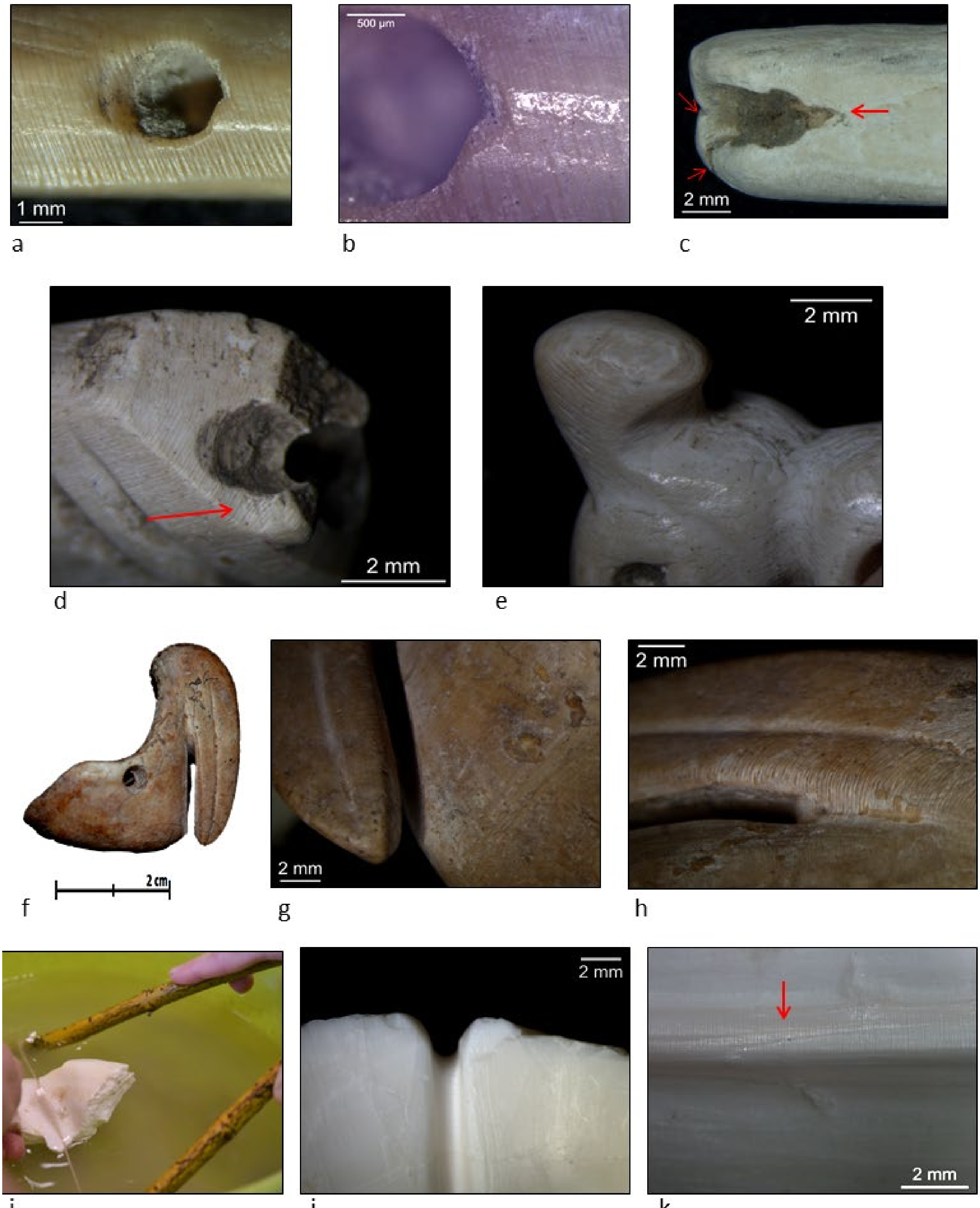


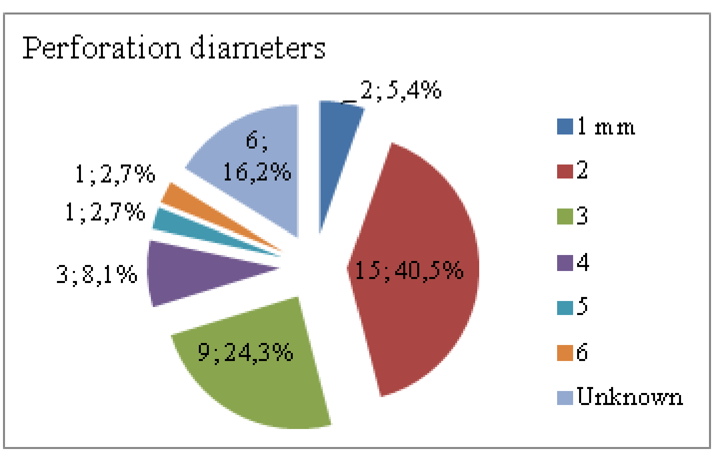
Figure 19: Cut grooves on perforations (a – d). Excising (f) and string sawing (g, h) bird beaks. String sawing experiment (i – k).

but it is not clear.[71] Another feature observed on tubular beads was cut grooves under the perforations (figure 19, c). These grooves are sometimes only with difficulty distinguished from the aforementioned cut marks. They were probably made in order to allow the stabilization of the drill bit. An analogue feature was observed on one of the tinklers (VAS-43): the area where the perforation was placed was previously ground, possibly to flatten the area and allow for the placement of the drill bit.

The diameter of the rim of the 37 drilled perforations varied between 1 and 6 mm, although the predominant values were 2 and 3 mm (64,8%, cf. tab. 25). On six artefacts, the perforation was partially broken and it was not possible to assess its original diameter. The axe-shaped pendant has a 5 mm perforation diameter. The perforation was made along the width of the pendant and is 12 mm long. It is possible that the resulting rim of perforation was large due to the necessary depth it had to be inserted in. The artefact with a perforation diameter of 6 mm is a disc bead broken in half (VAS-34). It is in a severe state of degradation, which may have affected the appearance of the hole. The artefacts with the smallest diameter are a "false" tubular bead and a dagger-shaped pendant.

Regarding the number of perforations, 26 artefacts have only one hole, including beads and pendants, while 11 artefacts have two holes. The latter group includes three zoomorphic pendants, the rounded and the rectangular ones. It also encompasses the automorphic pendant made of *Cyphoma gibbosum* and five "false" tubular beads. The dagger-shaped pendants have only one perforation, but the two cones are placed in an acute angle towards the decorated face of the pendant. This results in a narrower "bridge" than on the back (figure 19, d). On a few specimens, this order is inverted and the larger bridge is on the decorated face.

Table 25: Diameter of drilled perforations (mm) in the La Mata collection



71 The artefact also displays considerable use-wear on the bottom of the feature.

Decoration

In total, 20 shell ornaments display decoration, including incision, excision and drilling. Most artefacts (*n*=19) displayed incision, only in one case associated with excision: a small bird-shaped pendant in which the beak was excised (VAS-26; figure 19, e). Drilling was present in three artefacts, including the bird pendant, a frog-shaped pendant (VAS-36) and the decorated fragment of a lip of *Cassis* sp. (VAS-40).

Another decoration technique, not observed in other Valencioid artefacts, is string sawing. It is present only on the pelican-shaped pendant (VAS-31), where it was used to create an empty space separating the large beak from the body (figure 19, f – h). This technique produced a highly characteristic straight groove with discrete undulation and a rounded base. Such a narrow and deep groove cannot be created by the edge of a tool with a triangular cross-section, only by a string. Below this groove, it is possible to see the remains of an incision which was made before the string sawing started. This preliminary groove was produced in order to provide a place where the string could be stabilized during sawing. In other areas of the world, this was made by drilling the artefact and sawing from inside the perforation (Lothrop 1955).

A string sawing experiment was conducted in order to produce a groove on a fragment of *Lobatus gigas* lip. It was made on top of a preliminary incision made with a flint tool (exp. 3055-1). For the string sawing experiment (exp. 3055-2), a cotton string attached to a bow-like tree fork was used, together with sand and water. The positioning of the string proved to be a challenge, as stabilizing and keeping it in place during the motion was considerably hard. It was decided to maintain the lip fragment submerged in water together with the quartz sand, so that the sand would stay longer in the groove and the string would not break so often. The experiment was interrupted after 100 min, when the cut was no longer V-shaped and had similar characteristics to the archaeological one (figure 19, i – k). This experiment indicates that body positioning and the way in which the artefact and the string are held in relation to each other were probably key in allowing a more efficacious usage of the technique.

Polishing

This operation was noted on eight artefacts, including five zoomorphic and three dagger-shaped pendants. A soft polishing material was used for smoothing the interior of notches and grooves and for giving the beak of a bird-shaped ornament a rounded appearance (VAS-26). On other artefacts, there is no secure indication of polishing.

<u>6.2.1.2 – Performance and technical accidents</u>

As shown in table 26, only eight artefacts were fruit of high technological achievement, whereas two artefacts were clearly less carefully made. The former is clear in some

Table 26: Levels of skill investment per lithic ornament type in the La Mata collection

		High	Medium	Low
Bead	Disc	_	7	_
	Tubular	4	4	_
	Frog	_	1	1
PENDANTS	Tinklers	_	4	_
	Cut-out	_	3	_
	Dagger	4	7	_
	Biomorph	3	3	1
	Axe	_	1	_
	Rectangle	_	1	_
	Round	_	1	_
	Automorph	_	3	_
	Unknown	_	3	_
Total		**8**	**38**	**2**

biomorphic pendants in which excision and string sawing were used. As noted for the Jahn collection, there is little care for erasing previous, misplaced incision grooves (figure 20, a). In spite of being produced by excision, a small bird-shaped pendants (VAS-25) displays evidence of certain lack of care in the execution of an incision around the eye (figure 20, b). On the opposing face, the incision was not made at all. In a frog-shaped pendant (VAS-36), the decorative incisions on its face are superficial and poorly executed (figure 20, c). In fact, while the motif is the same, this rough decoration is unlike any of the decorations of other artefacts, at least in terms of execution.

The "real" tubular beads were skillfully made, as they present long and narrow perforations. All of them present breakages, but these did not happen during perforation as they also display use-wear traces (see next section). The perforation of dagger-shaped pendants are made along the width and placed on top of previously notched areas. The presence of the notches may render the stabilization of the drill bit easier, as the artefacts are very thin and cannot be properly stabilized when lying on their sides. A mechanism to keep the artefact still during perforation was probably used, such as inserting it in a piece of wood or fixing it with resin. The positioning of the two cones in an acute angle and on top of a notched area makes the artefact very fragile. This is the reason why in all the pendants from this collection the bridges between the two cones are broken. Only in one artefact (VAS-20), a bridge is still present, together with the head-like top of the pendant (figure 20, d). In a pendant (VAS-16), further grooves were made in order to make the bridge even narrower (figure 19, d). Making the perforations would thus be highly risky. Only one artefact does not display use-wear and may have broken during manufacture (VAS-16). The breaks may be partially related to use-wear, but the primary reason for breakage was most likely the fragility of the area. The pendants would probably have rather short lives. It is not clear

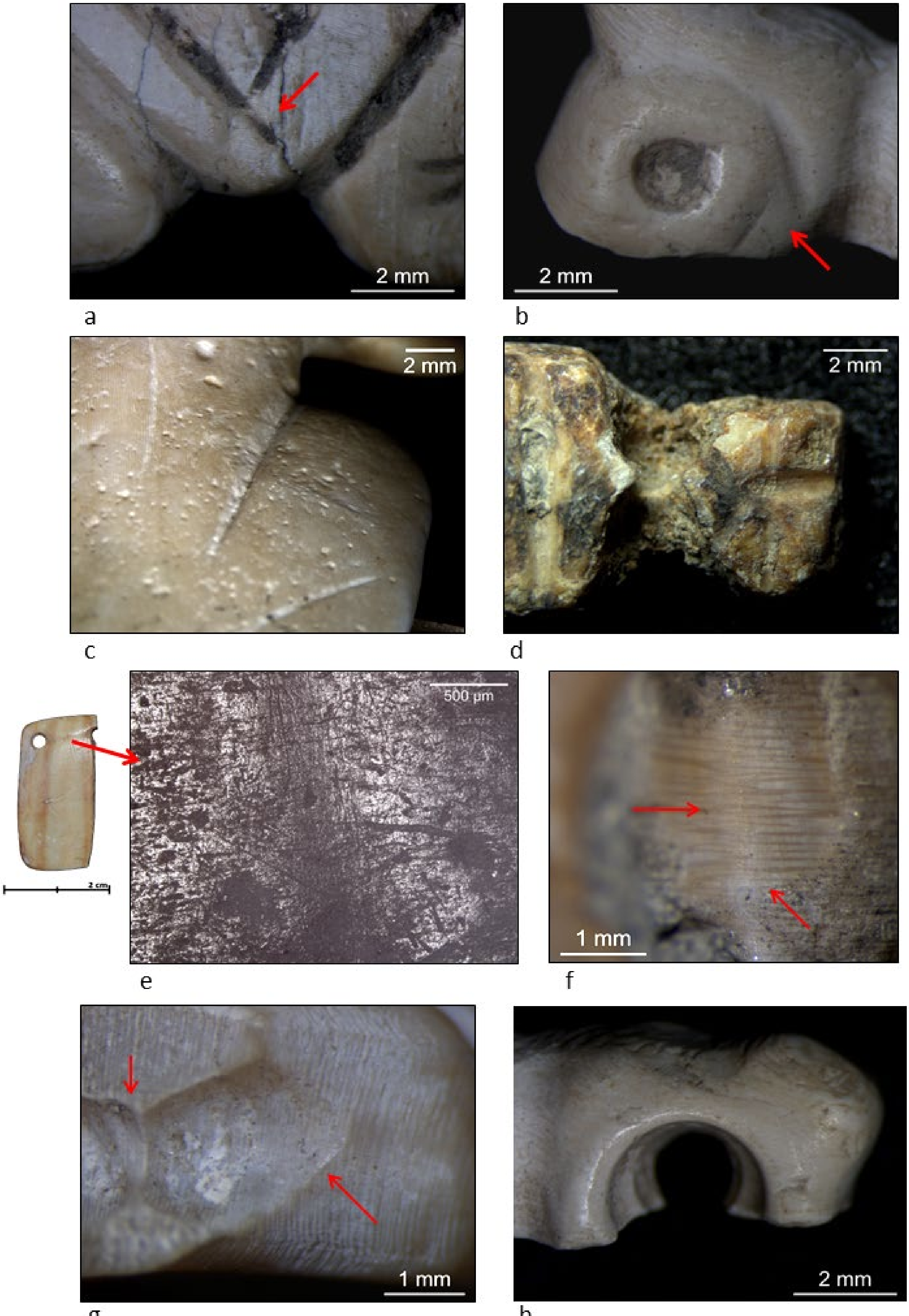


Figure 20: Misplaced (a, b) and superficial (c) grooves. Partially broken dagger-shaped pendant (d). Distinctive string polish (e, f) and polish and rounding on rim of perforation (g, h).

why they would be made to be fragile.

Most artefacts did not present breaks associated to the production process, with the exception of the axe-shaped pendant. It is broken on the perforation, which was never finished. As suggested for the specimen from the Jahn collection, the long perforation could have been difficult to make without breaking the artefact.

6.2.1.3 – Use-wear

According to table 27, the majority of the shell ornaments has evidence of use (38; 79,1%). The most common type of use-wear is the presence of polish and rounding on the rim of perforation (73,6% of the 38 used artefacts). This was accompanied by deformation of the rim on nine artefacts. “Sunken grooves”, similar to the ones observed in the Jahn assemblage, are present on one cut-out pendant. Scratches associated to the polish were observed on four artefacts, namely a cut-out, two dagger-shaped and the rectangular pendants. On two artefacts (VAS-14 and 28), it is possible to observe a linear polished area created by friction with the string (figure 20, e, f). Polish on edges and ridges was present on 17 artefacts (44,7%), while polish exclusively on one of the faces was present on two biomorphic pendants. Wear caused by friction with other ornaments was not observed in this collection.

The dagger-shaped pendants present polish on the rims of the perforations, evidence that they were used before breakage (figure 20, g). The acute position of the perforations suggests that the artefacts were sewn against a surface. This mode of attachment would probably allow a longer usage than just hanging loosely on a string as a necklace piece.

Table 27: Number of shell ornaments with specific use-wear traces per type in the La Mata collection

		Use-wear		Polish on rim	Rim deformed	Scratches	Polish sides		Wear other ornaments
		Yes	**No**				1	Both	
Beads	Disc	**1**	3	1	_	_	_	_	_
	Tubular	**8**	_	6	1	_	_	_	_
	Frog	**2**	_	2	1	_	_	1	_
P	Tinklers	**2**	2	1	1	_	_	1	_
E	Cut-out	**3**	_	3	1	1	_	_	_
N	Dagger	**10**	1	4	2	2	_	7	_
D	Biomorph	**6**	1	5	1	_	2	4	_
A	Axe	**1**	_	1	_	_	_	1	_
N	Rectangle	**1**	_	1	1	1	_	1	_
T	Round	**1**	_	1	1	_	_	_	_
S	Automor	**3**	_	3	_	_	_	1	_
	Unknown	_	3	_	_	_	_	1	_
Total		**38**	10	28	9	4	2	17	_

However, there is no strict correspondence between the position of the narrower bridge and the decorated face of the artefact. Further considerations are impaired by the breakage and successive erosion of the bridges. Regarding the small bird-shaped pendants, one of them is missing the front part (with the carved bird features), while the other one is missing the back (figure 20, h). Combined evidence from both artefacts suggests that the pendant was attached to a surface, likely sewn against it. A "button" type of attachment was noted for the *Cyphoma gibbosum* automorphic pendant.

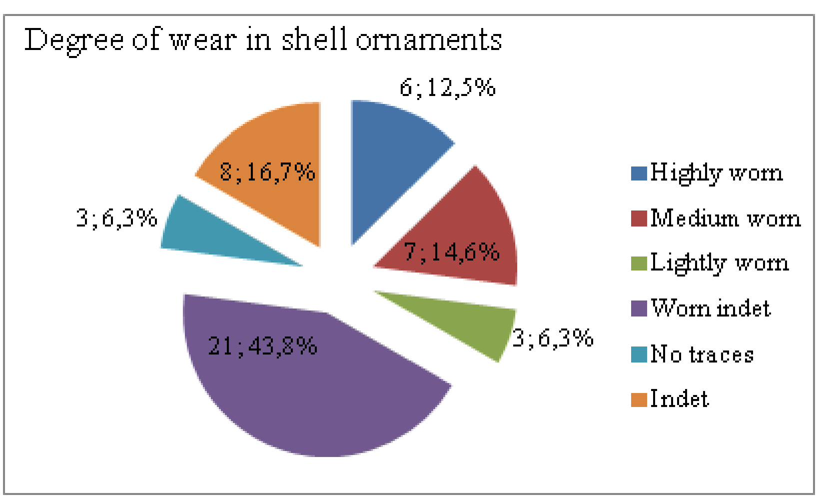
In terms of degrees of use-wear, three artefacts displayed no traces (6,3%), while eight did not present conclusive use-wear evidence (tab. 28). A few artefacts were highly worn (6; 12,5%) and a comparable number, medium worn (7; 14,6%). Three artefacts were lightly worn (6,3%), but in almost half of the collection, it was not possible to attest a precise degree of usage (43,8%).

Residue was observed on a few artefacts, although some of these traces are probably modern. This is clear on the round pendant, which has not only remains of a thick black substance, but also recent scratches and breaks. On other artefacts, residues are more isolated: red substances were observed on a frog-shaped bead, a tubular bead and a dagger-shaped pendant, while a black one was observed on a tubular artefact of unknown type.

6.2.1.4 – Recycling and reuse

The only evidence for reuse is present on two broken tubular beads. One bead presents a broken flat face with polish on top of it, suggesting that it was reused after breakage. On the other bead, even though the breakage is irregular, it has an overall rounded and polished appearance which suggests reuse. It is not clear if this would have been reuse as a bead or not, since the interior and edges of the break display use-wear. A knot could have been added on that point in order to keep the bead in place, but this is speculative.

Table 28: Degrees of wear in shell ornaments of the La Mata collection



6.2.2 – Lithic

Only three artefacts in the La Mata collection are made of stone materials. They were assigned to the pendant category, but present varied morphologies. Three different stone types were used, which overlap with the stones used in the Jahn collection. A flat rounded pendant was produced of slate. The shape of the artefact is not as perfectly rounded as the Jahn specimens and its material is less foliated. The pendant has a general grey colour and a creamish sector with a different texture, most likely rich in iron oxide. Its dimensions are of 18 x 15 x 3 mm and weight of 1,28 g (tab. 29).

The other pendant is elongated and made on a grey igneous rock similar to the one used for the elongated pendant in the Jahn collection. It is a light coloured, heavy, heterogeneous and coarse-grained stone. The artefact is broken on the perforation, therefore affecting its length value. It is larger on the middle as opposed to the extremities, presenting length greater than 40 mm, width from 8 to 18 mm and thickness from 8 to 14 mm. The other artefact is a fragment of a turtle-shaped pendant (the head and beginning of the chest), made on a black stone material. This is an extremely light material, coarse-grained, heterogeneous, and with a greasy black appearance. Microscopic observation indicates presence of mica and quartz. The dimensions of the pendant are 20 x 18 x 8 mm and a weight of 2,79 g.

<u>6.2.2.1 – Techniques and toolkit</u>

While there is little overlap in terms of shape between the three pendants, certain techniques were observed on more than one specimen. They are the same ones used for the lithics in the Jahn collection.

Blank acquisition

There are no clear traces of blank acquisition techniques left on the surface of the artefacts and also no information regarding the conditions of these materials upon collection (*e.g.*, flat slabs, blocks, pebbles, etc.). Similarly to the Jahn specimen, the elongated pendant may have been produced on an oval pebble that would be only further ground in shape. This would require the availability of similarly shaped pebbles of the same igneous rock, as other pendants of the same type were recovered from the Valencia Lake Basin (Osgood 1943, plate 12). The slate for the production of the round pendant may have been already

Table 29: Maximum and minimum size and weight per lithic ornament type in the La Mata collection

	Length	Width	Thickness	Weight (g)
Rounded	18	15	3	1,28
Elongated	40	18	14	19,44
Turtle-shaped	20	18	8	2,79

collected as a flat, small slab. There is no available information regarding where and how the blank of the turtle-shaped pendant was collected.

Shaping

Grinding was noted on the three pendants. On both the slate and the igneous rock pendants, flattened grains and a few isolated striations are observed. The striations are more visible on the iron oxide-rich area of the slate pendant. Small and interrupted flake scars on the edge of the slate artefact can be evidence of pecking, but they are not systematic and possibly related to the foliation of the material. Grinding was used to flatten the back of the stone turtle pendant and was one of the first techniques applied before carving (figure 21, a). The head of the turtle presents faceting. For the creation of the complex shape, scraping (figure 21, b), sawing (notching) and grinding were used in combination, for instance in the delimitation of the neck.

Perforating

The round slate pendant presents two perforations of 0,2 cm placed next to each other. While there is a break on one of them, preventing further analysis, there are grooves entering the other one, similar to the ones on the slate pendants from the Jahn collection. The perforation was drilled biconically, displaying circular scratches inside. This indicates the use of two different techniques, probably for widening the hole. The perforation on the elongated pendant was made on one end. The two drilled cones have 0,4 cm and are positioned in an acute angle in relation to each other (figure 21, c). It is not clear if this positioning was intentional. No scratches are visible inside the cones, although a massive drill was certainly used. The turtle-shaped pendant presents two biconical perforations of 0,2 cm made directly on the decorated face, parallel to the thickness of the artefact. The perforations are located closer to the centre of the face, rather than on the edges like on other biomorphic artefacts. The profiles are exposed by the breakage. The morphology of the perforations is similar to the ones on shell artefacts: broad rings with regular furrows on the walls (figure 21, d). It suggests that the mechanism and tool used for drilling was the same as on the shell ornaments.

Decoration

Incision was used on two artefacts as a decorative technique. On the elongated pendant, two lines were made around its circumference on the lower end, while another one was made closer to the perforation (figure 21, e). The incised lines are interrupted at certain areas, having varied depths depending on the sector. Rather than starting the incision on one side and continuously rotating the artefact in order to carve all sides to the same extent, the maker incised some areas for a longer period, creating deep grooves on the front of the pendant (defined according to its probable orientation when strung), while leaving

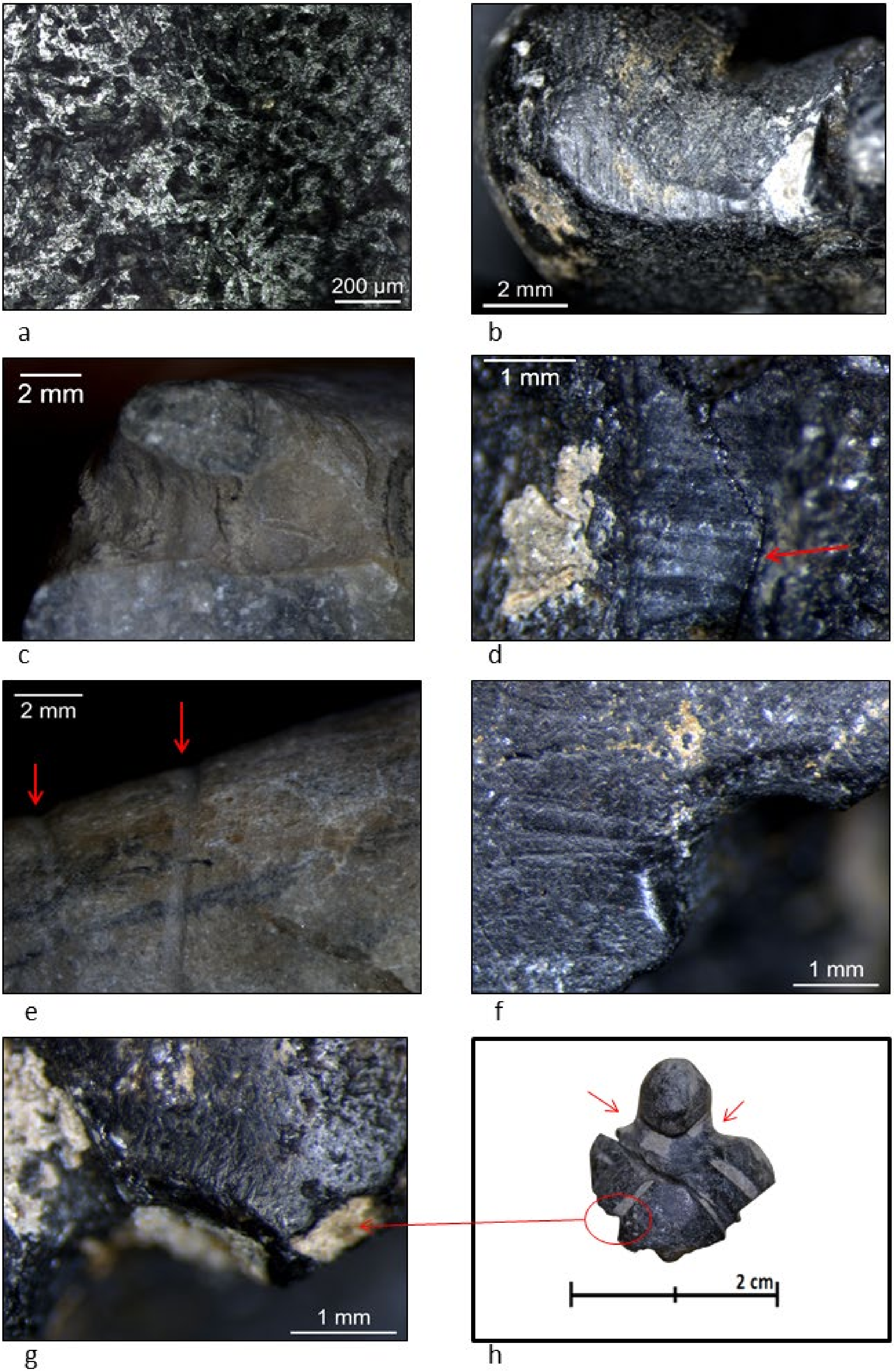


Figure 21: Manufacture (a – e) and use-wear traces (f, g) on stone ornaments.

the back without an incised groove. The grooves disappear on the sides of the pendant, being deeper on one side in comparison to the other. These changes in depth correspond to changes in gesture. The other artefact with incised decorations is the stone turtle, where it was used to produce lines. These were part of a body decoration, as seen on shell pendants. The incision grooves are U-shaped with scratches inside, also similar to the ones present on shell specimens. Excision is also used, as the head is produced by a combination of techniques (grinding, scraping and sawing) as mentioned above.

6.2.2.2 – Performance and technical accidents

The only pendant in which there is evidence of high technological achievement is the turtle-shaped one, in which excision was used, combining a range of techniques and preliminary planning of the volume. It is possible to notice, however, that the two sides of the neck are not perfectly symmetrical: one of them was carved further than the other (figure 21, h). The difference may not have been noticeable in such a small artefact.

6.2.2.3 – Use-wear

It is not clear if the elongated pendant was worn as it is broken on the perforation and has a relatively fresh appearance. However, there is certain rounding and polish on the rim of perforation. It is not possible to assess whether the artefact broke before, during or after use. The lack of clearly developed wear suggests one of the former two. There is no visible use-wear on the slate pendant either. In this case, it may be related to the difficult visibility of polish on this material. The turtle-shaped pendant presents polish, rounding, deformation and scratches on the rim and inside the perforations (figures 21, g). The scratches on the rim of perforation are positioned towards the middle of the face suggesting the crossing of a string there. On the back, the two perforations also present deformed notches towards each other and the area in between is polished and displays deep scratches (figure 21, f). The scratches may have been intentionally made. The carved area below the neck is also considerably rounded and displays polish, suggesting the presence of a string around it.

6.3 – Considerations

The analysis presented in this chapter points to considerable overlap between the two Valencioid collections, as artefacts display comparable traces. In this sense, they are complementary: evidence from one collection often provided further information on questions regarding the other one. Microwear analysis proved successful as a strategy for collecting data. Additions to the surface of artefacts were often observed (stickers, nail polish, pencil marks) which hampered the observation of traces. Likewise, the presence of residues had to be regarded with caution, as they may have been left by modern contact materials. Such issues are expected in museum and private collections, which can have complex and long biographies. However, they did not prevent the analysis of manufacture and use-wear, especially in the case of artefact types that were numerous. Some of the features could not be observed under high magnifications due to the presence of nail polish and ink, but they were still analyzed with the stereomicroscope. Another issue faced during their study was the internal comparability of each assemblage. There were many artefact types, considerably different from each other. When there are only a few specimens of each type, it is difficult to draw conclusions, especially regarding manufacture. Nevertheless, as will be discussed in Chapter 8, the analysis showed that the combined data from all artefact types and of the two assemblages can provide sufficient basis for writing biographies of ornaments.

Chapter 7 – Analysis: north-western Dominican Republic

From the north-western region of the Dominican Republic, 46 artefacts were analyzed for this research. The majority comes from the site of El Flaco (33; 76,7%), while the remaining artefacts are from other sites in the north-western region. This assemblage is therefore different from those of the Lake Valencia, since there is secure contextual information for many of them. In this analysis, only beads were included (see Chapter 3). The assemblage from El Flaco will presented as one group, while the materials from the other sites will be presented afterwards, as a second group. This will provide information that is specific to the site of El Flaco, alongside comparative data from the surrounding region. The analysis will be further divided according to the raw materials used for bead making.

7.1 – Beads from El Flaco

In total, 33 beads were recovered during the two years of excavations, encompassing different raw materials, especially stone and minerals. The analysis presented below will only include 31 artefacts, as two of them present fresh breaks that prevent analysis. This includes a tubular object which is partially hollowed, but made on an unidentified white raw material (Fnr. 1117). The second one is a short cylindrical artefact made of shell (similar to a disc bead) that was broken in several pieces (Fnr. 957). Excluding these two artefacts, the collection is divided in five raw material categories (tab. 30), namely lithics (17; 54,8%), coral (4; 12, 9%), bone (4; 12, 9%), shell (3; 9,7%) and ceramic (3; 9,7%).

In reference to colour, white predominates (15; 48,4%), being associated to predominance of calcite as bead raw material, alongside bone (tab. 31). The shell beads have creamish (*n*=2) and reddish colours (*n*=1). The colour brown is associated to the use

Table 30: General raw material types in the El Flaco collection

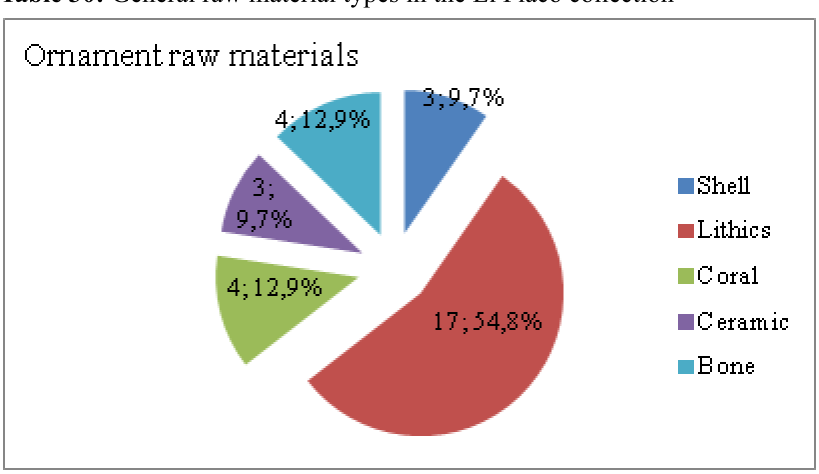
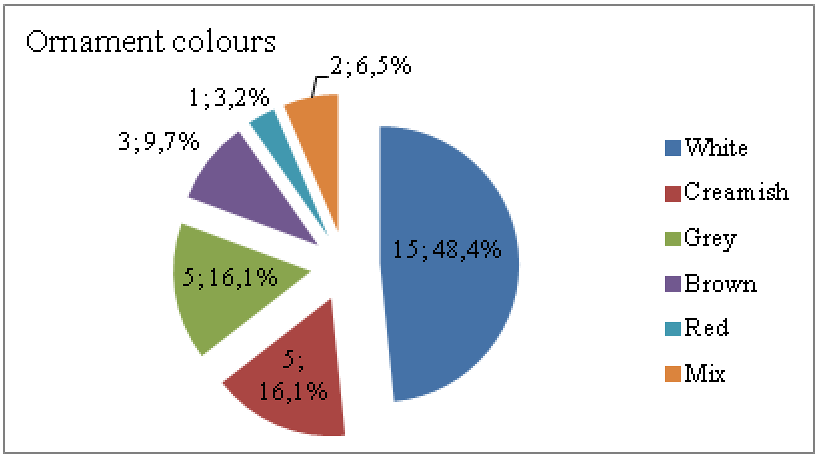


Table 31: Ornament colours in the El Flaco collection



of ceramics as raw material, while grey is from coral and certain stone types. Mix refers to two beads made of diorite, which have patches of colour in white, black and green.

The length of the artefacts varied from 3 to 27 mm, while width from 3 to 21 mm, and thickness from 1 to 45 mm. The predominant values were from 5 to 10 mm for both length (54,8%) and width (58%). These two values correspond to the diameter on beads and suggest certain homogeneity (i.e. perfectly circular beads). In reference to thickness, three groupings are possible, one between 1 and 5 mm (32,2%), another one between 11 and 17 mm (29%), and 22 – 45 mm (25,8%). The type of bead varies according to its thickness, measured along the axis of perforation; this suggests that cylindrical beads are predominant, but vary considerably in type (*e.g.*, short vs. long tubular beads).

The beads were recently excavated and are therefore in a very good state of preservation. Only one bead presents a fresh break. Other breaks, observed on seven beads, happened either before or during deposition. In addition, all the beads were cleaned by the author and kept separately from other finds. No ink marking was made on their surfaces.

7.1.2 – Shell

Shell was used in the manufacture of three beads. They are very thin and flat disc beads ("seed beads"), with diameter of 5 mm and thickness between 1 and 2 mm. Weight differs slightly: 0,02, 0,04 and 0,07 g. This difference may be related to a difference in the shell species used. One of them has a reddish face, being probably made from a red bivalve shell, such as *Chama sarda*. The other two were made of *Lobatus gigas* or another white/creamish species.

<u>7.1.2.1 – Techniques and toolkit</u>

The small size of the sample and the fact that only finished beads were included limit the amount of information that can be obtained regarding their manufacture. In order to obtain blanks that could become beads of such size, flaking the shells would be a time-efficient technique, requiring little predictability of the resulting fragments.

Shaping

Grinding was used to shape all beads, but traces are only visible on the reddish one (Fnr. 687). These can be observed as striations on the surface (figure 22, a). It was made using a hard mineral contact material, possibly by rubbing a large number of beads against a platform with another handheld stone, as the beads cannot be grasped individually. This bead presents a remaining nacre layer on the same face, a sign that it was not completely ground off. In order to grind the sides, it is possible that beads were strung together and rubbed against a platform. This would explain the homogeneity in diameter values as opposed to height (as suggested by Lammers-Keijsers 2007).

Perforating

The beads have a perforation placed on the centre, which is biconical and has circular scratches inside. The traces point to the use of a massive drill, made of a hard material with irregular edges such as flint or quartz (figure 22, b). The perforation diameters are of 2 and 3 mm. The difference in diameters, however, may be related to use rather than to the size of the drill bit.

7.1.2.2 – Performance and technical accidents

The similar dimensions of the beads are evidence of standardization. However, this is not difficult to achieve, not even for a craftsperson with little experience (Miller 1996). The beads are considered of medium skill, as there is no evidence of mistakes or "sloppiness".

7.1.2.3 – Use-wear

All beads have rounding and polish on their rims of perforation, while the perforations of the two creamish beads are also deformed (figure 22, c, d). On two beads, the polish is accompanied by small scratches entering the rim, which may be related to the material from which the string was made of. Two beads present polish on faces and side, while the remaining one (reddish) is not as used.

The cones of perforation of one bead (Fnr. 953-2) are considerably rounded and deformed, especially on one sector as opposed to the others (figure 22, e). This asymmetrical wear can be observed on the three beads, which suggests that they were not hanging loosely on a string, but were locked in a same position, possibly through sewing. This may be the case if they were used in an embroidered piece (Carlson 1995; Ostapkowicz 2013). It is not possible to ascertain if the beads from El Flaco were used in embroidery without analyzing more beads of the same type and comparing them to ethnographic ones.

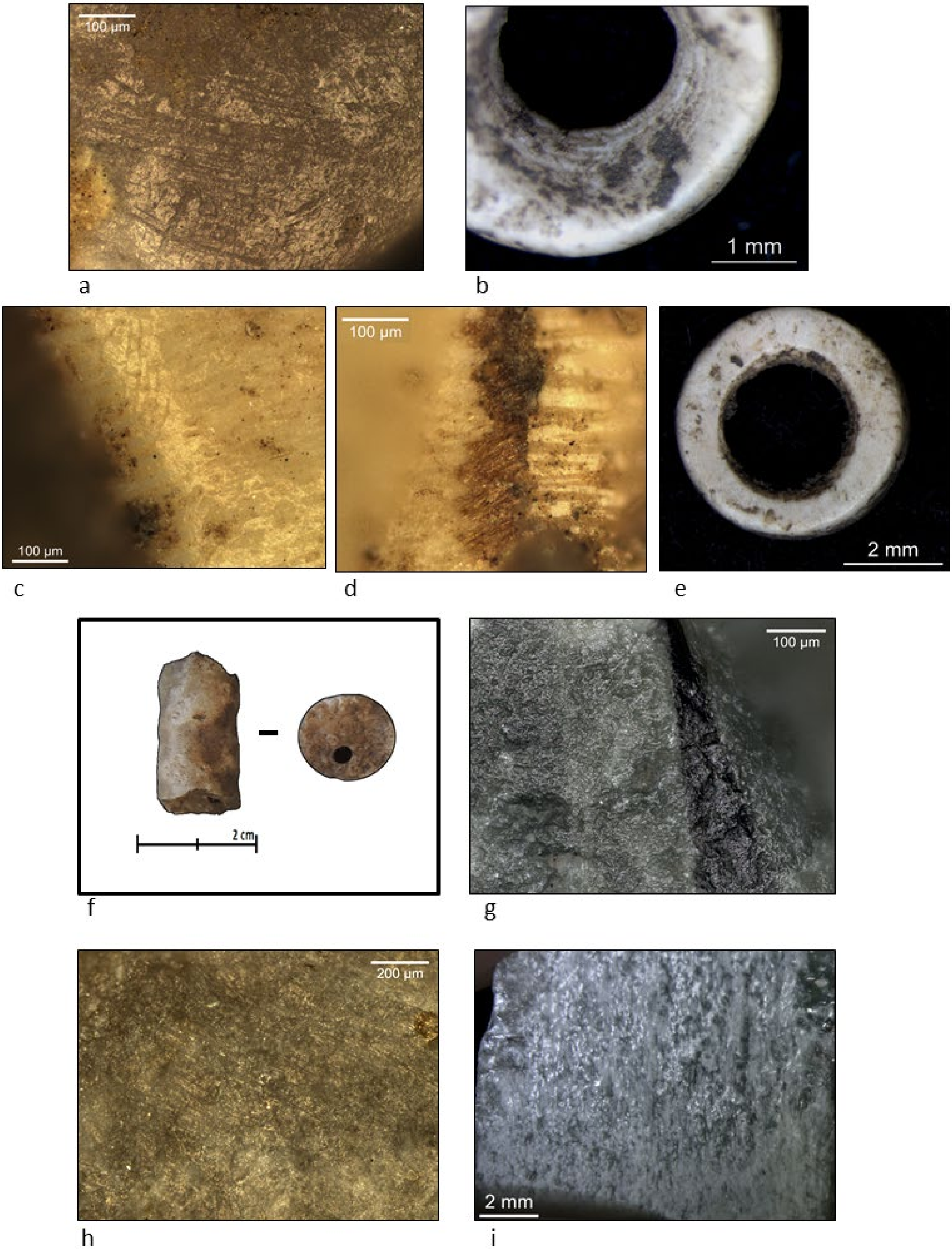


Figure 22: Manufacture and use-wear traces on shell beads (a – e). f: Calcite preform. Archaeological (g, h) and experimental grinding traces on lithic materials. g: diorite, h and i: calcite.

7.1.3 – Lithic

The most common bead raw material in El Flaco was lithic (17; 54,8%), a general term under which are included different rock types and minerals. Only three lithic materials were noted in this assemblage, one of which is clearly predominant: calcite (14; 82,4% of the lithic beads). An igneous rock constituted of white and (dark) mafic minerals, used for two beads, was preliminarily identified as diorite. The two beads differ slightly in term of colour, but both are hard, massive and coarse-grained. A third rock variety, used for one bead, is also a coarse-grained igneous rock, with grey colour. It is referred to as "igneous indetermined" in the table below (tab. 32).

There are two predominant types of beads: disc and tubular. Most calcite beads are tubular (*n*=9). Some tubular beads, in addition to the (main) perforation along the length, have an extra perpendicular perforation (*n*=7). Among the latter, there are two anthropomorphic beads. The irregular disc bead is a flat artefact, with oval shape and incisions on the side. The diorite beads are both disc-shaped, while the bead of indetermined material has a barrel-shape.

There is variation within each bead type, especially within tubular and double-perforated beads (tab. 33). The difference in thickness is pronounced, varying from 4 to 25 mm (most values were above 15 mm). These differences, however, have to be considered in relation to the diameter of the beads. Two tubular beads are partially broken on the ends, rendering the measurement of thickness inaccurate (not represented in the table). While difference in weight between igneous rocks and calcite is expected, there is considerable variability within calcite beads themselves, including the lightest (0,10 g) and the heaviest (5,80 g) beads in the collection.

<u>7.1.3.1 – Techniques and toolkit</u>

Evidence of production techniques was observed on all beads. However, as remarked before, traces from the early stages are often superposed by other production techniques and use.

Table 32: Bead types and lithic raw materials in the El Flaco collection

	Calcite	Diorite	Igneous indet	**Total**
Disc	4	2	_	**6**
Disc Irregular	1	_	_	**1**
Tubular	2	_	_	**2**
Tubular double-perf	7	_	_	**7**
Barrel-shaped	_	_	1	**1**
Total	**14**	**2**	**1**	**17**

Table 33: Maximum and minimum size and weight per lithic bead type in the El Flaco collection

	Length		Width		Thickness		Weight (g)	
	Max	Min	Max	Min	Max	Min	Max	Min
Disc	11	5	11	5	7	3	1,10	0,14
Disc Irregular	9	_	7	_	4	_	0,27	_
Tubular	14	8	14	8	24	16	5,80	1,10
Double-perf	12	8	12	8	25	4	4,50	0,10
Barrel-shaped	19	_	19	_	15	_	7,53	_

Blank acquisition

While no evidence of blank acquisition techniques was observed on the beads, there is one calcite bead preform. The sides of this bead are not completely smoothened and the faces are broken (Fnr. 824). The perforation, decentred on both faces, is cylindrical and very narrow. One of the faces is in fact only partially broken, while the remaining part also looks irregular, although more rounded (figure 22, f). This is an indication that the blanks for tubular beads were produced through the breakage of perforated calcite tubes. The separation of the blanks would be made through the groove-and-snap technique, although no evidence of cutting was found on this artefact. Calcite is a relatively soft material, so cutting/sawing is not time-consuming. A sawing experiment was conducted, in which initial cut grooves were made on a green calcite with flint (exp. 2477; 2 min) and a *Lobatus gigas* shell flake (exp. 2479-2; 4 min). In another experiment, a fragment of limestone was sawn with a flint tool until the piece could be broken in half (exp. 3048-2; 71 min). In fact, cutting/sawing would be the best technique for obtaining blanks from calcite, as it is a not brittle material and thus not good for flaking.

Sawing experiments on diorite were conducted with both a flint tool (exp. 3063-1; 23 min) and a cotton string (exp. 3063-2; 60 min). However, in both cases it was time consuming and not effective. Diorite is a very though material and not good for flaking. Diorite pebbles can be collected from river beds in the region and these could have been used for bead making. However, there is no evidence for stone bead making in the site, so they were probably produced elsewhere. Calcite is also available in the region, but the bead described above is the only evidence of production in the site. Considering its diameter and thickness (14 x 24 mm), it could be a preform of an anthropomorphic bead, with diameters of 9 and 12 mm and thickness of 22 to 25 mm. This is, however, speculative.

Shaping

Grinding was made on all beads, producing linear striations only visible at a microscopic level and, on a few specimens, also faceting (figure 22, g, h). The direction of the striations on the side is evidence that grinding was made along the thickness of the beads. On the diorite beads, flattening of the dark mineral grains is observed, which take a very bright polish. The white minerals do not take polish that easily, which renders their observation difficult. In order to produce a barrel-shaped bead, the two opposing sides of a globular preform were ground flat on the areas where the perforation was to be placed. Grinding calcite experiments on both coral (figure 22, i) and stone platforms proved to be easy and relatively fast (exp. 2479-1 and 2488-1; 3-4 min), while grinding diorite was more time consuming (exp. 3036 and 3037; 60 min).

On the sides of some calcite beads a groove was made, producing an "hourglass" shape (figure 3). Different techniques were used for this purpose: grinding the bead against the edge of a tool was the most common one and on one bead, scratches on the surface suggest the combined use of scraping (figure 23, a). On two calcite beads, rather than creating a real deformation on the side, only an incision was made around its circumference, through the use of a hard tool, such as flint or quartz (figure 23, b). The choice for incising may be related to the small size of the beads (3 x 4 and 7 x 8 mm).

Perforating

The perforations of the beads were made with massive drills which left circular scratches on the walls. A biconical profile with circular scratches on the walls of perforation was observed on three disc beads (two made of calcite and one of diorite) and on the perpendicular perforations of tubular beads (figure 23, c). The same features were reproduced on experimental perforations made with flint (exp. 2488; figure 23, d). The perforations made on a diorite one and the barrel-shaped bead and along the length of tubular beads are cylindrical. Circular scratches on the cylindrical walls are visible only on nine beads. A common feature of tubular calcite beads is a rim of perforation that is narrower on one face, and larger on the other (figure 23, e). This can be evidence of the widening of the perforations through the insertion of a tool after drilling. In fact, one of the anthropomorphic beads has scratches on the rim probably made by the insertion of a hard material. This possibility explains the difference between the diameters of the rim of perforation on each face on tubular beads. Therefore, the beads would be perforated from both faces with a long and thin drill bit of unidentified material and widened afterwards.

The calcite bead preform can offer insights into this drilling technique. The perforation on the preform is cylindrical, very narrow (3 mm) and long (25 mm). On one of its faces, there is a circular fracture around the rim of perforation, which may have compromised the whole bead and can probably be related to the moment of perforation. Either a hollow or a thin massive drill bit could have produced a hole with these characteristics. The same tool was probably used for the perforations of the beads with a cylindrical hole. More experiments need to be conducted in order to explore these possibilities. Finally, on one bead (Fnr. 197) a different technique was used to make the side perforation: while one cone was drilled, the other one was made either by applying pressure or by pounding with

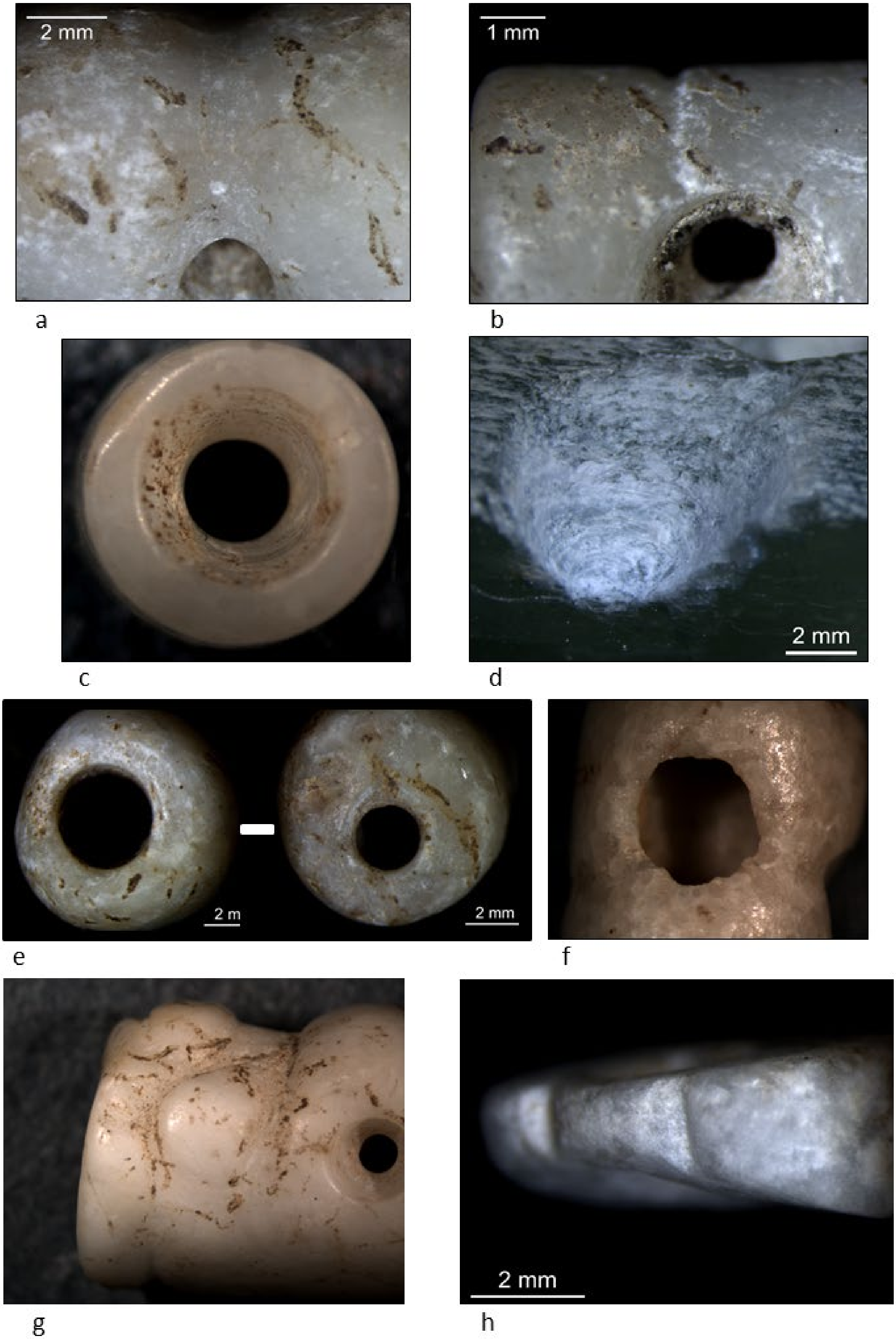


Figure 23: Incisions on the sides (a, b, g, h) and perforation techniques (c, e, f) on beads. d: experimental drilled perforation with flint on calcite.

a chisel on the thin wall of the bead (figure 23, f).

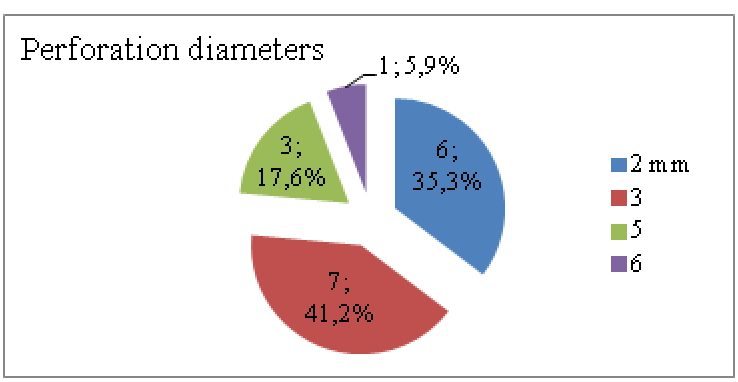
The diameter of drilled perforations is presented on table 34.[72] Most perforations have a diameter of 2 or 3 mm (76,4%), while the largest one (6 mm) can be found on the barrel-shaped bead. On several beads, the face perforations are not perfectly centred and aligned. Through comparison with the preform, in which the perforations are clearly decentred, this indicates a problem in the execution of the drilling technique or lack of concern, as the perforation is widened afterwards.

Decoration

Decorative techniques were only rarely used, with the exception of the two anthropomorphic beads. The sides were carved through incising and excising in order to create specific shapes on the beads depicting a nose, ears and legs. This procedure is clear on the ears, where multiple cut marks were combined to excise a circular area (figure 23, g). The incisions have a V-shape morphology, which points to the use of a flint-like tool. The sector which corresponds to the belly is pronounced on one bead (Fnr. 145), while on the other it has been carved in (Fnr. 676-2). On both cases, the area was modified by scraping (although not many traces are visible). The beads have a specific orientation, with the carved side facing forward.

Decorative elements were added to other six beads. Here are included the hourglass shape created on four beads by incising and/or grinding. Incising was also used to make six grooves (figure 23, h) on the sides of the irregular disc bead. Finally, drilling was also observed as a decorative technique on a diorite disc bead (Fnr. 1210). This decoration mimics the double perforations, although this bead is too thin (3 mm) to actually have a complete side perforation. The areas where the two unfinished cones are placed on the diorite bead from El Flaco were ground flat. It is not clear whether grinding and perforating the side of this small and thin bead would be possible after the bead was complete. It would

Table 34: Diameter of drilled perforations (mm) in the El Flaco collection



72 Only one cone of perforation is considered per bead, the smallest one. Therefore, the numbers are not representative of the maximum size of the drill bits, only of the minimum.

be very unlikely that a drill was stabilized on such a small surface. This is more reasonable if a handheld drill is used rather than a more complex mechanism. However, the hardness of diorite has to be taken into account when discussing the possibility of making a hole with a handheld drill. This stage would have to be performed before the separation of the bead from a larger (perhaps multi-bead) blank.

Polishing

The presence of this operation can only be attested on the two anthropomorphic beads. It was probably made with a soft material in order to smooth areas with misplaced carving traces. This eliminated most traces from around the area of the belly and smoothed the incisions.The technique was probably also carried out to highlight the shine of the calcite.

7.1.3.2 – Performance and technical accidents

Regarding the skill invested in each artefact, most lithic beads are not poorly made, but do not involve the use of highly risky techniques and are not particularly well finished (tab. 35). They also sometimes present misaligned cones of perforation. In terms of skill level, differences can be noted between the two anthropomorphic beads (Fnr. 145 and 676-2). Fnr. 145 has a larger diameter, although they possess the same height. On this same bead, incision predominates as a decorative technique, while the excisions are simply produced by the combination of individual incised grooves. By examining the disposition of such individual incisions, it is possible to perceive the difficulties imposed on the inflexible hard tool by this relatively soft material. The use of other techniques such as scraping seems also to be little to none. It is also possible to see misplaced or incomplete grooves between the legs and on the back of the bead. The legs on the bottom are also not aligned with the rest of the body, i.e. they are turned towards one side (figure 24, a).

On Fnr. 676-2, conversely, the excising technique predominates, creating shapes that are more tridimensional in spite of the material being coarser. In addition, the groove on the back is continuous and the feet are particularly marked and pronounced. All the parts of the body are aligned. The side perforation is also placed closer to head, in contrast with Fnr. 145, where it is placed on the middle, next to the pronounced belly. It is possible

Table 35: Levels of skill investment per lithic ornament type in the El Flaco collection

	High	Medium	Low
Disc	1	5	_
Disc Irregular	_	1	_
Tubular	_	2	_
Tubular double-perf	1	5	1
Barrel-shaped	_	1	_
Total	**2**	**15**	_

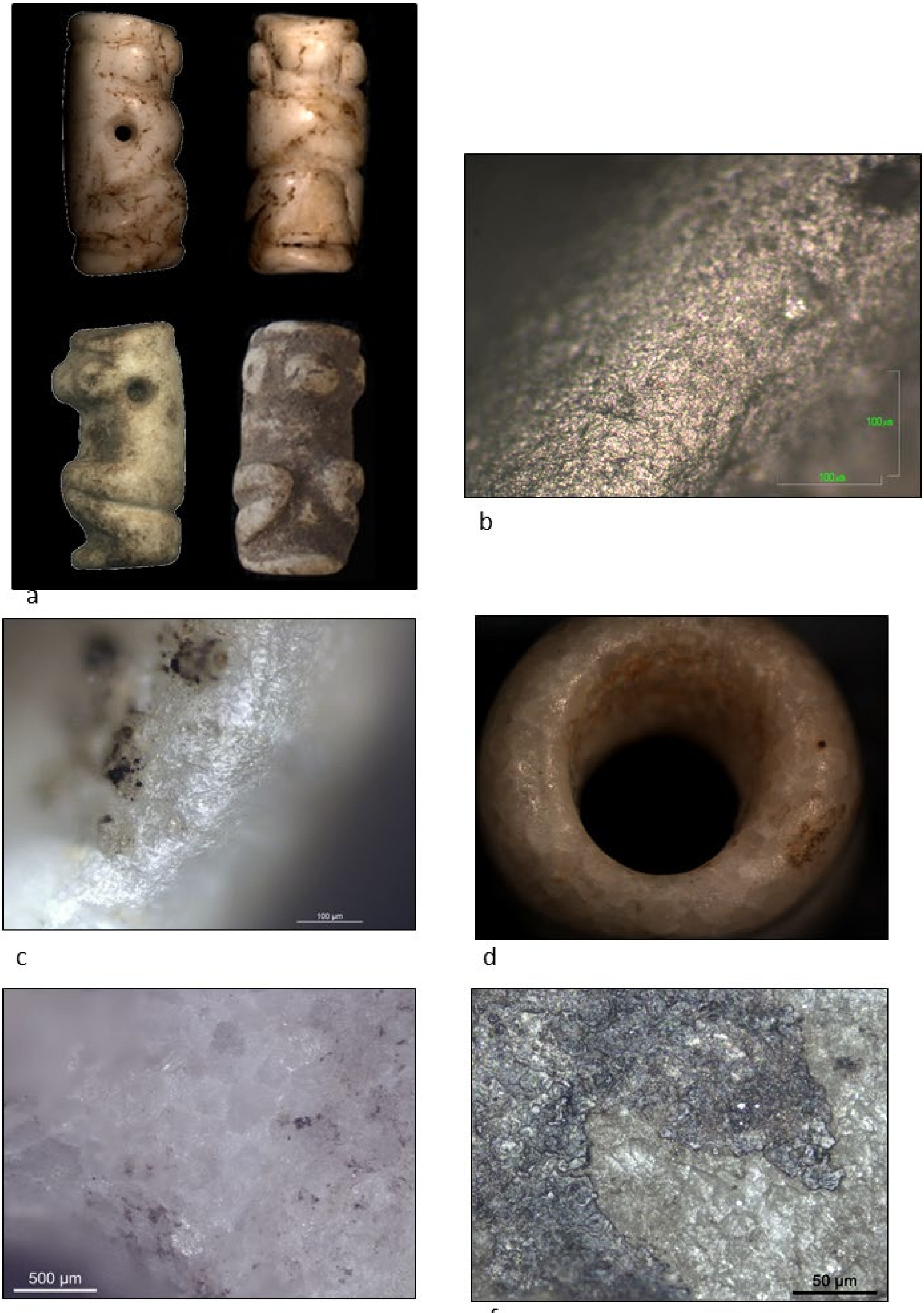


Figure 24: Anthropomorphic beads (from the top, Fnr. 145 and 676-2). Use-wear polish (b – e) and residue (f) on lithic beads.

that this difference is in fact associated to a differential mode of attachment. As mentioned above, it is common that tubular beads have a large and a narrower face perforation. The narrow cone, which lies on the bottom face (next to the feet of the figure), is located closer to the back side of the bead on Fnr. 676-2, while on Fnr. 145 it is closer to the front (the carved face). It is not clear if this inverted positioning of the hole is intentional and related to use.

The cone made by pounding on Fnr. 197 is evidence of the use of a more time-efficient technique, which resulted in ragged edges and a poor placement: it is not placed 180° in relation to the other one, but in an angle of less than 45°. This unexpected position may be evidence of sloppiness or lack of skill. The different technique on the last cone may also be the result of an accident due to the pressure exerted by the drill on the thin wall. Another evidence of lack of care is the incomplete incision on the middle of the bead. The barrel-shaped bead (Fnr. 801) displays an angle of perforation that is partially oblique, rather than straight; in addition, the perforation cones are not placed on the centre of the ground areas. Slightly misplacing cones of perforation is a common problem in bead making and may have been a greater challenge in harder rock varieties such as this one. It did not prevent the perforation, which is complete, therefore suggesting that the maker knew how to deal with such problem.

7.1.3.3 – Use-wear

Most lithic beads (12; 70,5%) display evidence of being used (tab. 36): rounding and polish on the rim of perforation, sometimes accompanied by scratches (*n*=3) or deformation (*n*=1) (figure 24, b – d). The faces of the beads also have polish around their edges, presumably caused by contact with another beads (*n*=10). Polish on the sides was less often observed (*n*=2), being produced by friction against a surface such as skin or clothing. The lack of traces does not imply that contact did not take place, but that perhaps not for long enough or with sufficient intensity.

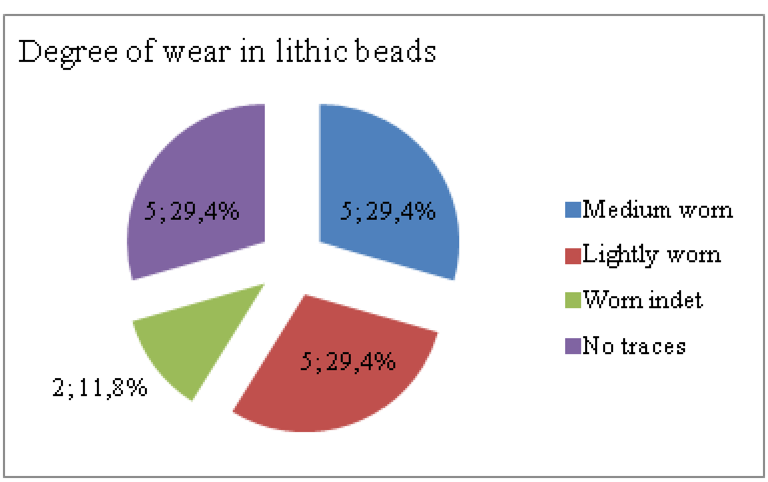
Table 36: Number of lithic beads with specific use-wear traces per type in the El Flaco collection

	Use-wear		Polish on rim	Rim deformed	Scratches	Polish sides		Wear other ornaments
	Yes	**No**				1	Both	
Disc	**5**	1	5	_	1	_	1	4
Disc Irregular	–	1	–	–	–	–	–	–
Tubular	**1**	1	1	_	1	_	_	1
Double perf	**6**	1	6	1	1	_	1	5
Barrel-shaped	–	1	–	–	–	–	–	–
Total	**12**	5	12	1	3	_	2	10

The distribution of use-wear in double perforated beads is more complicate. Even though they were included in the table below in a summarized form, differential degrees of wear exist between the length and side perforations. One double perforated tubular calcite bead is broken along its thickness and does not present any evidence of wear (Fnr. 1216). The other ones were used: three of them display no sign of wear on the side perforations, whose cones are very sharp, but some wear on the faces; while the other three have worn side cones and faces with varying degrees of wear. This suggests not only different degrees of usage, but also different modes of attachment. The two anthropomorphic beads differ from each other, as Fnr. 676-2 has worn side cones and a groove that links them below the neck, where a string would have passed (figure 24, e). Fnr. 145 has sharp side cones and little wear on the faces. The beads with worn length perforations were probably strung as normal beads, despite the presence of side perforations. This discussion will be resumed in the next chapter.

None of the beads recovered from El Flaco are heavily worn (tab. 37). Many beads are medium worn: three tubular ones (two double perforated ones), and two disc beads, one made of calcite and another of diorite. The lightly worn are two double perforated tubular beads, two calcite disc beads and a diorite one. A double perforated one, the calcite preform, a disc bead, the irregular disc bead, and the barrel-shaped one do not present use-wear traces, being presumably unused. The calcite preform (Fnr. 824) and the double perforated bead (Fnr. 1216) may have been discarded due to breakage, although it is not clear if the double perforated bead broke due to the adding of a side perforation. The misalignment of the perforation in the barrel-shaped bead would not prevent it from being strung, so there is no apparent reason for discarding it. There is no evidence for the calcite disc bead either (Fnr. 1129), while for the irregular one (Fnr. 953), it may be associated to its irregularity, decentred perforation and pronounced difference in thickness. It is possible that the incisions were casually made in a bead already to be discarded. This would explain why one of the incisions was interrupted.

Table 37: Degrees of wear in lithic beads of the El Flaco collection



Finally, the anthropomorphic bead with worn side perforations (Fnr. 676-2) presents residue of a black substance on its bottom face and on the sides, entering the perforation (figure 24, f). The polish on the face is on top of the residue and it is also associated to striations. No chemical identification was made, but it could be remains of resin used to attach a feather to the bead or on a string. A black/brownish substance is visible on the sides of the calcite preform (Fnr. 824), but it is not clear if it is residue.

7.1.4 – Coral

Tubular coral beads were recovered from the site (*n*=3), predominantly manufactured of branches of *Acropora cervicornis*. Only one bead was made of the thicker branch of a different species. The beads vary in length and quality of finishing, but can all be considered tubular and have creamish to greyish colours. In the table below (tab.38), the beads were separated according to coral species. In spite of variations, it is clear that the *A. cervicornis* beads are part of a uniform type, as opposed to the larger bead made of the unidentified coral, which is also much heavier. Most of them seem to be complete beads, with the exception of one preform which is less thick than the others (15 mm).

7.1.4.1 – Techniques and toolkit

The irregular and rough surface of the coral hampers the identification of traces, including of manufacture. The experimental programme had thus an important role in the creation of informed suggestions regarding manufacture techniques.

Blank acquisition

It is not clear how the coral branches were collected, although it would certainly require going to the seashore or exchanging with communities closer to those areas. Corals can be found washed ashore, already partially rounded. Whether they would be found in a desired thickness for the production of beads is speculative, but the branches probably had to be divided in shorter segments. On one *A. cervicornis* bead, it is possible to see striations associated to cutting/sawing. However, the beads of this material, at least the two finished ones, display rough and irregular faces, probably related to their breakage in sections.

A groove-and-snap experiment was conducted by sawing 2 mm grooves with flint around a branch of *A. cervicornis* (exp. 3054; 11 min). From these shallow cuts, it was possible to produce a controlled break of the branch with a chisel and a hammerstone.

Table 38: Maximum and minimum size and weight per coral bead species in the El Flaco collection

	Length		Width		Thickness		Weight (g)	
	Max	Min	Max	Min	Max	Min	Max	Min
A. cervicornis	18	11	18	10	30	15	3,60	1,01
Indeterminate	26	_	21	_	45	_	33,92	_

The resulting break displays the general roughness of the coral. The bead made of an unidentified coral (Fnr. 1032) has a round face, possibly natural (i.e. the extremity of a branch). The other face has a concave, U-shape with a line in the middle. Experiments have not been conducted, but this could be made by forcing a sharp point in the middle of the branch, also through chiselling.

Shaping

The only technique used for shaping the beads was grinding, as the *A. cervicornis* branches are already cylindrical. However, the surface of the beads is not completely smooth and regular, not even on the specimens with clear evidence of grinding (in the form of striations, flattening and rounding) (figure 25, a). According to the experiments, the grinding of *A. cervicornis* is a relatively easy and fast task: after 35 min of grinding on a stone platform, the whole surface of the branch was smoothened (exp. 3039). The surface of the coral acquires a creamish colour, in clear contrast to the previous greyish one (figure 25, b). The intensity of grinding on the sides varies from apparently not ground at all to almost regular. Only two beads present evidence of grinding on the faces: on one of them, the edge of the face is flattened, while on the unidentified coral bead, a face is clearly smoothened, although not flat. It is possible that grinding served the purpose of reducing the diameter and removing irregularities.

Perforating

The perforations on coral beads are cylindrical, long and narrow (diameters between 2 – 6 mm), which makes the identification of the technique and tool used difficult. The cylindrical shape suggests the use of a massive drill, especially on two of them (Fnr. 1252 and 1032). On Fnr. 206, there are sharp grooves entering the perforation on both faces (figure 25, c, d), which suggests chiselling, perhaps to finish the perforation. The perforation of the *A. cervicornis* preform (Fnr. 1118) was not finished and is very narrow and irregular (figure 25, e). It is possible that chiselling served to start the perforation on the beads. A very thin tool, hard enough to be pushed inside, would be used. After chiselling, it is likely that a massive, non-flint drill was inserted and twisted inside the bead in order to regularize the hole. On Fnr. 1032 (unidentified coral), on one face the perforation is a perfectly circular drilled hole, while on the other face, the hole is very irregular, most likely chiselled. Combining the evidence of all the beads, it may be argued that, rather than just following a specific order, the two techniques were alternated in order to perforate the coral beads.

During the drilling experiments, it was necessary to fix the coral in place in order to drill, since it is not a stable blank: it has considerable height, but small diameter. The perforation was initiated by chiselling, because it was not possible to maintain the drill bit in place. After producing a deep enough depression, drilling was started using a

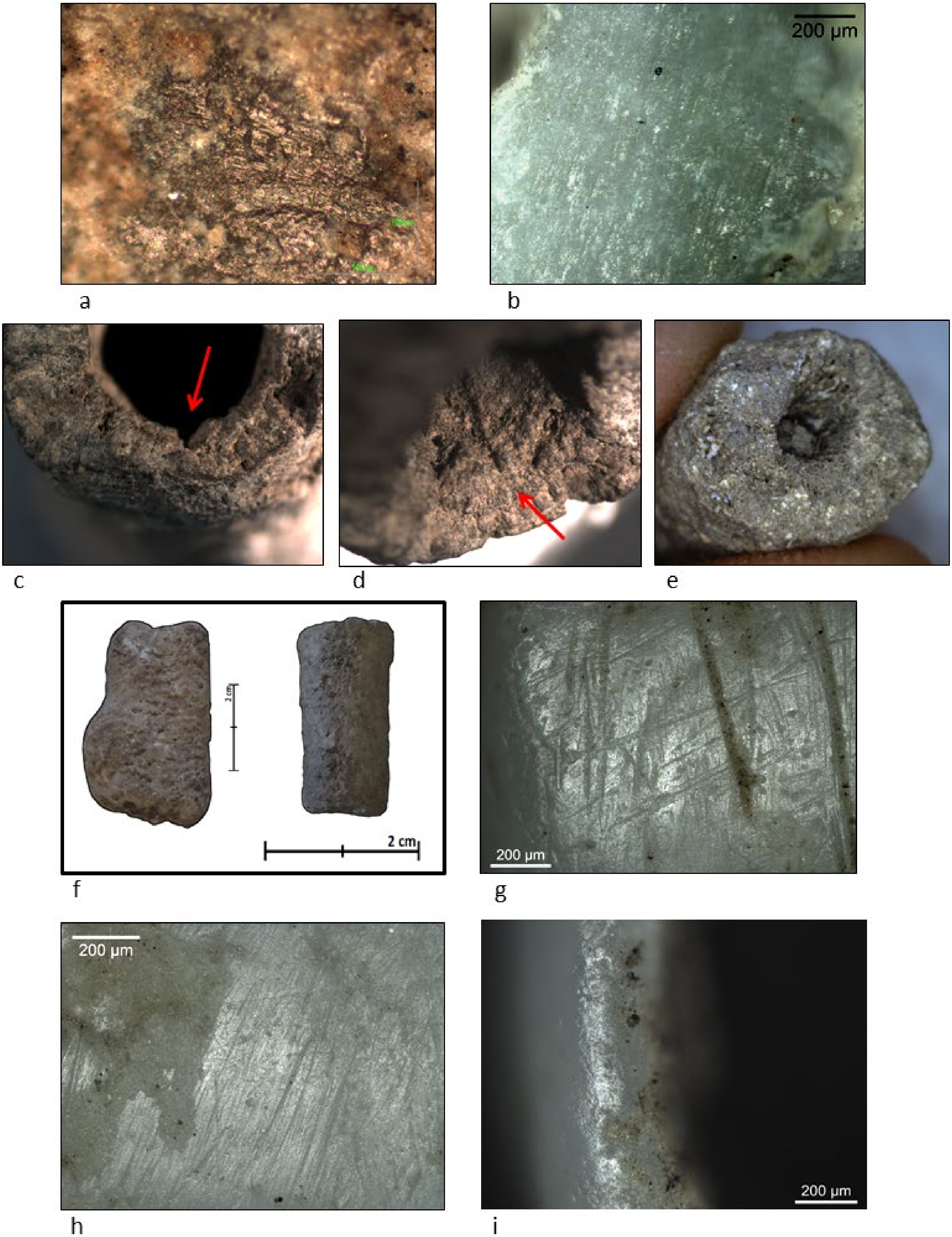


Figure 25: Manufacture traces on coral and bone beads (a, c – e, g, h) and use-wear on a bone bead (i). b: experimental grinding A. cervicornis.

mechanical drill with a massive bone tip (exp.3068). Drilling was carried out for 90 min, by constantly adding water and sand and resulted in a shallow perforation. While this technique is certainly effective, it is very time-consuming, even with the mechanical drill. More experiments need to be conducted, including with the use of a hollow drill.

7.1.4.2 – Performance and technical accidents

On Fnr. 1032, there is a large difference between the diameters of the two ends of the bead: 2,6 x 2,3 cm on one end and 2,1 x 1,8 cm, on the other. The smaller end is also more rounded and smoothened. This difference is also noticeable with the naked eye. On the other beads, the surfaces are also irregular, although more regular than Fnr. 1032 (figure 25, f). Overall, they are poorly finished. Half of the coral beads can be attributed to a low skill level, while the other two, due to the presence of the long and narrow perforations, to a medium level (Fnr. 1252 and 206). In any case, it is possible that irregular surfaces and rough textures, only partially ground, were desired.

7.1.4.3 – Use-wear

Wear was observed only on Fnr. 206, in the form of rounding and polish on the rim of perforation and on the edges of the faces. This bead was considered medium worn. One bead is a preform (Fnr. 1118), while the other two, which have no apparent problem in manufacture, do not present use-wear traces. The formation of use-wear polish on coral is not entirely understood, which may justify why polish was not observed.

7.1.5 – Bone

Four bone beads were recovered from the site of El Flaco. With the exception of the vertebra of a cartilaginous fish, the bone objects have not been subjected to identification. These beads are probably sections of naturally hollow, long bird bones. The vertebra is broken in half, not allowing an accurate measurement of its width. The maximum and minimum values for the dimension and weight of the bone beads are included on table 39. Regarding the long bones, two beads were made from the same bone, possibly from the same specimen as they present same diameter values (5 mm), texture and colour. The other long bead was made of a thinner bone, whose diameter varies from one end to the other. It is also thicker (16 mm) and has a slightly darker colour in comparison to the other ones.

Table 39: Maximum and minimum size and weight per bone bead raw material in the El Flaco collection

	Length		Width		Thickness		Weight (g)	
	Max	Min	Max	Min	Max	Min	Max	Min
Long bones	5	3	5	4	16	7	0,25	0,19
Vertebra	20	_	_	_	11	_	0,60	_

7.1.5.1 – Techniques and toolkit

The bone blanks were little modified to become beads. Two stages were involved in their production: blank acquisition and shaping. The cartilaginous fish vertebra could be directly brought from the shore or be exchanged, while for the long bones, there is no information available since the species have not been identified. Cutting traces were observed on the two beads made of the same long bone (Fnr. 1267 and 1018), along their edges (figure 25, g). The ends of the three long bone beads were ground, flattening their breaks. The sides were also ground and scraped, in order to remove organic tissues and intensify the bright white/creamish colour of the bone (figure 25, h). The holes are natural and there is no evidence of widening. In the case of the vertebra, no evidence of man-made modification was observed.

7.1.5.2 – Performance and technical errors

The three beads that have manufacture traces can be considered of medium skill, as no particularly difficult technique was used. There was not much effort in finishing, as small breaks can be observed on the edges of the beads that were not removed by grinding.

7.1.5.3 – Use-wear

Rounding and polish can be observed on the rim of perforation and edges of the faces of two long bone beads (figure 25, i), while no evidence of use was found on the third one (Fnr. 1036). On the vertebra, polish and rounding were observed on the rim of the perforation, suggesting that it was used as bead. This should be regarded with caution however, as the polish is not well developed or continuous. It was not possible to determine the length of wear of the beads, as there is not enough comparative evidence.

7.1.6 – Ceramic

Among the abundant ceramic remains of the site, three potential beads were recovered. They were assigned to three different types: barrel-shaped, globular and tubular. Two of them have darker colours, while one has a lighter, orange colour. The globular and tubular beads were originally thought to be, respectively, a spindle whorl and a vessel appendage. In the table below (tab. 40), the dimensions of the beads are included. Both the globular and tubular beads are broken along the thickness, preventing the measurement of width.

Table 40: Size and weight per ceramic bead type in the El Flaco collection

	Length	Width	Thickness	Weight (g)
Barrel-shaped	18	17	15	3,80
Globular	27	_	25	8,95
Tubular	24	_	30	8,93

7.1.6.1 – Techniques and toolkit

By looking at the paste under the microscope, it is possible to see small and medium-sized grains of unidentified tempers. The beads were shaped by hand (modelling), in order to create roughly spherical and tubular shapes. The faces of the smallest bead were flattened, creating the barrel-shape (Fnr. 174), while the globular one was directly perforated. A stick of wood was inserted in the centre in order to create the perforations. An impression of the wood can be seen on the walls of perforation of the globular bead (Fnr. 1073; figure 26, a). The diameter of the perforations was of 7 mm on the tubular and barrel-shaped beads, while it was not possible to assess it on the spherical one. The faces of the beads do not present evidence of the removal of the stick, such as excess of clay around the perforation, although the linear traces on the wall of perforation of Fnr. 1073 suggest the movement of removal of the stick. On the barrel-shaped bead, there are sharp and straight grooves entering the perforation, possibly made by chiselling (figure 26, b, c). These could have been made after firing the bead, in order to widen the perforation. The tubular bead was produced in a different way: after the removal of the stick when the clay was relatively dry, another layer of clay was added and folded inside the perforation (figure 26, d). The addition of this new layer is visible inside the wall of perforation and on the faces. A plastic decoration was added on top of this layer. The beads display striations on certain areas of their faces suggesting polishing.

Decoration

The only bead with plastic decoration is the tubular one (Fnr. 804). Chicoid motifs were made on its surface with a U-shaped tool, i.e. with a rounded and broad point (figure 26, e). The tool was first used to draw a line along the circumference of the bead, next to each end, and later to add geometric motifs to the space in between the two lines (the "decorative field"). On certain portions, the clay was not very dry when the incised grooves were added, producing undulating grooves, bordered by clay with a "dripping" appearance; on the opposite side, the clay was harder, creating sharper grooves. The same tool was used for adding two decorative perforations, one of which was the last thing to be done, while the other is interrupted by a later groove.

7.1.6.2 – Performance and technical accidents

The globular and the barrel-shaped beads were roughly made, displaying little concern for the creation of a regular shape and for a smooth finish. This is in contrast to the tubular bead whose production was made in two different stages and with the addition of a decorative pattern. It also has an intense black colour, unlike the other ones which mix different tones of clay and temper.

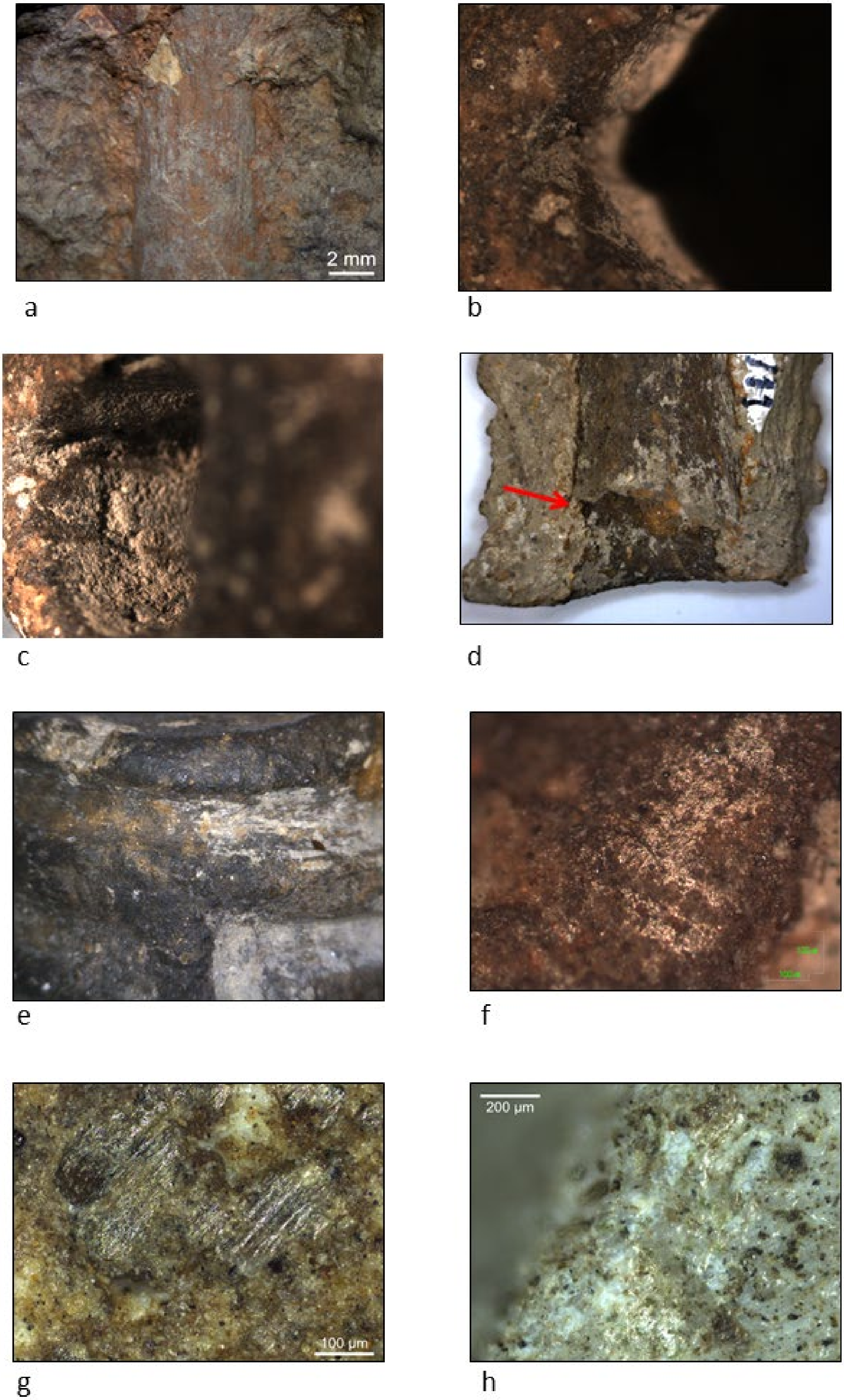


Figure 26: Manufacture (a – e, g) and use-wear (f, h) traces on ceramic and shell ornaments.

7.1.6.3 – Use-wear

Two beads present rounding and polish on their rim of perforations: the barrel-shaped and the tubular one. The former seems to have been little used (figure 26, f), while it is not clear for how long the latter was used. The rims of perforation of the globular bead are broken and, therefore, it is not possible to assess whether it was used. The walls of this perforation are quite sharp and without polish, suggesting that the bead was indeed not used.

7.2 – Beads from other sites in the north-western region

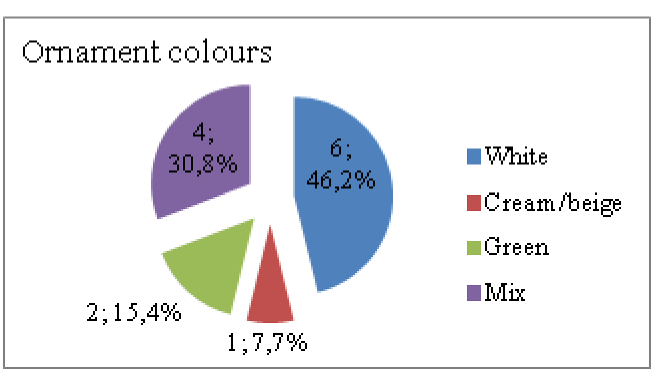
The 13 beads discussed in this section were recovered from different sites in north-western Dominican Republic, distributed in the provinces of Valverde Mao, Puerto Plata and Montecristi (see Chapter 3). They were produced from lithic materials, with the exception of one, made of shell. This specimen is not a bead, but a perforated disc. White is the predominant colour (6; 46,2%), which is linked to the use of calcite (tab. 41). The second predominant colour is "mix", which is in fact the black and white observed on diorite beads and its variations. Green is present on beads of an unidentified stone material, while creamish is the colour of the shell disc.

The state of preservation of the material is very good, since most beads were only recently collected from the sites. A disc bead made of the green-coloured rock from the site of La Luperona is broken along its thickness. Only one of the donated beads presents a scratch on the side, possibly made by recent contact with metal. The shell disc is the only artefact in a bad state of preservation: it was a surface find, probably being exposed for a long period of time. This resulted in a weathered external surface and a darkened internal surface, with considerable encrusted sediment.

7.2.1 – Shell

The perforated disc has dimensions of 46 x 46 x 12 mm and weight of 13,15 g. It was made from the lip of a large gastropod, presumably *Lobatus gigas*. It is similar to the one from the Valencia Lake Basin.

Table 41: Ornament colours from the north-western region collection



7.2.1.1 – Techniques and toolkit

The blank was probably obtained by flaking of the lip of the shell. Subsequently, the blank was ground, creating facets on the sides. Due to weathering, grinding striations are not visible with the naked eye anymore. Some striations can nevertheless be observed with higher magnifications (figure 26, g). The disc preserves the natural undulations of the lip, which cannot be easily removed unless the artefact is ground extensively. A conical perforation was made on the centre of the disc from the external face with a solid drill bit, but no traces are visible on the perforation walls. The perforation has a diameter of 3 mm.

7.2.1.2 – Use-wear

The disc was probably worn for a short period of time (lightly worn), which generated polish on certain areas of the rim of perforation on its external surface (figure 26, h). The rim on the internal face is quite sharp. On the rest of the artefact, it is not possible to observe use-polish due to the poor preservation.

7.2.2 – Lithic

The other 12 beads were classified under three lithic raw material categories: calcite (6; 50%), diorite (4; 33,3%) and green-coloured indetermined rocks (2; 16,6%). The beads were divided in three sub-types (tab. 42): barrel-shaped, tubular (and tubular double perforated), and disc beads. The most common type are disc beads, made of calcite and of the green-coloured rocks (5; 41,6%). Barrel-shaped constitute the second most common sub-type, including beads produced of diorite and calcite (3; 25%). Double perforated tubular beads are made of calcite and diorite (2; 16,6%).

Both the disc and double-perforated beads present homogeneous maximum and minimum dimensions (tab. 43). On the other hand, the difference between the maximum and minimum values for the tubular and the barrel-shaped beads are greater. This difference is also noted in relation to weight values, especially in the case of the tubular beads (16,26 g *versus* 0,10 g). The heaviest tubular bead is made of an igneous rock, possibly diorite (Pir-01), while the other one is smaller and made of a lighter diorite variety (LeoG-02).

Table 42: Ornament types and lithic raw materials in the north-western region collection

	Calcite	Diorite	Indeterminate	**Total**
Disc	3	_	2	**5**
Tubular	_	2	_	**2**
Double-perf	1	1	_	**2**
Barrel-shaped	2	1	_	**3**
Total	**6**	**4**	**2**	**12**

Table 43: Maximum and minimum size and weight per lithic bead type in the north-western region collection

	Length		Width		Thickness		Weight (g)	
	Max	Min	Max	Min	Max	Min	Max	Min
Disc	10	6	10	6	5	2	0,53	0,06
Tubular	23	5	23	5	18	4	16,26	0,10
Double-perf	9	8	9	8	14	6	1,90	0,50
Barrel-shaped	17	8	17	7	11	6	4,18	0,40

7.2.2.1 – Techniques and toolkit

The traces observed on these beads are similar to the ones present on the lithic beads from El Flaco. The blank production strategies did not leave clearly distinguishable traces on the artefacts, apart from isolated possible cut marks (figure 27, a). Most observations regarding this operation in terms of raw material availability and affordances made for El Flaco are also valid for this collection.

Shaping

Traces from grinding against a mineral platform were observed on all beads in the form of striations, flattening of grains and faceting (figure 27, b). In the case of the barrel-shaped beads, faceting was produced by the grinding of the sharp ridges that separate the faces and the sides. Disc beads made of calcite and diorite present diagonal and perpendicular grinding traces on the sides (Fnr. 008 and MoC-01). This suggests that either the beads were produced in multi-bead blanks or that they were ground while strung with other beads. Similarly to the El Flaco beads, two beads in this collection have an hourglass shape. They are both double-perforated beads: a shorter one made of diorite (Fnr. 001) and a thicker one, made of calcite (Fnr. 066). The grooves in the middle were made by grinding the beads against the edge of a platform.

Perforation

All the beads present circular scratches on the walls of perforation and either a cylindrical two-sided (*n*=10) or a biconical shape (*n*=2). The side holes on the double perforated beads are clearly conical. These features correspond to the use of solid drills, potentially of a flint-like material. Some perforations have a profile that is partially conical and cylindrical, with a rim of perforation that is narrower than the inner part. It is not clear what caused this variation, but different drill-bit morphologies or widening of the perforation could be potential causes. The perforation diameters varied between 2 and 4 mm. This difference does not seem to be correlated to bead type or raw material. The double-perforated tubular bead made of calcite (Fnr. 066) has the same pattern observed on similar beads from El Flaco: a narrow perforation cone on one face and a larger, widened one on the other.

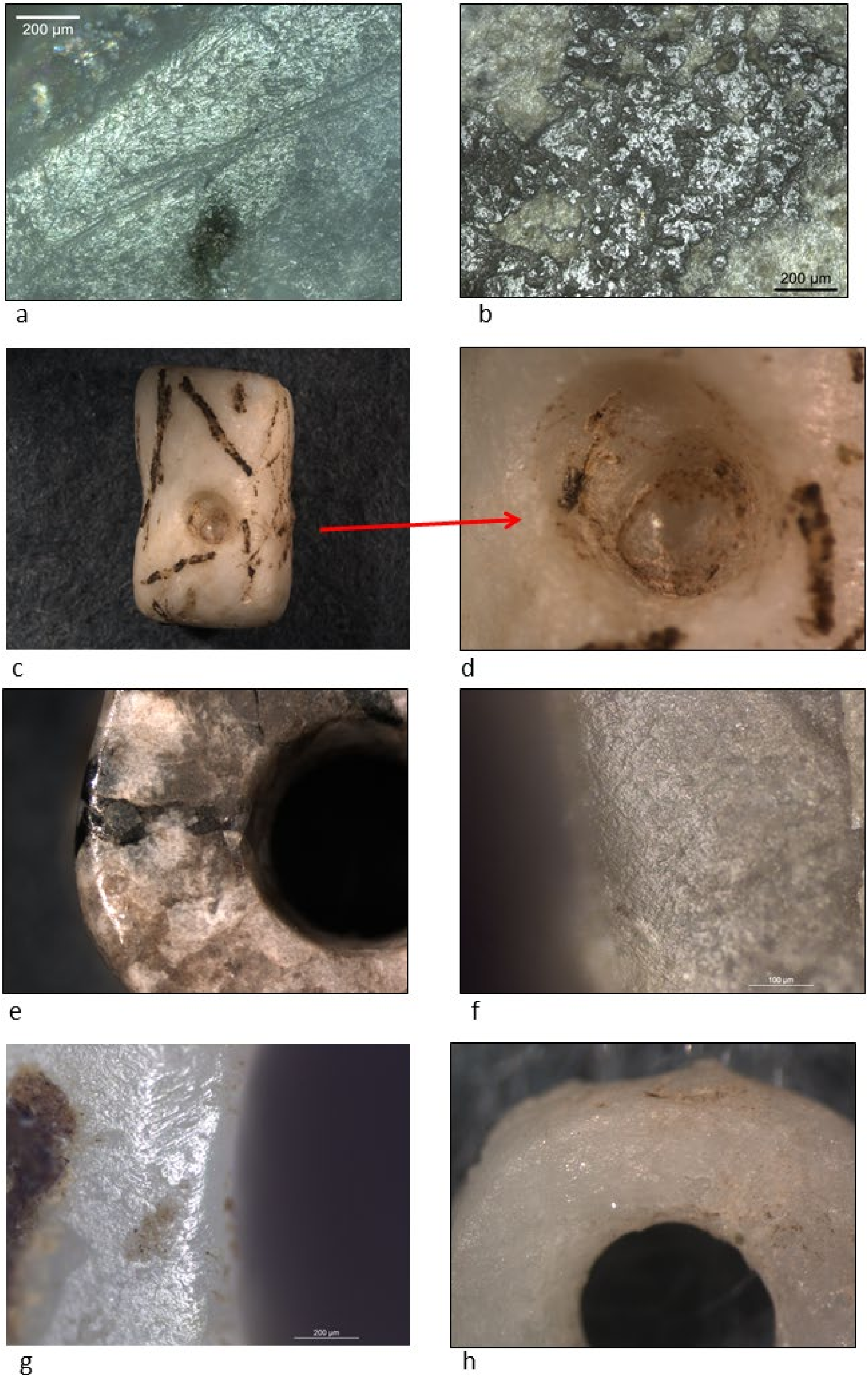


Figure 27: Manufacture (a – d) and use-wear (e – h) traces on lithic beads.

7.2.2.2 – Performance and technical errors

The only poorly made bead is the double-perforated calcite bead (Fnr. 066). One of its side cones was not finished. Apparently, two attempts were made of proceeding with this perforation on the same area, but it was left unfinished. It is also misplaced in relation to the opposing one (figure 27, c, d). The notch on the centre of the bead is also not homogenous, being less marked on certain areas of the bead. On the barrel-shaped calcite bead, the two cones of perforation did not meet in a first drilling attempt. In order to deal with this problem, another cone was added in a different angle on top of the other one.

7.2.2.3 – Use-wear

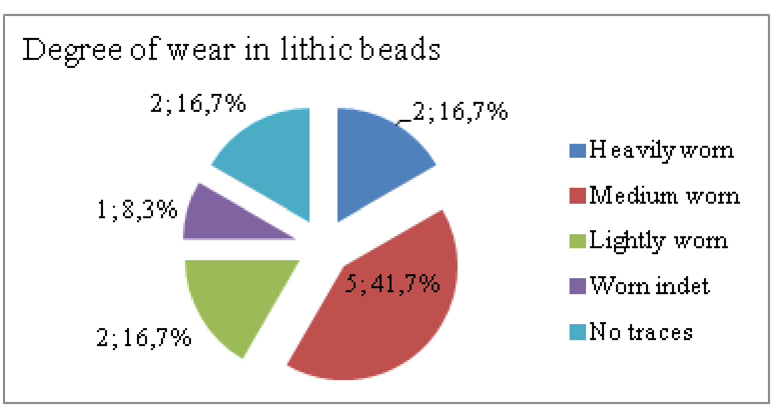
Most lithic beads present evidence of being worn (10; 83,3%), while only two displayed no use-wear traces (tab. 44). The most common use-wear trace was rounding and polish on the perforation rims, which was associated to deformation and scratches on a few specimens (figure 27, e – h). On half of the used beads, polish was observed on the sides, possibly caused by contact with a body surface or clothing. Most beads also displayed polish on their faces (*n*=8), evidence of contact with other beads.

In terms of wear development, most beads are medium worn (5; 41,7%), while a few are highly (2; 16,7%) and lightly (2; 16,7%) worn (tab. 45). While most of them were worn as normal beads, i.e. hung loosely on a string, the double-perforated beads present

Table 44: Number of lithic beads with specific use-wear traces per type in the north-western region collection

	Use-wear		Polish on rim	Rim deformed	Scratches	Polish sides		Wear other ornaments
	Yes	**No**				1	Both	
Disc	**3**	2	3	1	1	_	1	2
Tubular	**2**	_	2	1	_	_	1	1
Double-perf	**2**	_	2	_	1	_	1	2
Barrel	**3**	_	3	_	_	_	2	3
Total	**10**	2	10	2	2	_	5	8

Table 45: Degree of wear in lithic beads of the north-western region collection



wear on both face and side perforations. Even though one of the side cones is not finished in Fnr. 066, the other three cones display use-wear.

7.3 – Considerations

The two Dominican collections analyzed proved to be comparable in terms of bead types, raw materials and techniques used. In contrast to the artefacts from the Valencioid collections, the ornaments from the northwest of the Dominican Republic presented greater homogeneity, being made of only a few raw materials. While this allowed for intra-assemblage comparability, as traces could be directly compared between beads, individually beads provide less information than pendants. Beads are generally finished by grinding and polishing which erase most traces of previous stages, while pendants have more complex shapes and features which provide data on production sequences and toolkits. In this sense, beads are less informative, if debitage is not available for study. Nevertheless, the presence of preforms from El Flaco provided more data into bead technology. The high power analysis proved to be an important tool in the observation of beads, especially use-wear polish. Even though many beads were made of the same raw materials and assigned to same types, use-wear patterns suggest that they often had varied biographies. This will be further discussed in the next chapter.

Chapter 8 – Ornament biographies

In this chapter, the microwear and experimental data are combined in the form of *chaînes opératoires* and use lives. While the interest lies on entire biographies, this approach is not always possible as raw material provenance and acquisition strategies are often unknown. Archaeological and ethnographical informations will thus be added in order to build more comprehensive biographies and suggest possible interpretations for the observed patterns. The focus lies on the pre-Colonial part of the biography, as the ways in which these artefacts have interacted with people after removal from archaeological sites is not going to be discussed. A general ornament biography will be presented for the Venezuelan and Dominican assemblages. Although each case study includes more than one site, there are sufficient elements to group them together in order to create a less fragmentary picture. Within each context, artefacts will be separated according to technological groups that appeared significant during the analysis.

8.1 – The biographies of the Valencia Lake Basin ornaments

The material analyzed here comes from the sites of El Zamuro, Camburito, La Cabrera and Hacienda Mariara. Nevertheless, the samples share several characteristics with each other: from raw materials and ornament types to techniques and toolkits used to produce them. This is not surprising, as most of them are from neighbouring sites on the eastern shore of the Lake Valencia and are associated to the Valencia style ceramics of the Valencioid series.

8.1.1 – Conceptualization and raw material acquisition

The first stage in the biography is the conceptualization of an ornament or, as posed by *chaîne opératoire* advocates, the mental template. It guides the execution of all following stages, including the choice for raw material, toolkits and shapes depicted, and is related to the function that the ornament will have. As mentioned in Chapter 4, ornaments among Amerindian communities are associated to specific social groups, roles, and age categories. Their production is also connected to specific technological traditions and to the transmission of technical and other culturally relevant knowledge across generations. The mental template should not be regarded as a fixed form that will be imposed on a material; rather, it guides the maker in deciding which the appropriate choices and procedures are. The reasons behind the production of the archaeological ornaments are elusive to us, but can be suggested on the basis of the data gathered from artefacts, such as raw material characteristics and iconography. In this sense, it is a product of the analysis and cannot be posed *a priori*. The conceptual realm can be perceived in the specific choices made during the biography and *chaîne opératoire* of an object. These will be noted throughout this chapter.

All the marine shell species used for the production of beads and pendants had to be brought from the coast or the off-shore islands. Considering the estimated dates for the sites on the eastern shore of the Lake Valencia (Antczak and Antczak 2006; Mackowiak de Antczak 2000), shells were obtained through exchange with the bearers of Ocumaroid ceramics, who gathered them from the coast and the Los Roques Archipelago (from AD 1000). During the later part of the occupation (after AD 1200), they were also directly collected by expeditions to the islands organized by the inhabitants of the Lake Valencia. On the basis of his study of the shell material from the Dos Mosquises Island, Antczak (1998, 399-401) made a complex diagram depicting how the *Lobatus gigas* shell could be broken in order to obtain blanks. Knapping operations could be performed using the apex of the same shell or a stone as hammer, and a slab of *A. palmata* as anvil. In the collections analyzed here, lips, nodules, outer and inner body whorls of large gastropods were used. It is not always possible to assert the species used, although evidence points out to *Lobatus gigas*, *Strombus* sp. and *Cassis* sp.

In addition to being harvested directly from the sea, shells may also be collected from the beach in an already fragmentary state. There is evidence for this type of procurement only in one bead made from a bivalve shell (VA14050b). Specimens from *Oliva* genera figured prominently in the assemblage, for the production of 21 tinklers. Other species were also used for automorphic pendants, probably selected for their colours, patterns, shape and/or portability. Two umbo-perforated bivalve pendants were probably made from *Tivela mactroides*, while gastropods such as *Nerita tessellata*, *Fissurella* sp. and *Cyphoma gibbosum* were also perforated and made into ornaments. Visual appearance may not have been the only important aspect in the choice of raw materials: texture may also have been selected for. In the case of the bead mentioned above (VA14050b), the irregularities of the predated shell were not ground from its surface. This can be evidence of an interest in this particular texture, more than for a bright and "pure" colour.

Blank acquisition strategies for stone materials depend on how they are found in the environment and on their properties. Natural pebbles and slabs were sometimes collected and directly shaped into artefacts. This was probably the case with slate, the only known local stone material, which was collected nearby the shores of the Lake Valencia (Schubert 1978). Jet can be found in the southwest of Venezuela in the Apure state (Cirimele 1989), but it is not clear if it would have arrived in the site in an unmodified state, or as a blank, preform, or finished pendant. Finished serpentinite ornaments may have come from the Trujillo area on the foothills of the Andes, where a workshop was found

(Wagner and Schubert 1972).[73] Jet and serpentinite were likely being sawn into blanks, but the nature of the original pieces is not clear. An example of acquisition of finished ornaments is the presence of metal ornaments in the Valencia Lake Basin, probably from the Sierra Nevada de Santa Marta (Antczak *et al.* 2015). These were valued for their exotic provenance and supernatural associations of their colour and reflectiveness (and perhaps smell, cf. Martinón-Torres *et al.* 2012; Oliver 2000). The making of local mica-rich slate pieces into nose rings could be an imitation of the exotic metal artefacts, in a material that shared limitedly its sheen.

The diverse origins of the ornament raw materials point out to their entanglement in the Valencioid Sphere of Interaction. Ornaments made from these materials probably existed alongside other, perishable varieties (*e.g.*, seeds, wood, bone, resin, and feathers), constituting multi-material ornaments such as the ones observed among ethnographic indigenous communities (Ribeiro 1988). The use of seashells was made in a large-scale, perhaps due to mythological associations of the faraway sea. The cosmological role of the sea is suggested by the intense ritual activity and exploitation of the *Lobatus gigas* shell in the Los Roques Archipelago (Antczak and Antczak 2006; 2008; in press). While in the iconography of pendants and ceramic figurines, references are made to water environments and to a nocturnal and female realm (Roe 1982; 1997), the sea is much less present (Mackowiak de Antczak 2000). In the assemblages analyzed here, there are two exceptions: the pelican- and the shell-shaped pendants (VAS-31 and VA15522). The creatures depicted also do not feature in the faunal assemblages of Valencioid sites, suggesting that they may have been considered non-edible or repugnant (Mackowiak de Antczak 2000, 305). The turtle is an exception, as it provided many products such as oil, eggs and meat, and was abundantly depicted in figurines and pendants (Antczak and Antczak 2006).[74]

The symbolic importance of certain animal species for the bearers of Valencioid ceramics is extensively discussed elsewhere (Antczak and Antczak 2006; 2008; Mackowiak de Antczak 2000). As noted by these authors, predatorial relations may have been central in the choice for the animals depicted in Valencioid material culture. In this sense, rituals were conducted and offerings given to de-subjectify the *Lobatus gigas*, in order to render it edible and to compensate its spirit-owner for its exploitation. The same would have possibly been necessary in relation to the turtles (Antczak and Antczak 2006; 2008).

8.1.2 – The chaînes opératoires of ornaments

Among Amerindian societies, most tasks are distributed between the men and women. This

73 More recently, however, serpentinite deposits have been identified in other areas of the country, especially in the northern mountain ranges, the Andes and La Orchila Island (A. Antczak, pers. comm. 2015).

74 Antczak and Antczak (2006, 263-4) also note that while abundant turtle remains were recovered in the Los Roques deposits, they were seldom recovered from the Valencia Lake Basin.

means that certain ornaments are made exclusively by men[75], while others by women. This probably depended on the raw materials involved, the techniques and the purpose of the ornament. It is also possible that certain parts of a specific ornament were made by men and other by women. For instance, women are typically responsible for making strings, crucial elements in any composite ornament. In relation to the Valencioid site in the Dos Mosquises Island, Antczak (1998) argues that primarily men would have conducted the expeditions to the Los Roques islands. They would also be the shell carvers, responsible for the early stages of processing the shell, separating blanks, and even producing ornaments, before taking such items back to the mainland. While there is no information regarding the gender of the people crafting ornaments in the Valencia Lake Basin, the existence of a cooperative work cannot be overlooked, especially in the making of the composite pieces. This will also be argued in the following in relation to different levels of skill.

8.1.2.1 – Production sequences

The microwear data was organized in technical schemes, according to similarities in production sequences. Figure 28 (a, b) displays the *chaînes opératoires* used in the production of biomorphic ornaments, both of shell and stone (with the exception of the shell-shaped pendant, VA15522). The same techniques and tools were used to produce the biomorphic pendants, also generally following the same sequence (especially blue arrows). The tools used for shaping, decorating and drilling were the same on different shell ornaments and even on one of the stone turtles (VAS-51). These probably involved a combination of hard stone tools (such as flint) to start perforations, notches and incisions and softer materials to widen them. By comparison with the experiments, wood was possibly the material used for the drill bit, considering the micromorphological features of the holes. Likewise, either wood, bone or a soft stone may have been used for widening notches and incisions. The other stone turtle (VA14001) was produced with hard, flint-like tools, but followed a similar sequence of production as the other biomorphs. This internal coherence among the ornaments suggests that they were produced according to a same local tradition.

Regarding the sequence, before any further modification, the blanks were ground in order to create a smooth surface for carving. This stage is quite time-consuming and required hours of daily activity. On the other hand, its execution does not demand high skill and could have been carried out by young apprentices. While on most artefacts, grinding was primarily a technique to flatten the surface, on a few specimens it had a greater role in the shaping of the figure. After grinding, decorative incisions were made, often before the addition of side notches. This created a "sketch" of the future shape that guided the

75 Men such as warriors and shamans usually are profusely adorned, especially when it comes to the highly esteemed feather ornaments (Ribeiro 1988). They are also their primary producers.

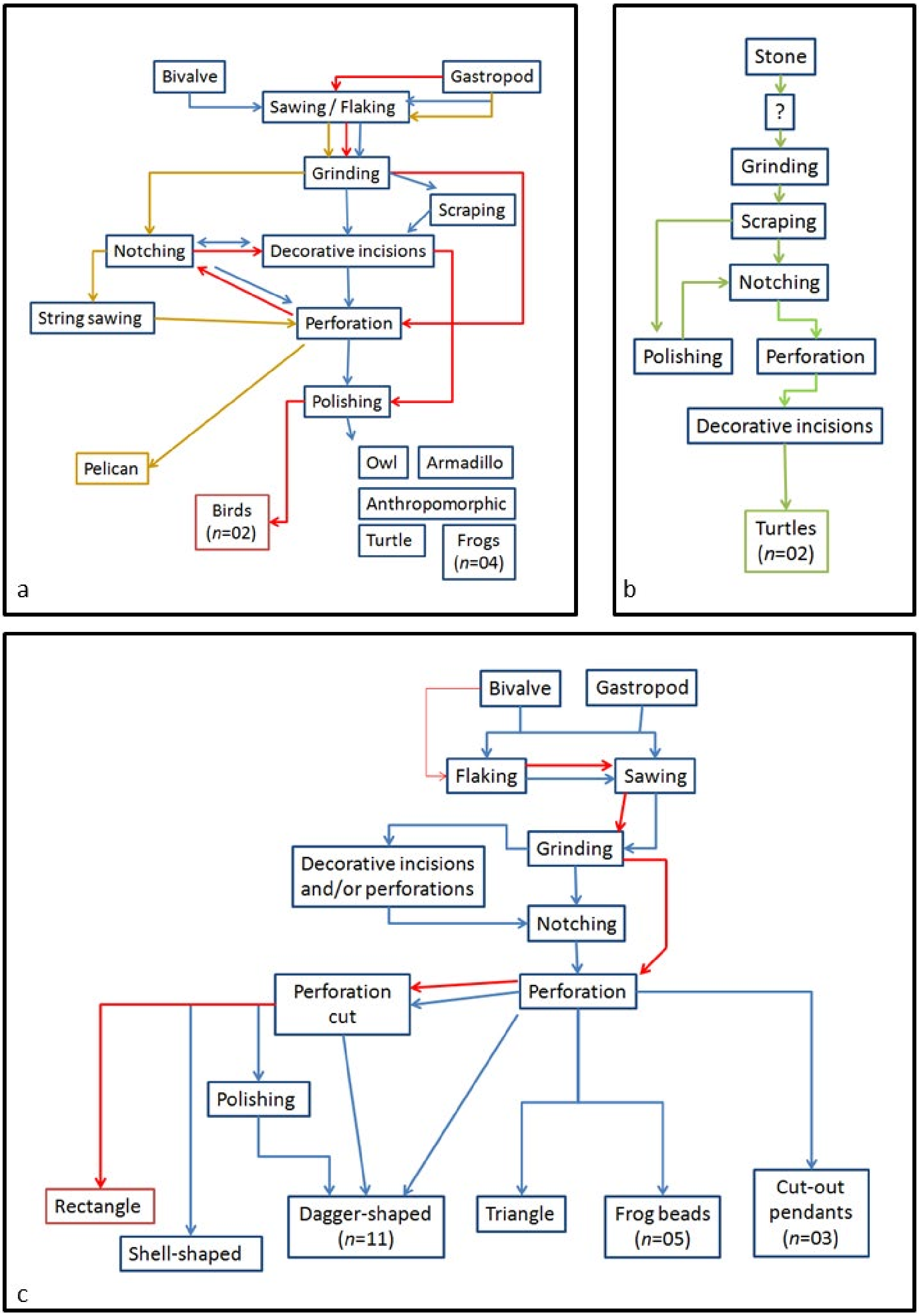


Figure 28: Technical schemes of biomorphic (a, b) and cut-out (c) artefacts.

craftsperson during the next stages. These first incised lines were sometimes reinforced, starting from the edges of the artefact towards the centre. Shallow and misplaced lines, remaining from the first stages, are visible on several artefacts, partially erased by use-polish. The side notches were made afterwards, as they are the main features delimiting the shape of the artefacts. The order between incising and notching was also observed on the "cut-out artefacts"[76] (figure 28, c). Especially on frog-shaped beads, "decorative" incised lines were made before the notches in order to serve as a sketch for the artefact to be. The presence of the sketch shows that since an early moment a mental template of the final artefact was guiding its production. It suggests that the selection of a blank takes place already with a specific shape in mind.

Drilling involves high risk of breakage of the preform, and thus it is expected to take place during the first stages of the production, especially in the case of elaborate pendants (Miller 1996). However, drilling was not a problem for the craftsperson that produced the Valencia Lake Basin ornaments: perforations are normally left for the final production stages, superposing decorative features. In fact, the perforation is placed in such a delicate and fragile place on the dagger-shaped pendants that many artefacts could easily break during production. During use, it would also not last long before the "neck" broke. On two artefacts of this type, the notch in which the perforation is placed was further carved, rendering the pendant even more fragile. This points out to a non-economic rationality, confidence in one's own skills, and perhaps a lack of concern with making lasting artefacts. This treatment to the dagger-shaped pendants contrasts markedly to the one given to other pendant varieties, which had longer use lives. There is substantial overlap between the production sequence of the "cut-out artefacts" and the biomorphic pendants, even though the end product is not clearly similar. However, the lack of three-dimensionality and use of excision on the cut-outs (and even among some of the biomorphs) should not be overlooked, as these operations involve high skill and considerable planning. The edges of the perforations of many ornaments were cut, creating a square shape and/or a notch in the direction where the string would be attached. This was common among biomorphic pendants, "cut-out artefacts" and tubular shell beads. The cuts may have performed different tasks: guide and stabilize the drill bit; widen a finished perforation; or yet, guide the string.

Suarez (1981) suggests that cylindrical beads were produced from the outer edge of the *Lobatus gigas* lip. In fact, only specific parts of the shell can provide a blank that is long and straight enough for the production of the beads (and for this reason, they were probably not made of bivalves). However, such straight pieces could also come from a few other areas of gastropod shells, such as the body whorl (A. Antczak, pers. comm. 2015). In any case, many specimens present irregularities on their surfaces typical of the

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76 "Cut out artefacts" refer to all the flat artefacts with a convex cross-section, produced by sawing. It is not a typological category, but a technological one. Its definition is thus broader than the subtype "cut out pendant".

external surface of the shell and also nacre remains on the opposing side. Stabilizing the drill to perforate the tubular beads may have been a problem, as the beads are thick and narrow (figure 29, a). The execution of these long and time-consuming perforations is also evidence of high-skill crafting. Similar cylindrical blanks may have been used for the production of disc beads, as multi-bead blanks. Disc beads are the most numerous ornament category recovered from the Valencia Lake Basin, however only few of them were part of the sample analyzed in this research. These disc beads are different from each other in terms of raw material and dimensions, not allowing for considerable intra-type comparison. With only a few beads of a same type, it is not possible to reconstruct detailed production sequences.

The same techniques were used in the production of geometric artefacts, like the axe-shaped pendants and the pyramids (figure 29, b): fragments of *Lobatus gigas* were ground and sometimes scraped in shape. The pyramids are quite small and could have been made from flaking debris. The blank used for the axe-shaped pendants had to be more carefully chosen, as they are quite heavy and thick. The long perforation along the width was probably time-consuming and required certain skill. Taking their shapes into consideration, the pyramids were ground individually. This would require considerable time and changes in gestures, especially in order to produce the small and straight facets, but not a particularly high skill. The production sequence of tinklers is rather homogeneous, as only two operations were required in their production (figure 29, c). It is not clear whether grinding was the only technique used for the removal of the apex or if pounding was used first but its traces were erased by grinding. Some technical variation was possible in the execution of the side perforation: most specimens were drilled, but on three specimens sawing and pounding were used.

Archaeologists studying the production of tinklers in Tenochtitlan and Xochicalco (Mexico) also noted the use of different techniques and toolkits for both the removal of the apex and the side perforation in a same site (Melgar 2010; Velázquez-Castro 2012). They associate this intra-site variability to the existence of diverse technological styles, possibly linked to different groups of craftsmen. As tinklers demand less time-input and not specialized skill in their production, they would have a lesser status and be produced by less experienced craftsmen. Contrasting these conclusions with mine[77], while the variation in production techniques of tinklers stands out in comparison to other ornaments, the homogeneity in the production of the latter is more elusive. The most elaborate artefacts, biomorphic pendants, are not exact reproductions of a fixed and immutable mental template. They follow a culturally-specific production sequence and system of representation, but no

77 It should not be overlooked, however that both authors (Melgar 2010; Velázquez-Castro 2012) are analyzing a larger assemblage, performed more experiments and are dealing with contexts in which craft specialization is suggested by historical sources.

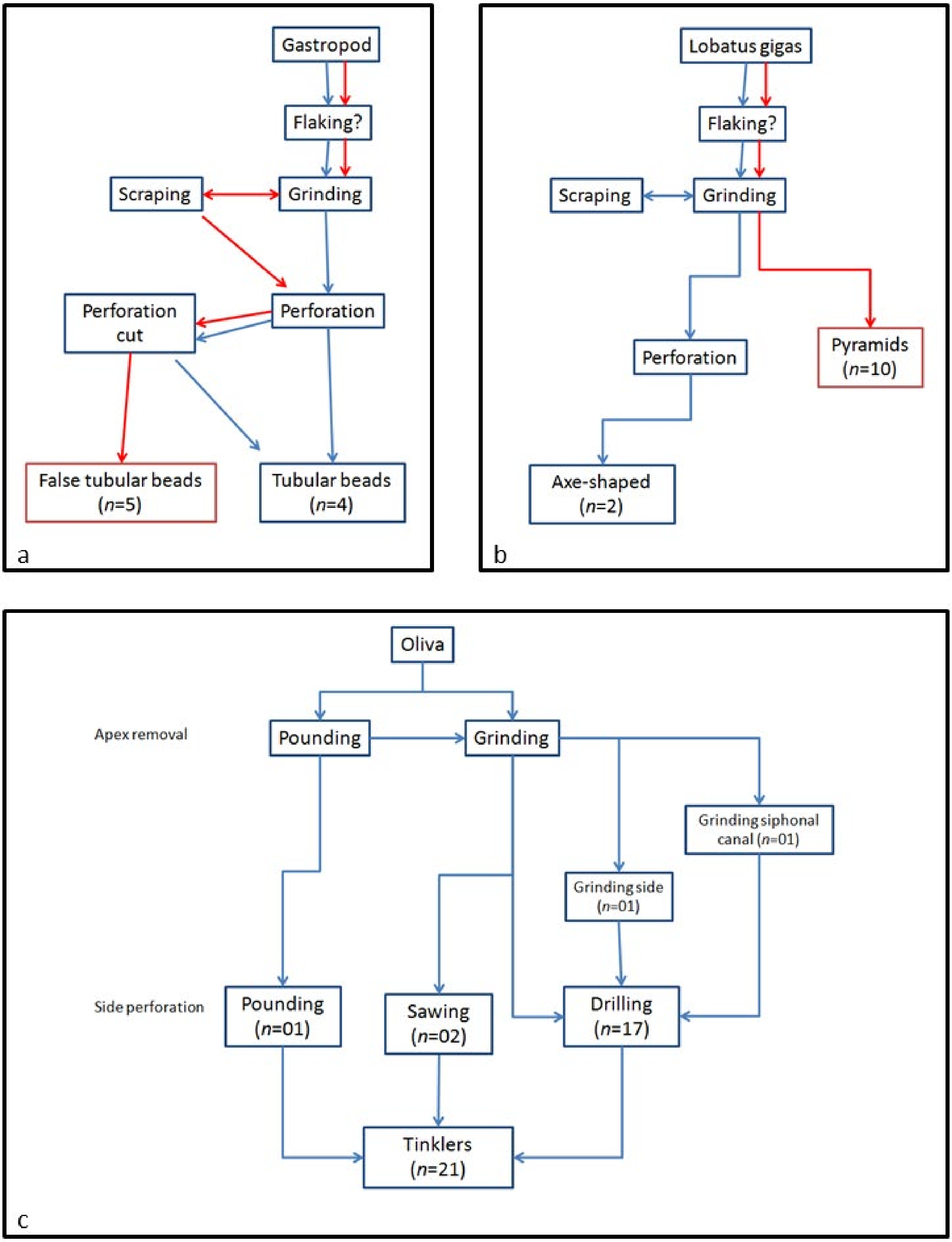

Figure 29: Technical schemes of tubular, axe-shaped, pyramids and Oliva ornaments.

two pendants are the same. In this case, we may talk about skilful performance of makers and desire to make his/her work stand out as unique.

Beads, dagger-shaped pendants and tinklers are the result of craft standardization, as these types are found in large numbers. The value of these artefacts lies in their performance as a group, *e.g.*, as long strings of beads and rattles composed of many tinklers. In this sense, I do not agree with the interpretation offered for the Mexican contexts: "mass production" is not sign of a lower value, but of the fact that they do not perform socially as individual artefacts. The difference between tinklers and the other two categories (beads and dagger-shaped pendants) is the use of different techniques for the execution of the side perforation. Given the lack of contextual information, the technological variation in tinklers cannot be linked to specific contexts of production.

A technical scheme was also constructed for the production of slate ornaments (figure 30, a). At least three types of artefacts were produced from this material: nose rings, round pendants with two perforations and a diamond-shaped pendant. After collecting presumably natural slabs, the blanks were ground flat and in shape. The perforation involved different techniques: chiselling, sawing and drilling. By comparing these specimens to artefacts in other Valencia Lake Basin collections, there are other nose rings, presumably made of slate, which were more carefully produced (figure 30, b, c). Their perforations are wider: on one, it was finished by drilling, while on the other, cutting/sawing was used, in order to remove the top of the perforation and give the hole a squarish appearance. These were probably the same techniques used alternatively in the archaeological ones. It is possible that the gradation between poorly made slate nose rings, well crafted ones, and metal varieties corresponded to a gradation in social hierarchies. For other ornament types, technical schemes were not created. This includes artefacts made of serpentinite, unidentified igneous rocks, jet, chalcedony, and ceramic. While there is information on their production sequences, it is limited and there is no evidence that they were produced in the Valencia Lake Basin.

8.1.2.2 – Skill and performance

Specialization and standardization was present in the making of shell and stone ornaments, in terms of sequences, gestures and toolkits. Shell working is part of a same, relatively uniform tradition: artefacts are transformed in similar ways, using a restricted set of techniques to produce a standardized repertoire of shapes. The animals and the specific ways in which they were depicted (i.e. stylization of specific anatomical features and decorative motifs) are recurrent in the assemblages. The same techniques used to craft shell were used for some stone specimens: not only general techniques normally used for bead making (such as drilling and grinding), but similar toolkits and sequences. However, shell crafting should not be seen as an enumeration of fixed types, but as the result of the use

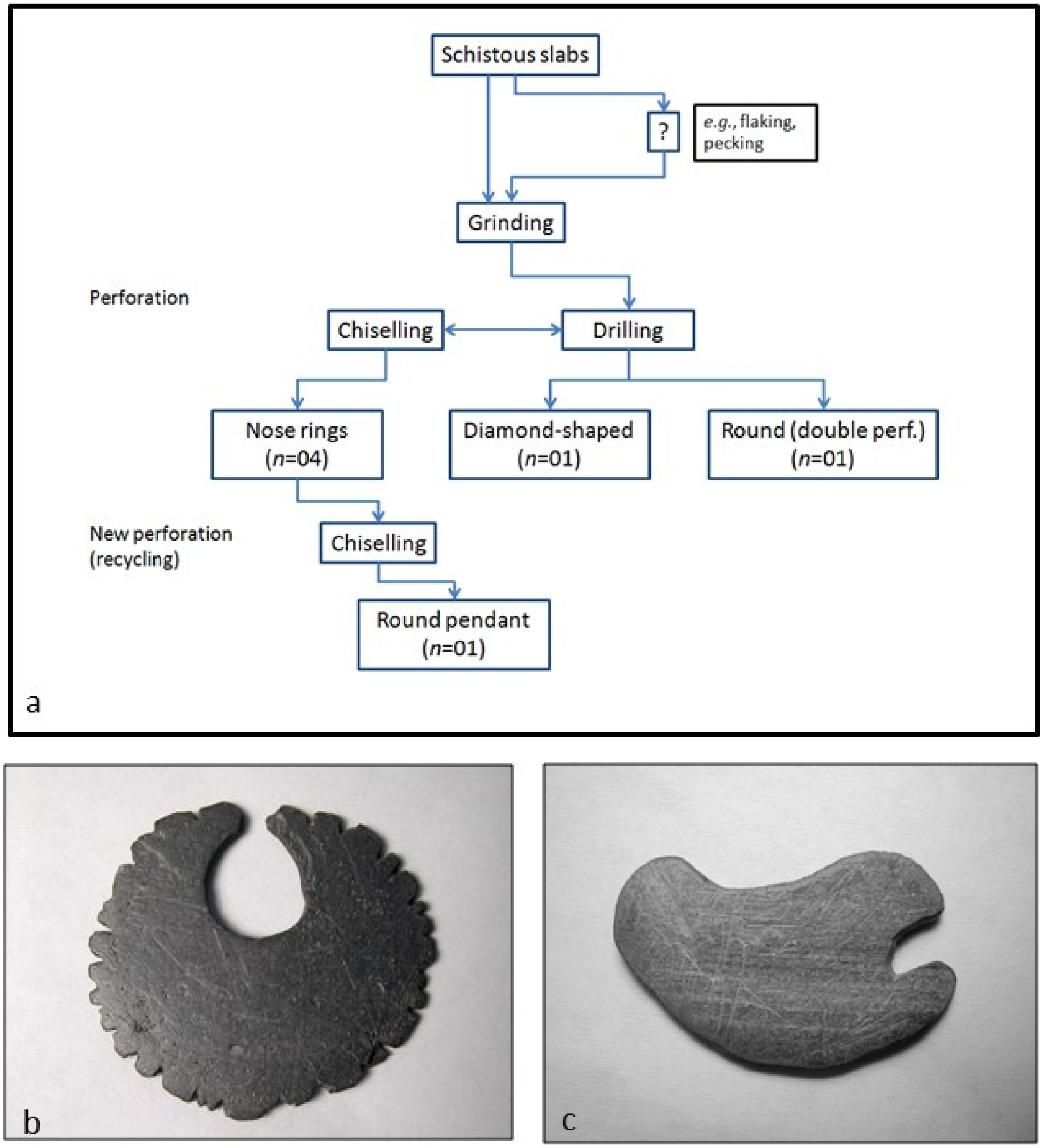

Figure 30: Technical scheme slate ornaments (a). Slate nose rings from Valencia Lake Basin, not analyzed here (b,c), pictures by A. and M. Antczak.

of sets of techniques combined to generate recurrent shapes. The makers' skill levels and choices can be perceived in the variability between specimens of a same ornament type.

There is evidence of different skill levels in the collection. In general, the skill level in shell working in quite high and the same can be argued for similar artefacts made of harder, stone materials. Biomorphic artefacts are the primary examples of high skill in crafting, but the low presence of technical errors in other ornament types also attests high technological achievement. Small variations such as lack of care in erasing traces left from previous operations or misplaced cut marks can also be noted in many artefacts. Therefore, whereas the shaping stage is recurrently made with high skill (producing symmetrical artefacts and excising complex forms), this is not always observed for the decoration. Poorly placed and/or superficial incisions on the small bird-shaped (VAS-26), the anthropomorphic (VA14014) and on the frog-shaped pendants (VAS-36) are examples of lack of care in the decoration. This evidence is in contrast with the skilful use of a nodule of the gastropod shell to create the head of the frog depicted on VAS-36 and with the skill demonstrated in carving the side notches on the three artefacts.

There was a conceptual difference in the way shaping and decoration were regarded and performed. The presence of finely-made pendants in the assemblage suggests that shaping was performed by highly skilful artisans. In contrast, there was not much care in the execution of the decoration and/or it was sometimes carried out by less experienced or inexperienced persons. There is also evidence of "tricks" used by inexperienced craftsmen in the stabilization of the drilling device: an incised line was placed under one of the decorative perforations on the shell-shaped pendant and a portion of the body whorl of a tinkler was deliberately ground flat. Rather than being produced by a single craftsperson with a linear project in mind, ornament making can thus be regarded as a collaborative endeavour in which tasks are divided between more experienced craftsmen and apprentices. This is in accordance with the way in which the knowledge of a craft is transmitted across generations in Amerindian contexts (Silva 2010). The makers would also be expressing aesthetic and moral concerns, and perhaps even engaging in contests, challenging each other for one's superior skills. For instance, the dagger-shaped pendants do not require considerable predictability and control of the volume of the blank. The most difficult part of their production is making the perforation. This is the stage in which the craftsperson could show off to his/her peers.

As argued in Chapter 4, a craftsperson is valued among lowland South America indigenous communities for his/her skills and discipline in the craft, especially when this involves difficult techniques (Lagrou 2009, 22). For the crafts in which representation plays a greater role, capacity for engagement with alterity is more important. The natural patterns displayed by animals (real or mythical) are often the primary influence for the creation of designs, whether these are depicted on human bodies, ceramic artefacts, basketry or beadwork (Barcelos Neto 2001; Vidal 2007; Van Velthem 2010a). Likewise, on Valencia Lake Basin ornaments, it is not worthwhile to separate the "purely decorative" motifs on the centre of the bodies from those that mark anatomical features (*e.g.*, fingers, eyes and mouth). Not only are the techniques and tools used for both motifs the same, but also they often occupy places where the animal species that inspired them have their own corporeal patterns. In this sense, they are also anatomical features. The incised crosshatched and punctuation motif is often depicted on ceramic zoomorphic and anthropomorphic figurines found in the Valencia Lake Basin (Mackowiak de Antczak 2000).

Ornaments are added to human bodies in order to modify and mould them: main examples are piercing, scarification, and also ornaments that compress or expand body parts. The weight of individual pendants, of strings of hundreds of *Lobatus gigas* beads and of tinklers, tied to certain body parts during ceremonial performances also had an impact in human behaviour. The habituation to such pressure and weights would be encouraged since an early age, mediating the growth and development of bodies. Learning a craft is a parallel process. Not only in terms of the necessary motor and perceptual skills to perform certain complicate operations (Karlin and Julien 1994; Pelegrin 1991; Roux *et al.* 1995), but even in the case of simpler activities such as grinding. Grinding activities, such as rubbing a tiny piece of shell in order to produce a pyramidal shape, entails specific body positions and resistance to pain. For this reason, it may be a good task for those that are starting to learn a craft. Learning traditional knowledge, as well as wearing ornaments, is directly connected to the becoming of a (fully social) person.

8.1.3 – Use-life of ornaments

Use-wear data suggests that some pendants had long lives, which is in accordance with archaeologists' interpretation of ornaments as prestige goods (*e.g.*, Boomert 1987). Most biomorphic pendants present at least a certain degree of use-wear (especially medium and heavily used). Certain pendants also display evidence of recycling and reuse, namely the shell-shaped one (VA15522) and the shell- and stone turtles (VA14018 and VA14001). Other supporting evidence is the distribution of use-wear polish which does not appear to be coherent in a single system of attachment. This is the case of the stone turtle (VA14001), which may have been attached more than once during its life and in different ways. The first and the third systems suggested in figure 31 (a) seem to be the most likely used ones. To a certain extent, this parallels Ewart's (2012) observations among the Paraná of the making and unmaking of beadwork. The presence of highly developed wear, however, indicates that this change would have taken place over longer periods of time.

While the biomorphic pendants can be grouped together in relation to the position of perforations, production sequences and representational character, they were generally strung in different ways. For instance, there are differences between the systems of attachment of the three turtle-shaped ornaments (figure 8,4, a – c). Some varieties of placement of biomorphic pendants on the body have been suggested in the literature (see Chapter 2): attached to head-, armbands and belts or hanging on a necklace. Pendants with two perforations probably occupied a central position or had a complex attachment system. Weight can also be a factor in the positioning of an ornament in a composite construction, as heavier artefacts could be placed on the centre (or on the back) in a position of notice. The use-wear evidence also does not suggest that the artefacts were hanging on a necklace.

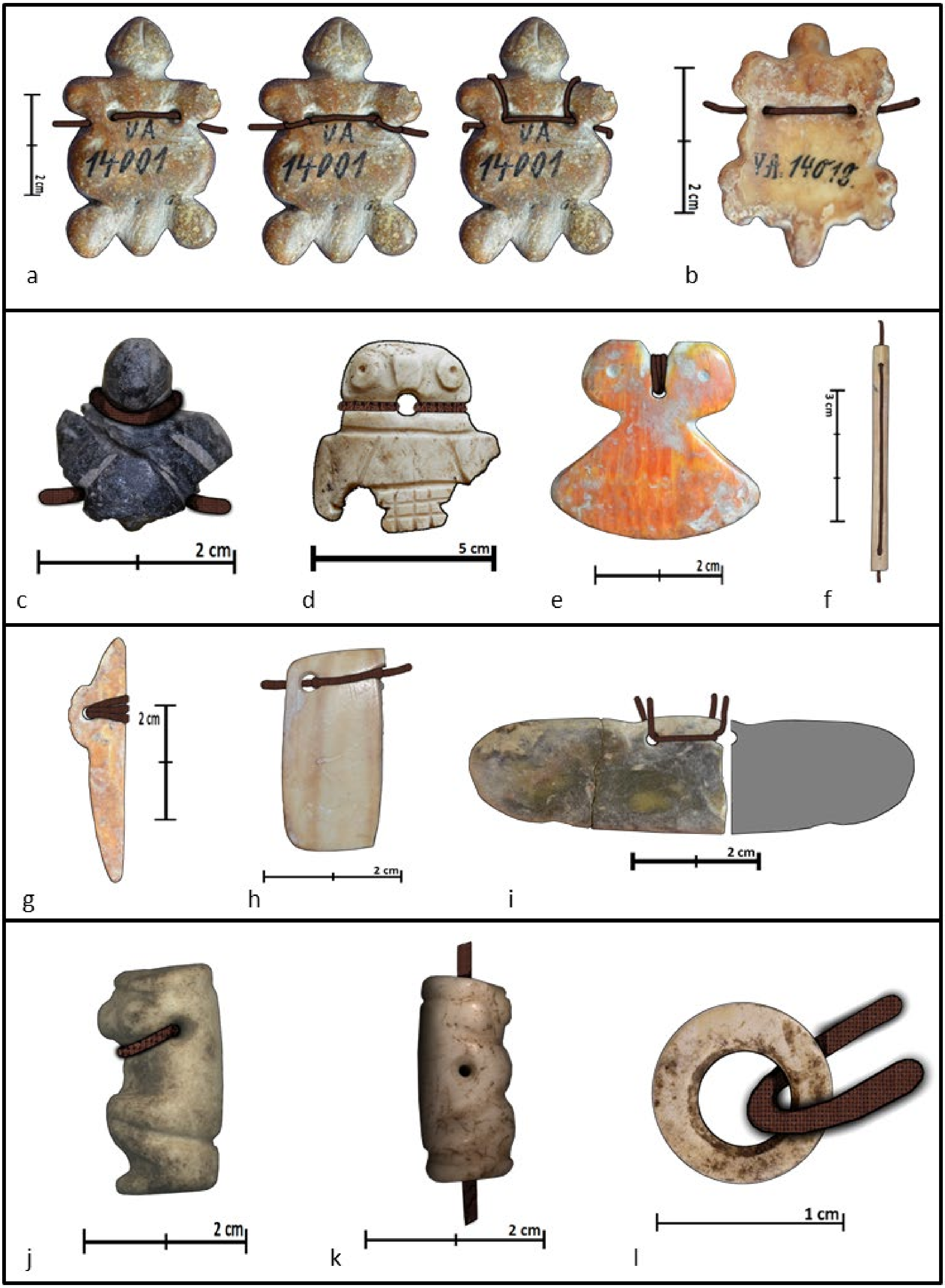

Figure 31: Possible systems of attachment.

Even if the artefacts were part of a neck ornament, they would not hang loosely, but were carefully woven into it.

Use-wear on the small bird-shaped pendants (VAS-25 and 26) suggests that they were sewn against a surface. This is a logical way to keep them upwards (if hanging loosely, the head would be upside down). An attachment similar to ethnographic composite ornaments with jaguar claws is a reasonable possibility.[78] The pelican-shaped ornament has a different system of attachment, as it presents two perforations; however, the general idea is the same: attaching the piece against a surface so that the beak faces forward and up. The pendant probably played a prominent role in a composition, most likely a band tied against a body surface. The owl-shaped pendant had a similar system, with strings attached to it's the "mouth" (figure 31, d).

The use-wear evidence on the disc and tubular beads suggests simple systems of attachment, i.e. hanging loosely on a string next to each other. An exception is the ceramic bead (VA14050d), which was kept in place by the presence of a knot or a smaller bead in contact with (at least) one of its sides. The presence of intentional cut marks on the perforations and the use-wear polish on the "false" tubular beads suggest that the string was entering through one end (face), exiting on the side and passing along the side of the bead towards the other perforation (figure 8,4, f). The beads were locked in place, possibly sewn. The dagger-shaped pendants are numerous in Valencioid assemblages and normally found in groups, having potentially been part of the same composite ornament (A. Antczak, pers. comm. 2015). Given their probable fragility, they may have been worn only on specific occasions. Most specimens analyzed here present use-wear, but interpretation is hampered by the frequent presence of a break and erosion next to the perforations. Therefore, it is not possible to argue for specific systems of attachment. While sewing their tops against a surface is a possibility, pendants made of *tucum* nut (*Astrocaryum* sp.) with similarly placed perforations found among different Amerindian communities are hung in short necklaces alongside small beads of a varied materials (Ribeiro 1988, 166). This would also be a reasonable system of attachment.

The cut-out pendants present clear evidence of a system of attachment. They were kept in place by the presence of two or three strings (or the same string passing inside the hole more than once) attaching the pendant to a specific place in a string or band (figure 31, g). For a person standing in front of the composite ornament, the visible part of the pendants was the side with the knob. They were probably strung next to others of the same type, although not in direct contact. The shell-shaped pendant had a similar system of attachment (figure 31, e). The frog-shaped beads, also produced in great quantities, do

78 Necklaces or crowns with jaguar claws are found in the Upper Xingu and among the Borôro. The claws are tied in a complex way against the string so that the sharp tip of the claws faces up and not against the wearer's neck or forehead (Ribeiro 1988, 166-69).

not present secure evidence of wear. Some specimens show limited polish around the rim of perforation, but these areas of the beads are generally eroded. There is, nevertheless, polish along the edge of the concave (back) face of the beads. This polish may be evidence that when in use, the artefacts laid against a surface. This could be the surface of an object, embroidered construction or the body. Their interpretation as inlays may be correct, but there is not sufficient evidence for such a claim. Another cut out artefact, the rectangular pendant, presented a very clear system of attachment, with cut grooves on the perforation to guide string (figure 31, h).

The *Oliva* sp. pendants are generally interpreted as tinklers, due to their singular morphology. The specimens analyzed often present polish around the rim of perforation and general rounded aspect, but no other recognizable evidence of attachment. A few specimens present deformation on the rim, suggesting the presence of a string from which the artefact would hang. It is not clear if the string that passed inside the hole would be tied around the siphonal canal. The *Oliva* shells have a natural notch in this area which would be ideal for attaching a string. Polish was observed on a few specimens in the notch, but this seems to be present naturally on the shell. Tinklers hanging from arm- and ankle bands are known from several Amerindian communities, often made from nut shells (Ribeiro 1988; Travassos 1986). On some occasions, small beads are in direct contact with the side perforation of the tinkler, whereas on other specimens, tinklers are just hanging on strings. No evidence of the presence of small beads was observed on the artefacts studied here. Certain ethnographic pieces made of nut are attached through a perforation on the top (which would correspond to the siphonal canal of the *Oliva* shell), even though they also present a side perforation. This would probably require a small knot or bead inside the nut to prevent the artefact from falling. In the same pictures, the attachment of some specimens links the top with the side perforation with a thin string. It is possible that the side perforation has a function in the acoustics of the artefact, rather than necessarily constituting a system of attachment. This could explain why only a handful of the Valencioid artefacts present deformation of the perforation. However, given that most *Oliva* shells are opened (i.e. the lip is not connected to the body whorl), such an attachment may not be possible. It is thus likely that only the side perforation was used, even though not generating pronounced use-wear evidence.

Regarding the serpentinite bat wing pendants, the use-wear evidence suggests that they were not attached against a surface. On both faces, two strings would connect the two perforations and go up, in direction of the edge of the artefact (figure 31, i). This means that the pendants could move back and forth. Vargas Arenas and colleagues (1997, 144-5) postulated this as one of the possible attachment systems of the shell bat wings. A similar ornament type is observed among some ethnographic communities: the Ye'kuana have a large wooden bat pendant which is worn on the back, possibly hanging from the neck of a dancer in ceremonial contexts.[79] This piece has a carved bat on the centre, reminiscent of the shell bat wing pendants found in the region. Another ethnographic example is observed among present day Kogi and Ika from the Sierra Nevada de Santa Marta in Colombia. The pendants were suspended in pairs from the elbows of dancers, serving as tinklers. It is possible however that if the Tairona bat wings were used as such, the dancing varieties were made of wood and the stone ones, more fragile, were exclusively for burials.[80] Considering the presence of use-wear, it is not likely that the Valencioid artefacts were only grave goods. All the artefacts analyzed here are broken (which could be a weak indication of a usage as tinklers), but only on one of them the break is not recent. It seems more likely that they were chest or back pendants. This is also suggested by their positioning in burials in the Mucuchíes area (Wagner 1973).

There is little evidence of the specific systems of attachment for the other stone artefacts, with the exception of two specimens. One of them is the elongated pendant from the Jahn collection (VA14004). One of its extremities was notched in order to place the perforation. The surface of the notches presents polish, which suggests that it was in direct contact with either a small bead or a knot. These would have prevented the pendant from oscillating on a string. The piece is also notably heavy, which may be an indication of its placement in the centre of a composite ornament such as a necklace. The other artefact with evidence of the system of attachment is the jet pendant (VA14038). This piece displays evidence of being highly worn, with considerable polish and rounding. The area immediately around the perforation is sunken in a circular shape. Similarly to the previous piece, this is likely evidence of the placement of a knot or bead in contact with this artefact during use, covering almost entirely that end of the pendant.

Most artefacts present small perforation diameters, generally 2 – 4 mm. The string used on such ornaments had to be even thinner in order to be inserted in the perforations. This required a resistant material that could be twisted to become a thin thread. It would be passed through the holes of the ornaments with an equally thin needle-like object, perhaps animal bone, teeth or plant thorns. There is evidence of the use of plant-based materials for the strings, potentially silica-rich varieties. This is however not conclusive and require further investigation regarding the process of wear formation by the use of different string materials.

Amerindian composite ornaments involve a range of raw materials: not only a plant-based string and a pendant, but also tiny seed beads, feathers, nuts and animal parts. While some necklaces and embroidered constructions may be composed only of pieces of a same raw material, larger pendants are more commonly placed alongside smaller ornaments of other materials. This polysemic character of composite ornaments should be

79 Description available in: www.orinoco.org. This usage has been suggested to me by M. Antczak (pers. comm. 2015).
80 These ideas and description are available in: www.metmuseum.org.

kept in mind, as its parts may refer to different processes, production sequences and social relations. The artefacts mentioned above (VA14050d, VA14014 and VA14038) should be regarded as evidence of the use of small beads next to larger beads and pendants. The necklaces were assembled in the Valencia Lake Basin with elements of diverse origins, at the same time displaying the capacity of the wearer to maintain relations with faraway peoples and domesticating these potencies in order to produce local identity.[81] The production of ornaments thus takes place in two scales. The individual beads and pendants discussed here are only part of this process: their biographies are always shared with those of other things and humans. On the other hand, some ornaments could have arrived at the Valencia Lake Basin already attached to a composite construction (*e.g.*, jet and serpentinite). However, more data from the region is needed to evaluate the plausibility of this scenario.

8.1.4 – Remaking ornaments

The Valencioid ornaments had complex biographies. Evidence from a few biomorphic artefacts suggests that they were "recycled" and reused. There is clear evidence from a slate nose ring, which was recycled to serve as a pendant. Less clear evidence was observed on the shell- and the turtle-shaped pendants. Cut grooves were probably made on top of previously used areas, in order to continue to use these ornaments in the same way. These may have been a way of "curating" the artefacts, so that they would continue active for a longer period. These pendants were not recycled *per se*, but curated. Evidence is also found on the stone turtle from the Jahn collection, which was probably strung more than once. It is also possible that the fresh V-shaped notches on its sides were added during a later stage of its biography (as opposed to the initial production of the artefact).

Other ornaments may have gone through similar procedures, but which did not leave traces on their surfaces. On a daily basis, different procedures may have been applied to the ornaments, such as cleaning, adding resin and storing in an appropriate place. Among Amerindian communities, fresh artefacts (i.e. shiny and recently made) are more valued (Van Velthem 2010b). They represent the ideal state of artefacts: old ones are regarded as ugly, greyish and deformed. In this case, "curation" can be equivalent to the prophylactic treatments applied to the bodies of people in order to maintain them stable and healthy (Alberti 2012; Vilaça 2005). While "curation" may be expected for the biomorphic pendants, it is not clear why the slate nose rings would be recycled. The raw material is available in the immediate region and the artefacts demand little effort and skill in their production. This raises a further question regarding the ideal biographies of specific ornament types. A study of all known depositional contexts of ornaments could shed light into this ideal biography.

81 This is argued in analogy with the valuation of products considered "foreign" by ethnographic indigenous communities from the lowlands of South America (*e.g.*, Hugh-Jones 1992; Van Velthem 2010b).

8.1.5 – Contexts of deposition

There is only limited information on the contexts of provenience of the materials analyzed from the Valencia Lake Basin. This encompasses solely the artefacts from the Jahn collection. The only information regarding the total number of ornaments recovered by Jahn is the "28 necklaces" figure from Von den Steinen's article (cf. Lejeal 1905; Osgood 1943). It is not clear, however, what is meant by the word "necklaces", which was used by Von den Steinen in his report and was later reproduced by other authors. This denomination seems to refer to actual ornaments that were found associated in context, therefore probably belonging to the same composite ornament.[82] It is not possible to contrast the sample analyzed here with that record, since part of the original collection has been lost during the 20th century (see Chapter 3).

Many ornaments come from burial contexts (20; 32,2% of 62 artefacts). There are at least four different burial contexts: an urn burial from Hacienda Mariara, a burial at Los Cerritos, one urn burial in Camburito Mound 8, and another (non-specified) burial in Camburito. With the exception of the urn burials, it is not known whether the denomination burial refers to single contexts or to more than one burial in each site. There is little bioarchaeological information for the burials excavated by Jahn; it is known that two infant urn burials were accompanied by ceramic vessels, one from El Zamuro and another one from Camburito (Mackowiak de Antczak 2000, 214). Ornaments were not found in these burials. A monkey burial was also excavated by Jahn, containing shell ornaments around its neck (Antczak 1998). It is not possible to know if any of the components of this "necklace" were analyzed here.

The pyramid-shaped artefacts analyzed in this research came from the urn burial at Camburito Mound 8, from which 203 specimens were recovered (Mackowiak de Antczak 2000). These artefacts can be grouped according to size: one larger, two medium, 199 small and one even smaller. In this research, only 4,92% of the total was studied (*n*=10), all part of the medium and small groups. As suggested by Mackowiak de Antczak (2000), they could have been inlays. In this case, the apex of the pyramids was likely inserted in previously notched or cut areas in a larger artefact. The consistent variation in sizes may be evidence that they were used in a complex composition of inlayed pieces, structured around the size difference. However, only one pyramid displayed possible evidence of use. The other pyramids are fresh, supporting the idea of preforms. It is not clear why such pieces were placed in a burial or if they were originally attached to a larger artefact (although this would have presumably left use-wear traces). The value of the pyramids was probably associated to the high number of pieces in the group and/or to their contribution to a complex composite artefact.

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82 According to A. Antczak (pers. comm. 2015), who had access the original German manuscript, Jahn was indeed concerned with the placement of ornaments in strings in correspondence with how they were found in the excavations.

The other urn burial was recovered from the Hacienda Mariara, on the northern shore of the lake. Only one artefact analyzed in this research was recovered in this context: the unidentified stone ornament, possibly an earplug (VA11589l). Fragments of serpentinite axes, a coral fragment, and a disc-shaped stone object, also interpreted an earplug, were found in association. It has been suggested that all the tools from this context were used before being deposited (Mackowiak de Antczak 2000). There is clear polish and rounding on the stone "earplug", however these traces cannot be directly associated to usage as an earplug. It is also a heavy artefact (21,5 g), which may have prevented such use. The area opposed to the knob was drilled, leaving a cavity where a stick would perhaps be inserted as part of the earplug mechanism.

Another group of artefacts was recovered from a burial context in Los Cerritos, on the eastern shore. This includes many biomorphic shell ornaments analyzed here: the stone and shell turtle-shaped, the armadillo-shaped, the anthropomorphic, and the triangular pendants. One of the serpentinite bat wing pendants (VA14002) also came from this context. It is not clear if they belonged to the same burial. All of them demand considerable skill and time-input to be produced. In addition, the serpentinite pendant may have been regarded as an exotic good. If all pendants belong to the same context, it suggests the burial of an important individual. Without bioarchaeological data, the question of who would be this person is just a matter of speculation. Most ornaments display considerable evidence of use-wear (medium and highly used). If the ornaments were interred with their original owner, this was certainly not a young person. However, as suggested above, the turtle-shaped pendants had complex biographies in which recycling and reuse could have taken place. In addition, two pendants do not present evidence of wear: the armadillo-shaped and the anthropomorphic ones. The armadillo displays the highest shell working skill level and ability of fore-planning in the assemblage. The lack of use-wear and their deposition in a burial suggest that they were produced with this single purpose.

The frog-shaped beads, originally belonging to a group of 11 artefacts, were collected from Los Cerritos as well. They probably belonged to the same composite ornament, potentially attached (sewn?) to a surface. Other six ornaments can only be generally assigned to El Zamuro/Camburito. Among these are included the three automorphic pendants studied here, which were part of a group of 21 shell fragments and possibly debitage. Other four tubular beads of chalcedony were also found, suggesting that the one analyzed here, which is heavily worn, was used in association to beads of the same material and type.

From the El Zamuro site, a ceramic pipe bowl was recovered next to the *Lobatus gigas* tubular bead (VA15406b). It has been suggested that the bead was in fact a pipe stem (A. and M. Antczak, pers. comm. 2015). It is indeed different from the (real) tubular beads from the La Mata collection, but displays cut marks on the perforation and notches for the strings. The artefact may have originally been used as a bead and later reused as a pipe stem. However, use-wear evidence for the use as a pipe stem has not been recognized. The owl-shaped pendant was also from this site, but there is no further information available. The 16 tinklers were recovered from El Zamuro, probably in association. It is not clear if they were strung together during their use lives, as they present different degrees of wear. This may indicate that they were assembled together just for deposition; but there is no information regarding their precise context. Seven cut-out pendants were also found in this site, but only three of them were analyzed. One of them was highly worn, while the other two medium worn. The differential wear among pieces of a same necklace may also be indication that composite ornaments were being dismantled and their parts remade into different compositions (Ewart 2012; Frieman 2012).

8.2 – The biographies of Dominican beads

Most sites in the north-western region of the Dominican Republic were associated either to the Meillacoid or Chicoid series or shared decorative elements of the ceramics from both. The site of El Flaco provided most of the analyzed specimens and also data regarding beads in context. In the following, the beads will be discussed in groups, highlighting the site of provenience only when it is relevant.

8.2.1 – Conceptualization and raw material acquisition

The choices made in terms of materials, shapes and techniques for bead making are socio-cultural and can offer insights into the mental template that guided production. In this sense, a range of raw materials from different origins was regarded as appropriate for beads in the north-western region: minerals, rocks, shells, ceramic, coral, and bone. This great variability is represented in the site of El Flaco, while almost all beads collected from the other locations were made of lithics. This is probably justified by the lack of extensive excavations in the other places. For instance, a bone earplug was recovered from the La Luperona site, whose excavation was started in 2013.

Calcite was the most common material, being present on disc, barrel-shaped and tubular beads. It can be collected in the north-western region, where limestone deposits of marine and lacustrine origins predominate as the geological basis (Ulloa Hung 2014). This is also the case for other materials such as igneous rocks (including diorite), vein quartz and a range of igneous and partially metamorphosed greenstones (A. Knaf, pers. comm. 2015). In other words, many of the materials and tools necessary for bead making can be collected nearby the sites in some of the rivers, such as the Yaque del Norte and Bahabonico.

There is limited evidence of why these specific raw materials were chosen for bead making. Appreciation for white and partially translucent materials has been recorded among ethnographic and ethnohistoric indigenous communities (Keehnen 2012; Lagrou 2009; Meggers and Evans 1957; Oliver 2000; Saunders 1999; Van Velthem 2010b). These properties have symbolic associations within shamanic worldviews and are present in shells, pearls and metals. It is possible that calcite beads were perceived in a similar way. However, their specific treatment (i.e. being made into bead types that are exclusive to this material) is evidence that they were not regarded as analogues to shell varieties. Necklaces of çibas, interpreted as beads of calcite and diorite, would be part of the "Taíno" caciques' attire and important in their demonstrations of power, connection to the supernatural, and wealth (Oliver 2000). On the other hand, the choice for lithic materials can also be connected to their long-term durability (Barcelos Neto 2008). Their colour and shape are limitedly affected by time and they are also less prone to breakage. This contrasts markedly with other raw materials, especially of organic origin. Among the Kaxinawa, these properties, present in glass beads, are associated with maize seeds, semen and the production of children's bones, eyes and teeth (Lagrou 2009). In this case, there is also an association between beautiful, moral and healthy.

A dichotomy can be noted between the calcite and the diorite beads. However, under the term "diorite", a range of different igneous rocks may be encompassed. In the assemblage, there are specimens more similar to diorite (although they also require geochemical analysis), while others may only be referred to as "igneous rocks". These rocks are abundant in both Early and Late Ceramic Age contexts (Boomert and Rogers 2007; Hofman *et al.* 2007; Knippenberg 2007; Watters and Scaglion 1994). The differentiation between the rock types would be made by Amerindians in terms of characteristics such as colour, weight, texture and region of provenance. For instance, certain igneous rock beads are similar to the calcite beads in terms of shape and techniques of production, except for having black or greenish patches on the surface (*e.g.*, Fnr. 001 from La Luperona and the bead from El Manantial, Montecristi). On the other hand, some beads, even though they have a homogeneous white or greyish colour, are markedly heavier than the others (Fnr. 801: 7,53 g; La Piragua: 16,26 g). Considering that these artefacts would be hung on the body, weight may have been an important attribute differentiating beads in terms of the composite ornaments of which they would make part, who would wear them and at which occasions. If a necklace of multiple heavy beads was made, it would probably not be worn by all members of a social group and/or on a daily basis. The wide occurrence of calcite and diorite beads throughout the country and the broader region suggests a regional appreciation for them and a shared (at least basic) understanding of their meaning, affordances and supernatural associations. This is noticeable not only because the same materials are used, but also because the bead types are recurrent.

Another common material used for beads in the site of El Flaco was the stony coral, *Acropora cervicornis*. In addition to three *A. cervicornis* beads and one of an unidentified species, unmodified fragments of *A. cervicornis* were also recovered from the site.[83] This indicates that the people at El Flaco had access to fresh branches of this material brought from the coast, rather than being just receivers of finished beads. The rough surface of the bead preform (Fnr. 1118) suggests that the material was collected freshly washed ashore or directly from coral reefs and brought or exchanged to the site. While coral can be ground and become white and smoother, considering the irregular surfaces of the finished coral beads found, it is possible that the material was valued for its unique texture and general rough appearance. Other coral species can be obtained inland, as they are part of the regional limestone formation, but they were not used as beads in El Flaco. A spherical coral bead, possibly made of *Porites* sp., was observed in a private collection in the nearby village of Laguna Salada. It has a characteristic pattern on its surface, produced by the grinding of the corallite ridges. The presence of this pattern also suggests an interest in the specific natural patterns and textures of corals.

Shell species were also used as ornaments in El Flaco. "Seed" disc beads were recovered, one produced from a reddish shell (*Chama sarda* or *Spondylus* sp.) and the other two probably from *Lobatus gigas*. An *Oliva* sp. tinkler was also recovered, in addition to fragments of large gastropods. Modified *Oliva* sp. shells were also collected in the site of Rosa Gómez in La Jaiba, to the west of El Flaco, but on the northern side of the Cordillera. There is one finished tinkler, while the other 2 shells had their apexes partially modified. The rarity of these species in other surveyed sites, which present abundant bivalve and other gastropod shells, suggests that they were brought to the Rosa Gómez site primarily to be made into tinklers. In addition, a shell perforated disc was recovered from Montecristi, but from an area not far from the coast where scatters of large gastropods are very common.

There is no evidence for shell bead production in El Flaco. The beads are similar to the ones produced at the workshop site in Grand Turk (Turks and Caicos) until the beginning of the 13th century AD. The abundant production was sent to the Greater Antilles, especially Hispaniola (Carlson 1995). Even though the dating is earlier in comparison to El Flaco (13th – 15th centuries), it is possible that the shell beads were coming from a similar workshop, perhaps in a different location or island. Besides the typological resemblance and use of the same shell species, the beads from El Flaco were drilled with a hard stone tool, similar to what is argued for the Grand Turk varieties on the basis of contextual association with flint drill bits.

In relation to other materials used for beads in El Flaco, there is no evidence for how they were collected. Regarding the ceramic beads, their pastes are probably similar in composition to other ceramic artefacts from the site. The geochemical composition of the beads has not been studied, although it would certainly provide insights as to whether

83 Microwear analysis has not been conducted on these specimens, so it is not known if they were used as tools, such as rasps. In any case, they were not beads.

they were treated differently from other ceramic artefacts. In addition, the three beads are quite different from each other, which may also be complemented by differences in paste composition. Finally, no study was conducted to identify the animal species from which the bone beads (*n*=4) were made. Most beads were produced of fragments of long bones of unidentified birds: two of them are more morphologically similar to each other in terms of texture and diameter, as opposed to a third one. The fourth (potential) bead was made from the vertebra of a cartilaginous fish. While they are all made from a similar material in terms of composition and workability, differences in raw material provenance should not be ignored: while the bird bones remain to be identified, the vertebra undoubtedly has a marine origin. This is most likely related to the maintenance of ties with communities from that area.

8.2.2 – The chaîne opératoire of beads

Limited information regarding the context of bead production can be obtained from the sites studied in the region. The number of beads is small in El Flaco in comparison to the extensive excavations that have been conducted thus far. The analysis of the beads suggests that the contexts of production were varied, as the beads may have come from different places. For instance, the location of the shell bead workshop in Grand Turk is justified by the wide availability of *Chama sarda* and *Lobatus gigas* (Carlson 1995). The flint (chert) drill bits, however, are a non-local material, probably brought from Hispaniola. Only a specific type of bead was produced in a large scale in Grand Turk, while other varieties (tinklers and stone beads) were likely brought from elsewhere. This is evidence that the production and consumption of beads depended on a high degree of regional connectivity. The same could be happening with the calcite and igneous rock beads found in El Flaco and throughout the Dominican Republic: specialized production took place in workshops and from there, beads circulated across the island.

8.2.2.1 – Production sequences

Technical schemes were created for the production of the beads from the Dominican Republic: for calcite, igneous rock, coral and ceramic beads. While there are similarities in bead making across the different raw materials, it is important to highlight the differences and specificities of each group. Technical schemes were not constructed for other materials as there was less evidence for their production sequences.

Calcite, in the form of masses or crystals, was collected and roughly ground in cylinders (figure 32, a). This was done with grinding platforms of hard materials, such as stone and *Acropora palmata* corals. Before this stage, flaking may have been done to remove irregularities from the material and to preliminarily shape a blank. Sawing also could have been used to separate smaller blanks from the cylindrical form. The calcite

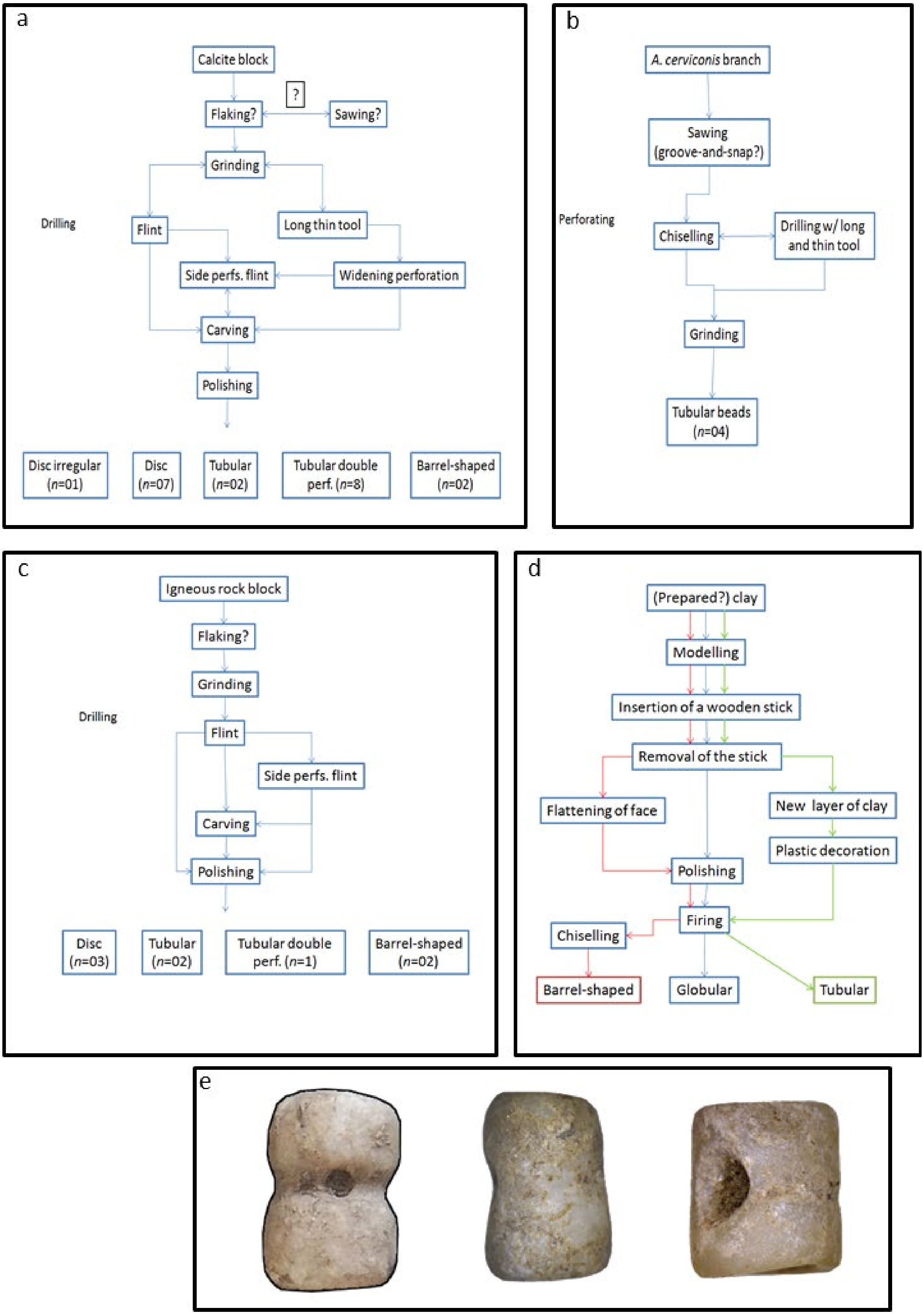

Figure 32: Technical schemes for calcite, igneous rock, coral and ceramic beads (a – d). Variations in the side grooves of calcite beads (e).

preform from El Flaco has a narrow, straight and long perforation, made with a non-flint material, possibly an organic tool. Contrasting it with other calcite beads, it is clear that the perforations of the latter were widened. Different perforation diameters on each face of a same bead are observed in this assemblage and also in museum collections in the country. However, second perforations added to the sides of calcite beads are generally made with massive, hard stone drills, possibly flint or quartz. Short tubular beads were also perforated with a flint-like tool. There are, however, some exceptions: one of the side cones of perforation in Fnr. 197 was made by chiselling or gouging. Considering the bead's thin wall, the maker may have thought that a faster technique was better than drilling. Alternatively, this could have happened accidentally, due to an exaggerated pressure of the drill. Likewise, on the anthropomorphic bead (Fnr. 145), one of the side cones is clearly conical, while the other one is wider and cylindrical. This suggests the use of a different drill bit, perhaps of the same variety used for the main perforation. The use of different techniques or tools for the execution of a same operation is evidence of familiarity with the material and with the different ways of working it. It is within the realm of specific cultural technological choices: people knew that other techniques and tools were possible, but chose to use certain ones.

Before (or sometimes after) the placement of side perforations, the calcite beads were "decorated". This was made by incising the beads with a hard, non-flexible tool, most likely flint or quartz. Combinations of incisions are used to excise the limbs and other anatomical features of the anthropomorphic beads. On the hour-glass shaped beads, incising was probably combined with another technique, such as grinding, to create a wider and more pronounced groove on the centre of the bead. Afterwards, the beads were polished, with an unidentified, possibly soft material, in order to remove traces such as misplaced grooves. Considering its thickness and diameter, it is possible that the preform was to be made into an anthropomorphic bead. This is evidence that some manufacture stages could be performed in the site (*e.g.*, widening the main perforation, decorating, adding the side perforations and polishing). However, it cannot be extended to all the beads in the site. It further suggests that if the beads were entering the site through exchange networks, not only finished beads changed hands but also preforms.

Regarding the beads made of igneous rocks (figure 32, b), a pebble or block of this material was collected and blanks were separated from it. It is not clear which techniques were used for this task. Sawing either with a flint tool or with a string is not very efficient, even with the use of abundant water and sand. Flaking is a possibility, but it must be kept in mind that these rocks are quite heterogeneous and not good for flaking. The next stage in the production is grinding, which led to the clear flattening and polishing of mafic minerals. The perforations were made with a flint-like tool, although one bead has a cylindrical perforation (Fnr. 001). Side perforations were added to this specimen with a flint-like drill bit. One igneous rock disc bead presents unfinished, decorative perforations on the side. The areas where the cones of perforation are placed were previously ground flat. These are the only two igneous rock beads that present some sort of decoration in the assemblage analyzed here. This may be a particularity of this assemblage or region, as igneous rocks have been made into anthropomorphic beads elsewhere in the country.

Three finished beads and one preform made of coral were recovered from El Flaco (figure 32, c). There is no clear evidence of the blank acquisition technique, although one bead presents possible cut marks on the side, next to one end. Sawing with a hard flint-like tool requires little work and does not damage the tool considerably. In fact, the groove necessary for breakage is quite shallow. Another possibility is breaking a branch in smaller blanks by hitting it with a hammerstone. The long and narrow perforation was made through a combination of chiselling and drilling, especially as the drill bit needs a place to be stabilized. In the final stage, the beads were ground. The coral beads were probably made locally, as a form of non-specialized, domestic production. Similarly to the tinklers from the Rosa Gómez site, coral beads were produced in small scales in village sites such as El Flaco. It is not clear however if they could also enter the site through exchange networks.

The final technical scheme was made for the ceramic beads (figure 32, d). Even though only three specimens were recovered from the site of El Flaco so far, they are very different from each other both in terms of type and technology. The three artefacts were modelled by hand and perforated by the insertion of a wooden stick, which was probably removed before firing. From this point, their production sequences differ: two had their sides polished, while the third one had an extra layer of clay applied to its surface, on top of which the complex Chicoid motifs were carved. Finally, they were fired and one of them had its perforation further chiselled, perhaps to make it wider. It is possible that beads were part of the broader ceramic making tradition in the site and made by the same people (probably women). Only one of them is certainly a bead (Fnr. 174), while the other ones could be a vessel appendage (Fnr. 804) and a spindle whorl (Fnr. 1073). The latter two also do not present clear evidence of use-wear, which poses a problem for their interpretation.

<u>8.2.2.2 – Skill and performance</u>

Technical errors can be noted on some beads from the north-western region, especially in the form of slightly misplaced perforations. In this sense, it is possible to talk about different skill levels. However, the representability of this variation in performance is not clear, as most beads are not locally produced. Whether such information refers to different skill levels within a given group of craftsmen or to a general lack of care or skill in the regional bead making tradition is not possible to assess at this stage.

The best example of different skill levels is found on the two anthropomorphic calcite beads, which suggests that a different craftsperson made the decoration of each bead. Despite the differences in skilled practice, they depict the same motif: a specific composition of the figure, in which the facial features are excised and separated from the legs by an empty space. Other anthropomorphic tubular beads found in the Dominican Republic have a different composition, especially on the face.[84] The anthropomorphic pendant recovered from the site of La Luperona is similar to pendants found in museums across the country, at least in terms of raw material and composition of the motif (Hofman and Hoogland 2015, fig. 3). The motif on the pendants, despite also depicting an anthropomorphic figure with folded legs, is also different from the anthropomorphic beads.

A discussion of why the beads have these recurrent and specific shapes touches upon the symbolic realm for which we have no access in the present. However, a more in-depth study of variability within the assemblage can offer clues into the conceptualization of ornaments. Despite differences between the El Flaco beads and other anthropomorphic beads from the country, there is marked continuity in shapes and decoration. Not only is the organization of the motif similar, but also the orientation of the bead and production sequence. For instance, the anthropomorphic bead from the site of El Cabo, which I had the chance of examining briefly[85], also has the same system of a narrow cone of perforation on one face and a widened one on the other. In addition, the general shape of the faces is also the same (i.e. one face is more triangular, while the other one is circular). This suggests that the beads are made with similar tools and are also organized in standardized ways. This is further indication that a more thorough assessment of bead making requires a broader look into the regional variability.

For instance, in the assemblage analyzed here, there are beads with incised decoration, beads with anthropomorphic representations, beads with hour glass shapes and beads with side perforations, and even one with unfinished side perforations. These features could be grouped in functional versus purely decorative: on the one hand, strings were attached around the hour glass shapes and entered the side perforations; on the other, some beads had non-functional incisions and unfinished side perforations. However, this distinction is more apparent than real on calcite tubular beads. There is a progressive evolution of the ways to make the groove on the centre oscillating from real groove to just an incision representative of the groove (figure 32, e). The same may be argued in relation to side perforations: the side perforations can be functional or just decorative. This continuity is also present on the anthropomorphic beads. The lowered, empty area on the centre of the bead is reminiscent of the groove on the hour glass beads. It separates the two

84 Arrom (1975) includes figures of anthropomorphic beads which have more elaborate excision, but are also markedly different from the beads from El Flaco. Some of the beads presented by Fewkes (1922) are more similar to the El Flaco specimens.

85 The site of El Cabo San Rafael in the province of La Altagracia was excavated by a team of Leiden University from 2005 to 2008 (Hofman *et al.* 2008c; Samson and Hoogland 2007). It was dated to the Late Ceramic Age (AD 600 – 1504) and many ornaments were recovered (De Ruiter 2009; Samson 2010; 2011).

fields of decoration: the head and the legs. In this sense, the tubular beads with hour glass shapes were conceived as schematized versions of the anthropomorphic beads. This is not to say that such beads are equivalent to each other, as the production of anthropomorphic beads involves the use of a larger blank and of incising and excising techniques. The continuity between the different types of tubular beads and their relation to other bead types would profit from a large-scale comparison with beads from other areas.[86] At this stage of research, given the small size of the assemblage, it suffices to say that lithic beads are the result of a standardized production, but that their decoration inhabits the grey zone between utilitarian and purely decorative. The use-wear data seems to corroborate this observation and will be discussed in the next section.

8.2.3 – Use-life of beads

Exogenous products entering an Amerindian community are incorporated in specific local ways, in which they can be "pacified" or considered completely foreign (Lagrou 2002; 2009; Van Velthem 2002; 2010b). The process of incorporation of beads of a "foreign" origin in the social sphere can be done in different ways and levels, for instance by adding local motifs or through the organization of foreign and local beads in composite ornaments.[87] This could also imply in a differential usage: beads made of local materials and/or by local individuals (*e.g.*, ceramics, bone and coral) could be used in different combinations, occasions, or by different people than the beads produced elsewhere (lithic and shell). If they were exchange items and produced in workshops elsewhere in the island, the desire for maintaining long-distance relations with other communities are certainly important elements in the acquisition of beads. However, whether beads obtained through exchange were conceived as foreign or not is a question that should be posed as well. The degree of "otherness" in which different communities are inserted can vary (Vilaça 1992) and certainly had an influence on the ways the beads were perceived by people at El Flaco.

In Chapter 2, the standard interpretation regarding the attachment system of the double perforated beads was discussed: they would be hung on the side perforations, while feathers would be inserted along the thickness. This idea was contrasted with the results of the use-wear analysis conducted here. Rather than fitting in this general scheme, the beads have diverging trajectories: some were probably used in this way; others were strung only along the thickness; and others, on both perforations. These trajectories are different regardless of the bead type. An anthropomorphic bead (Fnr. 676-2) was strung

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86 By examining figures of beads and pendants from the Playa Grande site (López Belando 2012), to the east of the studied area in northern Dominican Republic, it is possible to note the importance of this central groove in the production of the human representations. It is the primary element carved on the beads before making anatomical features. This supports my general idea, although will require further investigation into tools and raw materials used.

87 The cotton idols and belts from the Greater Antilles could be an example of this practice: they include beads of different native materials (shell species and seed), alongside materials of European origin (Ostapkowicz 2013; Taylor *et al.* 1997).

on the side perforations and a feather was probably inserted along its thickness, which is suggested by the presence of an unidentified black residue on one face (figure 31, j). The other one (Fnr. 145), however, does not present use-wear on the side perforations, but only on the faces, which indicates that it was only used strung along the thickness (figure 31, k). Therefore, there is no direct correlation between the adding of a side perforation and the functionality of the bead. In this case, the side perforations are just decorative, not being used for stringing the beads. This supports the idea of a thin line between decoration and functionality. Double perforated beads cannot be lumped together just according to their types. They are not all the same. The ways in which a bead was going to be attached depended on factors other than the type and raw material. Beads were possibly conceived in different ways by the people that used them at El Flaco as opposed to the producer, elsewhere in the region. This difference in conceptualization (or reinterpretation) may be responsible for the variation in modes of attachment.

The beads had multiple use trajectories. The specimens with more pronounced use-wear are the shell beads (figure 31, l). Only one bead made of calcite (from La Luperona) displays comparable wear. The fact that some lithic beads were discarded with little to no use-wear is unexpected, given that they were not locally produced. In other words, beads were apparently discarded when they could still continue to be used. On the other hand, the use of a calcite bead even though one of its perforations was not finished (Fnr. 066) suggests the opposite: since there were not many beads, this one had to be used either way. The shell beads correspond to this “low availability” logic: there are only a few beads of presumably exotic origin and they display extensive wear. It is possible that beads were only used during a specific stage or event in people’s lives and that afterwards they could not be transferred to other individuals, thus leading to their abandonment. The relative low degrees of use-wear support the idea of a short-term usage. However, it remains to be tested against further data from the site.

More than 70% of the beads have perforations with 2-3 mm of diameter. This is similar to the Valencia Lake Basin case study, but even more homogeneous (which is not surprising given the greater homogeneity of bead types). This points out to the use of really thin strings. It is not possible to assess if the strings were produced at the site, although plants that could be used for such purpose are available in the region (e.g., cotton and *cabuya*). However, it is more likely that strings of beads were exchanged, rather than individual pieces. As argued above, it is not inconceivable that strings of beads were disassembled and the individual items stored or included in new composite ornaments.

8.2.4 – Contexts of deposition

In this section, only the beads recovered from the excavations at the site of El Flaco will be considered. During the occupation of the site, all material accumulated on the house floors was “swept” aside, thus forming mounds (Hofman and Hoogland 2015). The mounds present a complex stratigraphy which is evidence of a range of different activities that formed them: deposition and burning of garbage, horticulture and burials. Hearth structures were also found in association with the mounds.

Most beads were recovered from the mounds or adjacent areas, while one was a surface find. Many beads were recovered in the organic horizon (fill) of the mounds (n=12), some from the ash layers of the mounds (n=3), and others from the regolith adjacent to the house platforms (n=13). A few beads (n=4) were excavated from the upper layers impacted by ploughing. The two anthropomorphic beads were found in the southern slope of a house platform in nearby units (8 and 9), connected to a hearth structure. One of them (Fnr. 145) comes from the ash layer, while the other one (Fnr. 676-2) is from the ploughing area. Other beads also came from this same unit, outside of the house structure: a ceramic bead, a diorite disc bead, and two calcite beads. Three double perforated calcite tubular beads were also found in relatively close context (Fnr. 838, 840-1, 840-2): most of them are from the mound fill in Unit 14, while one is from the ash layer of the mound. In the same square (63-57-90), the calcite preform (Fnr. 824) was found in the ploughing area. Three other beads were also recovered from a same square in Unit 21 (Fnr. 953-1, 953-2, 957), two of which from the plough zone and the third from the fill of a mound. Two of them are shell disc beads,[88] while the remaining one is the calcite irregular bead. The building up of the mounds occurred relatively fast (Hofman and Hoogland 2015), which suggests that the beads may have indeed been associated during their use-life. The other beads were found isolated from each other, although in similar contexts. The coral beads were found in different units and from both the regolith and the ash layer of a mound, therefore not associated to a specific context of use or production.

The only exception is a bead found inside the fill of a grave. It included the burial of a 6 years old child together with the metacarpal of an adult (Hofman and Hoogland 2015). It was a double perforated calcite bead, broken along its thickness (Fnr. 1216), with no use-wear. It is not clear if it was intentionally placed in the burial or if it ended up together with the fill by accident. The other burial in the site, which included 2 individuals, was not associated with beads. The association of ornaments with child burials is not uncommon among present-day and pre-Colonial Amerindian societies (De Veth 2013). It is possible that the bead was used by the child, but only for a short period of time, thus not generating any use-wear. The type of breakage, not seen on other beads recovered from the site,[89] could have been intentional and a proper way to deal with the belongings of a child.

The contexts of beads in El Flaco contrasts with the scenario at the site of El Cabo in the east of the country. In this site, ornaments were recovered not only from sweeping

88 Fnr. 957 was fragmented in several pieces and therefore not included in the analysis.
89 The breakage along the thickness was only observed on a short tubular bead from La Luperona (Fnr. 084).

areas, but also from the fill of the postholes cut into the limestone bedrock (Samson 2010; 2011; Samson and Hoogland 2007). These would have been deposited together with ceramic *adornos* in the holes after the removal of the posts for abandonment of the houses. The ornaments would also be deposited in key postholes within the house, presumably as a way of beautifying it (Samson 2011). This is different from what is observed in El Flaco, where most beads are associated to the mounds or sweeping areas adjacent to the houses. With the exception of the bead accompanying the child burial, the only broken bead from El Flaco (the preform, Fnr. 824), was not treated differently from others. Therefore, most of the beads associated with “garbage” are in fact intact and display little to no evidence of wear. They may have been lost and swept aside with the garbage. Alternatively, they may have been considered unusable after a few use episodes or were intentional depositions of unknown purpose.

8.3 – Contrasting contexts

Microwear data was combined with overviews of depositional contexts, raw material availability, and South American ethnography in order to construct the biographies of ornaments. In this section, a comparative exercise is conducted, highlighting differences, similarities and possible connections between the case studies. Differences between the collections are expected as they have different sizes and also different natures: one includes beads and pendants, while the other, only beads.[90]

In both the Venezuelan and the Dominican Republic case studies, there are multiple biographies of ornaments: they were made of several raw materials which were obtained from different regions and by different means. Different production sequences, toolkits and techniques for achieving similar ends were noted for both regions. The choice for these depended on the local ornament making traditions, on the mental templates, i.e. the desired ornament types, and on the properties of the raw materials. The contexts and scales of production also differed: large-scale shell and stone working was taking place at the Valencia Lake Basin, while bead making at the site of El Flaco was quite limited. Shell and lithic beads were probably produced in specialized workshops elsewhere in the Greater Antilles. In this sense, there is evidence for specialized production for both contexts, even though at El Flaco this would not have taken place locally.

Highly skilful craftsmen are political and/or religious experts in certain Amerindian communities (see discussion in Chapter 4, cf. Guss 1990; Hugh-Jones 2009; Overing 1989; Silva 2010; Van Velthem 2003). Individuals with such attributions could be present in the Valencia Lake Basin, as suggested by the high levels of technological achievement

90 However, it should be noted that only a few artefacts were in fact excluded from analysis from the Dominican Republic, such as three earplugs and an elaborate anthropomorphic pendant. Even if these were included, there would still be a marked difference in typological variability between the samples.

in shell and stone working. This is in accordance with the abundant evidence for ritual activity in the Dos Mosquises Island alongside shell working debitage, both conducted by the restricted social groups who travelled to the islands. In the Valencia Lake Basin, shell working involved not only the ability to produce complex and difficult shapes, but also individual creativity in making forms that were not just reproductions of a ready-made model. Creativity, individuality and high skill are primarily expressed in the three-dimensional biomorphic pendants. In addition, following Lagrou's (2009) idea that the application of traditional motifs and shapes implies in an engagement with alterity and the supernatural, the production and use of ornaments, together with the transmission of knowledge of its manufacture, may have been closely connected to mythological narratives about the owners of the raw materials and the origins of the motifs.

Conversely, at El Flaco, no production of standardized beads and pendants took place, as these items were most likely obtained through exchange networks. Political and spiritual leaders and their kin would be responsible for establishing and maintaining social relations with distant communities (Mol and Mans 2013). High skill crafting of beads would not be important attributions of such individuals. They were probably coordinating the acquisition of lithic and shell beads, which had to attain only to a basic formula, *e.g.*, an hour-glass shape with double perforations, and not to particularly high skill standards. Beads were valued for their specific surface features (colour, texture and shape) and respective associations. The interest and, to a certain extent, meaning of these attributes would be largely shared across communities, allowing for their broad circulation. At the local level, these artefacts were resignified, used in varied ways and perhaps further exchanged. The exotic origin of these beads may also have been laden with supernatural associations.

In both contexts function/use seems to be fluid: certain ornaments, which at first were expected to be used similarly, display evidence of different ways of stringing. For instance, each Valencioid biomorphic pendant has a specific attachment system, different from the others. This may signal their singularity, importance, long-term usage and perhaps transference between different individuals. Alternatively, some ornaments may have been produced just to be part of a burial. In the Dominican Republic, beads of a same type were actually differently attached. Based on ethnohistoric sources, beads and pendants have been associated to the attires of prestigious individuals, such as *caciques* (Alegría 1995; Oliver 2000). However, based on the archaeological data from El Flaco, it is not possible to assess who wore the beads. They were probably worn for short periods of time and the only contextual association of a bead places it in the burial of a child. In both case studies, use-wear rates vary considerably within artefact types, some being fresh and presumably unused, while others considerably used. Highly worn ornaments are more common in the Venezuelan case study, while the majority of beads from the Dominican contexts are lightly worn.

In both cases, only a section of the ornament biographies is visible. In the assemblage from the north-western Dominican Republic, the majority of the beads is finished and lightly worn. Blanks, preforms, highly worn, broken and recycled specimens are virtually absent. The material recovered is probably only a fraction of what the occupants possessed. One must ask what happened to the materials that are absent and what are the implications for the interpretations suggested above. Most of the stages of the biography of ornaments can be observed in the collections from the Valencia Lake Basin. Even if only limitedly present in the assemblage analyzed here, blanks, debitage and preforms have been reported from sites in the region. Part of the Valencioid artefacts was deposited in domestic contexts and burials, while certain ornaments were probably exchanged. This raises the question of which ornaments could be exchanged and which could not. The artefacts found in burials perhaps could not be separated from their makers or rightful possessors. A pre-Colonial variant of the exchange of *quirípas* along the Orinoco River may also have entangled the societies of the Valencia Lake Basin (Gassón 2000). Associations between the System of Orinocan Regional Interdependence and the Valenciod Sphere of Interaction have been suggested before (Biord Castillo 2006; Biord and Arvelo 2007) and may reveal more extensive and complex lives for some of the ornaments produced in the Valencia Lake Basin.

Beads from the northwest of the Dominican Republic were pieces of a broader phenomenon that extended across the region or even further in the Greater Antilles. At first, this regional homogeneity in bead types seems to contrast with the cultural diversity previously suggested for the north-western region (Ulloa Hung 2014). However, the circulation of beads may have had a role in the establishment of relations between different communities, similarly to other Greater Antillean material culture of the Late Ceramic Age. The interconnectivity and large-scale exchange networks of circum-Caribbean societies through time has been explored in recent publications (Hofman *et al.* 2007; 2008a; 2010; 2014a; 2014b; Hofman and Hoogland 2011; Mol 2007; 2014). The role of beads in these systems is exemplified in the early Colonial period by the *quirípas* case and by the exchange of greenstone frog-shaped pendants in the Lower Amazon (Boomert 1987), and also by the Early Ceramic Age workshops in the Lesser Antilles (Cody 1991a; 1991b; Hofman *et al.* 2014b; Mol 2014; Watters 1997a).

The combined evidence from the biographical analysis and South American ethnography shows that bodily ornaments are always connected to social relations with others. These can be the kin members, to which one transfers his/her crafting skills, neighbouring communities (exchange partners), or supernatural entities who are owners of the raw materials or motifs used in the craft. In this light, it is no surprise that beads were widely used as mediums of exchange. While the ornaments of both contexts refer to broader interaction networks and relations with other communities, the production sequence of the beads at El Flaco is distributed along these relations. Each stage of the life of the beads may have taken place in a different locality and, while changing hands, their meaning and importance may have changed accordingly (Kopytoff 1986). This can be the reason why double perforated beads were strung in different ways. The number of times these changes took place cannot be assessed, but the Dominican beads studied here probably had short use lives. In this sense, ornaments from the Late Ceramic Age Dominican Republic cannot be fully understood without a study of regional dynamics. The production sequence of the Valencia Lake Basin ornaments is also distributed to a certain extent, as the first stages of blank acquisition and shaping were performed on the off-shore islands (Antczak 1998). However, the contrast between the two case studies can clearly be attributed to differences between two ornament making and "consuming" traditions.

Chapter 9 – Final considerations and future prospects

In the beginning of this thesis, several gaps were pointed out in our current understanding of bodily ornaments in the pre-Colonial circum-Caribbean. Microwear analysis was thus proposed as an approach that can bring innovative data about the biographies of beads and pendants. The production and use of ornaments were main points of inquiry, followed by their relation to contexts of deposition and raw material provenance. Beads and pendants from two case studies, the Valencia Lake Basin and north-western Dominican Republic, were investigated. Biographies of bodily ornaments were created, with a focus on technological choices, skill levels, and mode and length of usage. Ethnographic examples from the lowlands of South America were used in order to make sense of the observed patterns in the treatment of ornaments by indigenous communities.

9.1 – Results and implications

In the previous chapter, a focus on the *chaîne opératoire* allowed me to perceive technological choices, gestures and different levels of performance in the manufacture of ornaments. The biographical approach permitted me to connect the different stages in the life of an ornament, including the acquisition of raw materials, use, reuse, potential integration in exchange networks, and deposition. These results clearly demonstrate that a microscopic approach can shed new light into how ornaments were dealt with and conceived by Amerindian peoples. The main contributions of this research can be divided in production and use of ornaments. While these refer to the specific case studies analyzed here, they also have implications for our understanding of ornaments in other regions and time periods of the circum-Caribbean.

In relation to the production, several raw material types were envisioned as proper for ornament making. Their origins, colours, weight, durability, among other properties, were selected for and dictated (to a certain extent) which shapes would be made from them. Some materials may have been regarded as connected to other beings, such as their spirit owners or groups of people that provided the materials. In both studied contexts, the main raw materials used for ornaments came from outside the vicinity of the settlements. In El Flaco, shell and lithic beads potentially had different places of origin from across or beyond the island, whereas ornament materials came to the Valencia Lake Basin from the coast, islands, and different sectors of the mainland. Local materials and/or local products were also used in both contexts, such as bone, ceramics, coral[91] and slate. While local products were normally used in the production of "simpler" ornaments for which less skill is required, they should not be regarded as artefacts of lesser value. Rather, as I showed based on use-wear and ethnographic evidence, heavier and more elaborate pendants are accompanied by smaller beads, generally of organic materials that have not survived degradation. Scholars too often assume that what is recovered from the archaeological record encompasses the totality of the necklaces of past peoples. Likewise, the production of ornaments among present-day communities can be a collaborative work, in which seed and nut beads, alongside threads, are produced by women in domestic contexts. The polysemic character of composite ornaments must be taken into consideration, as well as the properties of different materials and social relations they incorporated.

This research also provided evidence of different skill levels in ornament making, sometimes even in the same artefact, suggesting collaboration between a more experienced craftsperson and an apprentice. Transmission of knowledge takes place through observation and practice, as children and apprentices try to imitate older and more experienced people (Högberg 2008; Ingold 2001; 2013; Silva 2010). Ornament production is thus not a single event carried out solely by a highly skilled specialist. Considerable variability was noted in terms of techniques, tools and sequences, not only when contrasting one case study to the other, but also when looking at different ornament from the same collection. The microwear research also attested the use of different tools and techniques to achieve similar results in each case study. In the Venezuelan collections, there is evidence of specialization, in the form of comparable production sequences and toolkits, even though the final products have different morphologies, are strung differently and even made from different raw materials. On the other hand, some types, such as the slate ornaments, have their own techniques for perforating. In the Dominican collection, similar production sequences exist for calcite and igneous rock beads, despite the different mechanical properties of each raw material. Beads of other materials had different sequences and toolkits. This variability in techniques and toolkits is connected to different raw material properties, but also to socio-cultural choices, i.e. traditional ways of making certain beads.

Only in the last decades the study of non-flint materials has gained prominence among archaeologists. While in the Caribbean region the use of shell and coral as tools has long been recognized and approaches focused on past toolkits proposed (Lammers-Keijsers 2007; Van Gijn *et al.* 2008), perishable tool materials are still unaccounted for. It is often assumed that perforations were executed with hard materials, such as flint or quartz. The results of this investigation indicate that other materials were also used: in the Valencia Lake Basin, drill bits for perforating shell were made of a softer material such

91 Coral is not a local material in either one of the studied regions. However, as previously argued, it was probably made into beads at El Flaco, in the Dominican Republic, being thus a local product.

as wood, while in the Dominican Republic, an unidentified long, thin and flexible tool (possibly wood or bone) was responsible for perforating tubular calcite and coral beads. This evidence challenges previous assumptions regarding the difficulties and restrictions imposed by drilling. People were aware of them and had a varied set of solutions to deal with technical problems. This requires a reconsideration of lapidary industries in the Caribbean: for instance, the execution of long perforations in hard materials in the Early Ceramic Age could also have involved the use of a specialized toolkit including wood and bone.

This is the first research to thoroughly investigate ornament use-wear in the region. Varied systems of attachment were attested for ornaments, especially pendants: the ways in which the string is attached and whether the artefact was in contact with other surfaces. In both case studies, ornaments were deposited in the archaeological context at different stages of their lives: unfinished, displaying no use-wear, lightly, medium and highly worn. A few ornaments were also identified as recycled and reused. This practice was observed in both biomorphic pendants, which are made with time-consuming techniques and high skill, and slate nose rings, which are easily made from a local raw material. This challenges our assumptions regarding which things and materials are supposed to last, i.e. to have long biographies, and which are just to be efficacious for a short period of time (for instance, dagger-shaped pendants and calcite beads).

The microwear research also revealed that not all ornaments were used or made part of a same necklace with a homogeneous biography. Individual ornaments probably had complex and multiple biographies, being often remade and/or reassembled, similarly to what Ewart (2012) recorded among Paraná communities. Several scenarios were attested for the Valencia Lake Basin: 1) ornaments were produced, used, sometimes recycled or reassembled and used again, and finally reassembled for deposition in burial urns (together with the owner?); 2) ornaments could be produced just to be deposited in a burial; 3) and ornaments could be left or lost in domestic contexts. In El Flaco, beads were often found isolated or in small groups of 2-4 in the mounds; some of them were potentially part of the same necklace. There is no direct association between bead types and raw materials with specific degrees of wear. Many of the beads do not present evidence of technical errors or breakage and display little to no use-wear. The reasons for the deposition are elusive, but some specimens were most likely lost and later swept aside to the mounds.

Finally, the absences in the assemblages should also be noted. In El Flaco, we do not have evidence of the entire production sequences. In addition, many beads must have been taken away from the site or further exchanged. This is evidence that the biographies of the beads and also their production sequences were distributed in space. They did not belong only to the people who produced or once used them, and maybe not even to those who finally discarded them. In the light of current research in the circum-Caribbean region

(Hofman *et al.* 2007; 2008a; 2010; 2014a), certain ornament types and materials were part of connected regional histories whose only remains were found, at different stages of their existence, dispersed in the sites of the north-western Dominican Republic. Similar remarks can be made in relation to the Venezuelan case study, as the materials refer to large-scale relationships within the region. Nevertheless, it may be argued that great part of the biographies of ornaments took place in the Valencia Lake Basin, where it is part of a coherent assemblage in terms of types, technologies of production and high degree of usage. In this sense, ornament making in the Valencia Lake Basin is a more concentrated phenomenon, even though parts of the biographies of specific ornaments (serpentinite, jet and organic pieces) are not present or archaeologically visible.

9.2 – Evaluating the methodology

The approach advanced in this research proved to be successful in answering the questions posed in the first chapters. In spite of the different origins of the collections (i.e. museum, private and systematically excavated), substantial data could be obtained from the study of all of them. Post-depositional and post-excavation modifications were more common in the Venezuelan collections, which impaired or even prevented analysis of certain artefact surfaces. The presence of residues on artefacts from the museum and private collections was also regarded with caution, as they may be recent additions in the long biographies of these ornaments. The residue on one of the beads from the Dominican Republic, which was recently excavated from El Flaco, is more likely related to an ancient event, such as the attachment of an object with resin. In any case, the results of this research demonstrate the underexplored potential of museum and private collections for microwear analysis.

The size and diversity of the collections posed a challenge to this investigation as several raw materials were present. A thorough examination of the materials requires different sets of experiments, which could only limitedly be accomplished. The stereomicroscope predominated as instrument of analysis, as opposed to the metallographic microscope, which had a secondary role. This proved to be an effective way of approaching the collections, given the high variability of types and raw materials. However, the observation and characterization of polishes was limited, preventing a more in-depth assessment of contact materials. The latter was restricted to the identification of the use of either soft or hard materials in grinding, sawing and drilling. In addition, the different composition of the samples (i.e. beads and pendants *versus* only beads) limited their comparability. Likewise, the difference in sample sizes led to a similar problem. The mechanisms of formation of use-wear on each material also demands further exploration. While several researchers have focused on use-wear on shell, bone and teeth pendants (*e.g.*, Bonnardin 2008; D’Errico 1993; Minotti 2014; Vanhaeren *et al.* 2013), its formation rates and appearance are less clear for stone types and coral.

Despite the aforementioned limits, this research was capable of perceiving general tendencies on each assemblage by systematically analyzing wear patterns in individual artefacts. These limitations invite future research, in order to test ideas advanced here through the systematic analysis of larger samples and expand the methodology.

9.3 – Avenues for future research

The present research focused on providing new insight into the case studies and proposing a methodology for approaching indigenous ornaments from the circum-Caribbean. The next step would thus be to approach long-term and large-scale dynamics throughout the region. Raw materials, iconography and typologies suggest relationships between ornaments from different regions in the circum-Caribbean during the Ceramic Age (see Chapter 2). The nature and intensity of these relationships is often poorly understood in both the macro- and micro-regional scales. How the recurrence in iconographic motifs relates to technical procedures is a question that still needs to be examined. Selecting comparable samples from throughout the circum-Caribbean in order to perform microwear analysis may shed new light on whether they were indeed produced and used in similar ways. The potential of this approach lies precisely in its power of tracking actual choices, actions and technical procedures.

With these goals in mind, future research should focus on: 1) the study of larger assemblages of ornaments with contextual information from different areas in the Caribbean; 2) further developing the methodology with new equipments and a more extensive experimental programme; and 3) extending the interpretative possibilities through ethnographic analogies. For instance, studying more ornament collections with contextual information from the island of Hispaniola could provide new light into where and how they were being produced, circulated, and used. This would increase the understanding of regional dynamics and interaction networks that have been primarily studied on the basis of ceramic styles and, more recently, raw material provenance of ceramics and lithics. Microwear analysis can provide independent and new insight into how provenance data fit in larger patterns of ornament production and use. In relation to the Venezuelan case study, future research would profit from examination of other Valencioid collections (*e.g.*, from the off-shore islands), but also from the investigation of material from other ornament making complexes in the adjacent regions to the west (*e.g.*, Quíbor and Mucuchíes) and to the southeast (Guianas and Lower Amazon). The relations between these areas and the insular Caribbean have been previously proposed on the basis of shared iconography and raw materials (Boomert 1987; Cody 1991a), but demand further investigation and new data. In this sense, a study of Early Ceramic Age workshops could provide more information on bead making technologies and on long-term dynamics of ornament making in the region. The working of hard materials into complex shapes in contexts where metal tools are not available is unparalleled elsewhere in the world and further study would provide a new understanding of available toolkits in the pre-Colonial Caribbean. Evidence for organic tools found in this research is an example of this underexplored dimension.

A broader experimental reference collection for Caribbean contact materials focused on the production of ornaments should be created. Experiments investigating the formation of different rates of wear and types of traces with the use of diverse raw materials for ornaments and strings should also be conducted. Other improvements would be a more intensive research on perforation techniques, including casting of archaeological and experimental bore holes and comparison under a Scanning Electron Microscope or a 3D micro-CT scan. These techniques would allow a better visualization of micromorphological features inside the holes. Together with a specific experimental programme, a more in depth assessment of drill bit raw materials and drilling devices used would be made. They could also provide better conditions of examination of other three-dimensional surface features on the artefacts, such as incision grooves.

An investigation of lowland South American ethnographic collections, informed by specialized publications on Amerindian material culture, will shed light into systems of attachment for comparison with microwear data. It can also provide an idea of possible combinations of materials, including recurrent solutions to specific problems in ornament making: where is resin used? Where are specific bead types placed? How are ornaments tied? How are individual pieces separated from each other by the use of small beads and/or knots? Furthermore, an investigation of ethnological theories from South America, such as Amerindian perspectivism (Viveiros de Castro 1998; 2004; 2006), can provide insight into the role of bodily ornaments in the production of personhood and sociality (Lagrou 2012; Miller 2007a; 2009; Seeger 1975; Van Velthem 2010a). A more in-depth investigation of the anthropology and archaeology of the body and of other types of modification (tattooing, scarification, body paint, cranial modification, etc.) should be conducted. In combination with ethnohistoric and iconographic studies, these lines of evidence can provide a better understanding of how past inhabitants of the Caribbean experienced their bodies and of how this changed over time.

In sum, further microwear research into bodily ornaments in the circum-Caribbean can provide new data on discussions that have permeated the discipline over the last decades, such as exchange networks and the existence of a pan-Caribbean, shared cultural background. As demonstrated in this research, it offers insight into technological traditions, toolkits and composition of craft groups. The ways in which raw materials and ornaments have been dealt with and transformed by different communities can thus contribute to a broader understanding of how Amerindian bodies and identities were constructed and negotiated over time.

Abstract

Bodily ornaments are abundant in the circum-Caribbean region. Made of a variety of raw materials, most notably shell, stone and minerals, they have been recovered from the archipelago and surrounding mainlands. Most studies have focused on iconographic analysis of the motifs depicted on pendants and on the sourcing of exotic raw materials from which they were made. Technologies of production have also received attention, with emphasis on workshop contexts from the Early Ceramic Age (400 BC – AD 600/800). For the later period (until AD 1492), considerably less is known. This research proposes a theoretical framework focused on the cultural biographies of ornaments. The main objective is to approach how pre-Colonial indigenous communities have dealt with ornaments, including the collection of raw material, production sequence, use, reuse and deposition. A *chaîne opératoire* approach is also put forward, in order to assess technological choices, gestures, techniques, toolkits and skill levels. Two case studies from the Late Ceramic Age are discussed: the Valencia Lake Basin in north-central Venezuela (AD 800 – 1200) and the northwest of the Dominican Republic, especially the site of El Flaco (AD 1200 – 1400). Microwear analysis was conducted on 161 beads and pendants using optical light microscopy, with magnifications of up to 200x. Experimental replications of specific techniques with local tools and contact materials were also made to serve as analogues to the microscopic evidence. An overview of the biographies of ornaments among lowland South American indigenous societies was made in order to shed light into the patterns observed in the archaeological material. Analysis has shown that in the Valencia Lake Basin the production of ornaments had an important role, involving high skill and the use of a specialized toolkit for shell working. The ornaments display different degrees of use-wear and indicate different systems of attachment with strings, regardless of type and depositional contexts. In El Flaco, bead making was only limitedly present and restricted to specific raw materials. Most beads, made of calcite and igneous rocks, probably entered the site through exchange networks. In general, the beads are intact and present limited use-wear. This combined approach (microscopic, experimental and ethnographical) permitted a new insight into the role of ornaments in these contexts and on how their biographies were connected to social relations at local and regional levels.

Resumen

Ornamentos corporales pre-coloniales son abundantes en el circum-Caribe. Elaborados de una variedad de materias primas, notablemente conchas, rocas y minerales, han sido recuperados tanto del archipiélago antillano como del continente. La mayoría de los estudios se ha centrado en el análisis iconográfico de las decoraciones en colgantes y en el estudio de proveniencia de las materias primas exóticas de que fueron hechos. Las tecnologías de producción también han recibido atención, con énfasis en los talleres de la Época Cerámica Temprana (400 a.C. – 600/800 d.C.). Poco se sabe acerca de los ornamentos del período siguiente (hasta 1492 d.C.). La presente investigación propone un abordaje teórico centrado en las biografías culturales de los ornamentos. El objetivo principal es aproximarse a las formas como las comunidades indígenas pre-coloniales han tratado a los ornamentos, incluyendo la recolección de materias primas, la secuencia de producción, el uso, reutilización y deposición. También se utiliza el concepto de cadena operatoria para poder percibir elecciones tecnológicas, gestos, técnicas, herramientas y niveles de habilidad. Se discuten dos estudios de caso de la Época Cerámica Tardía: la cuenca del lago de Valencia en la región centro-norte de Venezuela (800 – 1200 d.C.) y el noroeste de la República Dominica, en especial el sitio El Flaco (siglos XIII – XV d.C.). Un estudio traceológico de 161 cuentas y colgantes fue llevado a cabo haciendo uso de microscopia óptica con magnificaciones de hasta 200x. Replicas experimentales de técnicas de manufactura con herramientas y materiales locales también han sido producidas para servir de analogía a las evidencias microscópicas. Un estudio acerca de las biografías de los ornamentos entre sociedades indígenas de las tierras bajas de América del Sur fue hecho para establecer las posibles explicaciones de las tendencias observadas en el material arqueológico. El análisis ha revelado que en la cuenca del lago de Valencia, la producción de ornamentos ha tenido un rol importante, incluyendo destacada habilidad técnica y el uso de un conjunto de herramientas especializadas en el trabajo de la concha. Los ornamentos presentan diferentes niveles de formación de las huellas de uso y diferentes sistemas de ensartamiento, no importando su tipo o contexto de deposición. En El Flaco, la producción de cuentas estaba presente de forma limitada, siendo restringida a pocas materias primas. La mayoría de las cuentas, hechas de calcita y rocas ígneas, probablemente entró al sitio a través de redes de intercambio. En general, las cuentas están intactas y presentan huellas de uso poco desarrolladas. El abordaje combinado (microscópico, experimental y etnográfico) ha generado una nueva visión acerca del rol de los ornamentos en los contextos estudiados y proporcionó ejemplos de cómo las biografías fueron conectadas a las relaciones sociales a nivel local y regional.

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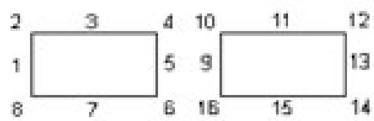
Appendix 1

Use Wear Form: Ornaments

Site:______________________ Indiv. Nr:__________

Analyst:____________________ Date:__________

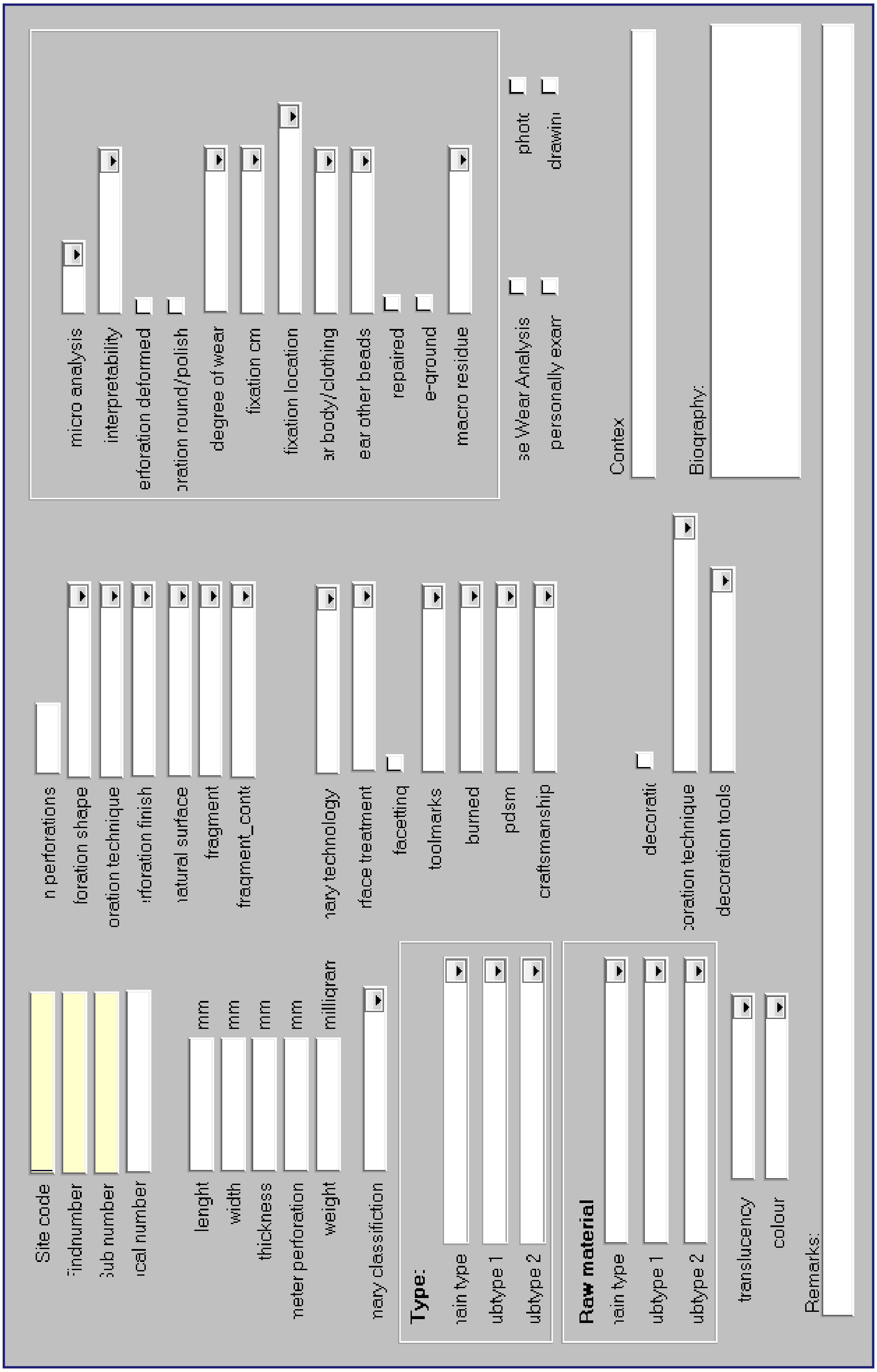


local number ____________
length ____________
width ____________
thickness ____________
diameter perforation____________
weight ____________
prim classification____________
type ____________
main type ____________
subtype 1 ____________
subtype 2 ____________
context ____________
raw material ____________
translucency ____________
colour ____________
crossection ____________
perf finish ____________
natural surface____________
fragment ____________
fragm_context____________
prim technology____________
surface treatment____________

facetted ☐
toolmarks ____________
burned ____________
pdsm ____________
craftsmanship____________
micro analysis____________
interpretability____________
degree of wear____________
fixation cm ____________
fixation location____________
wear body / clothing____________
wear other beads____________
repaired ☐
re_ground ☐
macro residue____________
use wear analysis ☐
personally examined ☐
photo ☐
drawing ☐

Appendix 2

Database template



Appendix 3

Experiments use-wear analysis

Piece no. ____________
User name: ____________
Date: ____________

Tool type: ____________
Raw material: ____________
Retouch: ____________
Used edge: ____________

Grain size: fine medium coarse
Hafting: ____________
Edge angle: ____________

Material: ____________

State: dry fresh soaked

Hardness: soft medium hard

Additives or pollution: ____________
Type of surface worked on: ____________

Motion: cutting sawing shaving scraping planing whittling graving
boring piercing chopping adzing wedging pounding grinding

Contact surface: ____________
Loading: static dynamic
Duration (in min.): ____________

Angle worked: ____________
Depth of insertion (mm): ____________

Detailed description of experimental procedure and activity carried out:

____

Tool effectiveness (describe also its deterioration through time):

____

Cleaning procedures: soap alcohol acetone HCL KOH ultrasonic tank

Photographic documentation: ____________

Appendix 4:

Experiments conducted in 2014 (2475 – 2498) and 2015 (3036 – 3068)
Slurries used: water (W), sand (S)

Nº	Blank mat.	Activity	Tools	Slurry	Time	Efficiency
2475	Green calcite	Grinding	A. palmata	No	45’	Very good
2477	Green calcite	Sawing	Flint blade	No	2’	Very good
2479-1	Green calcite	Grinding	A. palmata	W	4’	Very good
2479-2	Green calcite	Sawing	Flint, shell, wood	No	-	Good, good, ineffective
2488-1	Green calcite	Grinding	Stone slab	W	3’	Good
2488-2	Green calcite	Drilling	Bow drill flint	No	27’	Good
2488-3	Green calcite	Drilling	Hafted flint palms	No	30’	Good
2480	Lobatus lip	Percussion	Hammer-stone, wood anvil	No	-	Good
2484-1	Lobatus lip	Grinding	A. palmata	W	-	Good
2484-2	Lobatus lip	Drilling	Hafted flint palms	No	-	Good
2486	Lobatus lip	Drilling	Bow drill flint	No	-	Very good
2487-1	Lobatus lip	Drilling	Hafted wood Palms	S, W, coral		Ineffective
2487-2	Lobatus lip	Drilling	Mechanical drill wood	S, W	102’55”	Good
2490-1	Lobatus lip	Sawing	Flint blade	No	-	Good
2495	Amethyst	Grinding	Stone slab	W	20’	Ineffective
2500	Lobatus lip	Grinding	A. palmata	No	24’	Good
2498-1	Oliva sp.	Grinding	A. palmata	No	60’	Good
2498-2	Oliva sp.	Sawing	Flint blade	No	60’	Good
3036	Diorite	Grinding	Sandstone	S, W	60’	Good
3037	Diorite	Grinding	A. palmata	S, W	60’	Good
3039	A. cervicornis	Grinding	Sandstone	W	35’	Very good
3041	Mica-schist	Sawing	Flint	No	60’	Good
3043	Spondylus sp.	Sawing	Flint	No	63’	Good
3045	Spondylus sp.	Grinding	A. palmata	S, W	35’	Very good
3046	Mica-schist	Grinding	Quartzite	W	3’	Very good
3048-1	Limestone	Grinding	Sandstone	S, W	70’	Good
3048-2	Limestone	Sawing	Flint	No	71’	Good

3049-1	Jet	Grinding	Sandstone	S, W	30’	Very good
3049-2	Jet	Sawing	Flint	No	23’	Good
3054	A. cervicornis	Sawing	Flint	No	11’	Very good
3055-1	Lobatus lip	Sawing	Flint	S, W	135’	Good
3055-2	Lobatus lip	Sawing	Cotton string	S, W	100’	Good
3058	Serpentinite	Sawing	Flint	No	126’	Ineffective
3061-1	Spondylus sp.	Percussion	Hammer-stone, wood anvil	No	-	Very good
3061-2	Spondylus sp.	Drilling	Mechanical drill bone	S, W	110’	Good
3062-1	Spondylus sp.	Grinding	Sandstone	W	80’	Very good
3062-2	Spondylus sp.	Notching	Flint	No	25’	Good
3062-3	Spondylus sp.	Notching	Wood	S, W	91’	Good
3063-1	Diorite	Sawing	Flint	No	26’	Ineffective
3063-2	Diorite	Sawing	Cotton string	S, W	60’	Ineffective
3068	A. cervicornis	Drilling	Mechanical drill bone	S, W	90’	Good