Author: Breukel, T.W.
Title: Tracing interactions in the indigenous Caribbean through a biographical approach: Microwear and material culture across the historical divide (AD 1200-1600)
Issue Date: 2019-04-18

2

Natural and cultural background

The first purpose of this chapter is to introduce the biogreography and geology of the Caribbean insofar as is necessary to situate the use, non-use, and total absence of various types of materials in the islands. Second, it provides a brief overview of the cultural history of the archipelago up until the Early Colonial Period, in order to contextualise the material histories of the artefact groups studied in this work. This includes a review and evaluated of various observed and hypothesised stages in the biographical trajectories of celts and paraphernalia alike (Sections 2.3 and 2.4).

2.1 The natural setting

The geography of the Caribbean Islands is the result of a complex geological history beginning with westward movements of the Caribbean plate in the early Cretaceous. The Greater Antilles arose early on through processes of active volcanism and tectonic deformation, modified by later seabed uplift, whereas the Lesser Antilles are composed of uplifted coral reefs and younger volcanic events dating from the late Tertiary to the present day. Overviews of these processes can be found in Burke (1988), Draper *et al.* (1994), and Jackson and Donovan (1994). The result is an archipelago rich in lithic resources, but with a highly variable spatial distribution of specific desired materials (Knippenberg 2006, 151-156).

Topographic variation is large and ranges from steep mountainous terrain, coastal ranges, rolling foothills, flat river plains, and limestone cliffs to shallow banks, extensive neritic zones, and oceanic trenches. This provides a wide range of habitats, micro-climates, and ecosystems with proportionally high rates of species diversity and endemism in light of the total surface area of the region (Myers *et al.* 2000; Woods and Sergile 2001). The last large-bodied terrestrial mammals inhabiting the oceanic islands went extinct in the mid-Holocene (Steadman *et al.* 2005). As a result, raw materials such as antler and leather are not naturally present in useable quantities. However, there is an abundance of smaller terrestrial mammals and reptiles, bat species, invertebrates, avian fauna, and so on. The West Indies as a whole count circa 10.500 native seed plant species (Acevedo Rodríguez and Strong 2012), with at least 300 native trees in islands such as Puerto Rico (Little and Wadsworth 1964, 11). Over a hundred plants are archaeobotanically attested in past craft, subsistence, and ritual economies (Newsom 2008; Newsom and Wing 2004). As studies in indigenous historical ecologies show, however (Balée 1994), that can only pertain to a very partial selection of its original richness. Maritime biodiversity is also incredibly rich, counting ecosystems such as mangroves, coral reefs, and a densely inhabited pelagic zone. It includes economically significant molluscs such as *Lobatus gigas* (for meat and their shell), large aquatic mammals such as Trichechus manatus, and stony corals whose skeletal structures provide unique tool materials (Kelly and Van Gijn 2008).

Hispaniola, the main island of study, has a complex tectonic history. It is composed of twelve geological provinces roughly oriented as long west-northwest terranes that include fragments of oceanic plateaus, remnants of volcanic arcs, and metamorphic terranes, some overlain by sedimentary basins (Mann *et al.* 1991). The northern Dominican Republic is therefore topographically characterised by the northwest-southeast oriented Cibao valley, bounded on the south by the high peaks of the Cordillera Central and on the north by the coastal belt of the Cordillera Septentrional. The valley itself is mostly flat and forms the drainage basin of the El Yaque del Norte river, which is fed by tributaries from the mountain ranges. These contain a variety of igneous and low-grade metamorphic formations (up to greenschist facies, with some local amphibolite facies). Three separate inliers from a forearc terrane are exposed on the northern flank of the Cordillera Septentrional, which contain various rock types resulting from high-pressure subduction metamorphism at low to high temperatures (e.g. Draper *et al.* 1991; Escuder-Viruete *et al.* 2011; 2013). The Puerto Plata Complex to the west contains a serpentinite-gabbro complex with dioritic intrusions and volcanic rocks, with low-grade metamorphic rocks occurring and high-pressure rocks from the eclogite facies and the blueschist facies present. The La Samaná Complex to the east contains retrograded eclogite and blueschist rocks, besides a variety of other metamorphic schists (Escuder-Viruete and Pérez-Estaún 2006). The Río San Juan Complex (RSJC) lies on the northeastern flanks in between, forming the watershed of the eponymous river. This complex contains a host of various rock types, including two distinct serpentinite mélanges embedding tectonic blocks of the aforementioned low to high-pressure metamorphic materials. Significantly, jadeite-bearing rocks of varying purity were recently found in these mélanges, occurring as blocks up to several meters in size (Draper *et al.* 1991; Hertwig 2014; Krebs 2008; Schertl *et al.* 2012). These raw materials were exploited and probably exchanged by the community of Playa Grande (López Belando 2013; Knippenberg 2012; Schertl *et al.* 2018).

The second Caribbean occurrence of jadeitite consists of deposits associated with the serpentinite mélange of the Sierra del Convento in southeastern Cuba (Cárdenas-Párraga *et al.* 2010; 2012; García-Casco *et al.* 2009b; 2013). This complex contains a suite of high-pressure subduction rocks similar to the Río San Juan Complex, and forms part of the same general rift zone that extends all the way towards the Motagua Fault Zone (MFZ) in Guatemala (Figure 3). The Blue Mountains in Jamaica form part of this tectonic feature as well, containing rocks from the greenschist, amphibolite, and blueschist facies (Draper 1986; Roobol and Lee 1975). The MFZ extends over 200km with two main source mélanges of jadeitites (North MFZ and South MFZ) and a host of other high-pressure rock types. The high chemical and mineralogical diversity of these sources has been extensively studied in connection to its exploitation by various Mesoamerican cultures (e.g. Harlow 1994; Harlow *et al.* 2011). These rare occurrences form the background of the current discussion on the exploitation, circulation, and acquirement of celt raw materials by indigenous Caribbean communities.

The southern Windward Islands, as the other core area, form part of the Lesser Antilles. This island chain is geologically divided into two arcs: an outer arc composed of uplifted coral reefs, and an inner arc formed by recent volcanic activity (Wadge 1994). The older limestone formations are overlain by igneous materials deposited from the formation of volcanic peaks in the Windward Islands (Draper *et al.* 1994), and the island arcs separate in the Guadeloupian archipelago. The majority of igneous rocks are intermediate to mafic in composition (andesitic to basaltic), and certain basalts found in Grenada and Carriacou are chemically distinctive (Section 4.4.2). Trinidad and Tobago are not oceanic islands but are instead located on the continental shelf of South America, leading to significant geological differences. The latter island contains accessible formations of low- to medium-grade metamorphic rocks, diorite, and sandstone (Jackson and Donovan 1994). Their biogeography also reflects that of the adjacent continental areas, with which these islands were connected until the Holocene sea level rise. Altogether, the Caribbean Islands offer a strikingly diverse landscape which has been exploited since the very beginning of human migration into the island chain.

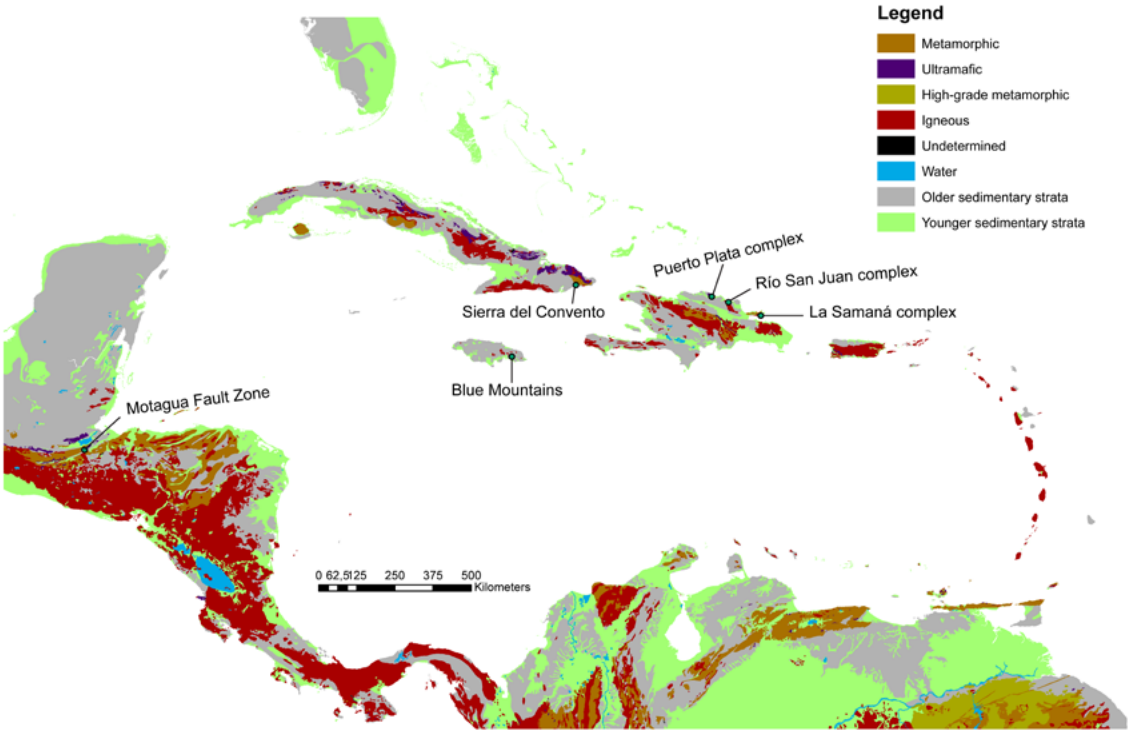

Figure 3: Simplified overview of circum-Caribbean geology based upon French and Schenk (2004) with relevant high-pressure rock source locations indicated.

2.2 Indigenous Caribbean cultures: a short overview

The oldest archaeological complex within the Caribbean Islands is found at sites such as Banwari Trace and St. John in Trinidad, dated to around 5000 BC. It is typified by an a-ceramic material cultural complex containing various types of macro-lithic materials such as mortars, anvils, and grinding stones for processing cultivars, and sizeable edge-ground celts with substantial grooves for attaching hafts. Relatively simple siliceous lithic flakes and pointed tools made of modified bones and teeth are common (Boomert 2000, 54-68; O'B. Harris 1971; Pagán-Jiménez *et al.* 2015). Though the islands north of Trinidad lack such early sites, paleoenvironmental research does indicate anthropogenic landscape modification after 3000 BC (Siegel *et al.* 2015). The eared/winged axe types (see below) typical of the Windward Islands are often considered as associated with the Archaic Age (O'B. Harris 1981). The earliest Lithic Age and Archaic Age assemblages in Cuba and Hispaniola both date to around 4000 BC (Rouse 1992; Wilson 2007). The former are typified by a set of material culture that is classified by Keegan and Hofman (2017, 22-23) as flaked stone complexes, since they are principally known from lithic workshop sites and not from domestic contexts with broader economic focuses. Macro-lithic and shell tools are clearly present in essentially contemporaneous 'Archaic Age' complexes, however, including various types of celts (Kozlowski 1974, in Keegan and Hofman 2017, 33, 38-43; Veloz Maggiolo 1976). The archaeological nature and social organisation these early societies are still poorly understood, in spite of the gradual recognition of significant variability in their material cultural expressions and subsistence economies. However, a sustained, inter-generational interaction network based around the exchange of lithic materials (and associated knowledge) has been demonstrated to exist in the northeastern Caribbean leading to the Archaic-Saladoid interface (Hofman *et al.* 2014b).

These interactions tie into culture historical developments that begin to take place starting between 800-200 BC (*sensu* Keegan and Hofman 2017, 67), outlining what is classified as the Early Ceramic Age (ECA) period. The traditional position is that Arawak-speaking populations from the Orinoco Basin migrated into the Antilles around 500 BC, introducing egalitarian sedentism, a horticultural economy based on manioc, White-on-Red painted pottery, and an animist ontology from the tropical lowlands (Boomert 1999; 2000; Rouse 1986; 1992; Siegel 1989; 2010; Wilson 2007). The earliest sites are located in the northeastern Caribbean and are characterised by a new material cultural complex. This includes abundant pottery of the Saladoid and/or Huecoid series, a rich variety of bodily adornments, and polished petaloid celts. The timing, origin, and character of these 'migration(s)', the monolithic 'veneer' of Saladoid material culture, and the degree to which those aspects of the 'Ceramic Age kit' originated with Archaic populations all remain under debate. The most up-to-date overview is provided by Keegan and Hofman (2017). Early Ceramic Age sites were initially sparse but connected over long distances. This gradually gives way to more archaeologically expressed heterogeneity, with the emergence of additional sites leading to a more densely inhabited landscape and contractions in the geographic distance of their social networks (e.g. Boomert 2000; Crock 2000; Crock and Petersen 2004; Hofman 2013; Hofman and Hoogland 2004; 2011; Hofman *et al.* 2007; 2011; Keegan 2000; 2004; Keegan and Hofman 2017). Between 200 BC and AD 400 sites such as Pearls (Grenada), Trants (Montserrat), Elliott's and Royall's (Antigua), Hope Estate (St. Martin), Prosperity (St. Croix), La Hueca and Sorcé (Vieques), and Punta Candelero (Puerto Rico) were tied through the large-scale production and exchange of lapidary materials. These include a number of green-coloured rocks (nephrite, serpentinite, aventurine, malachite, peridotite, turquoise, purported jadeitite), translucent crystals (rock crystal, amethyst, carnelian, chalcedony), as well as diorite, *Lobatus gigas*, *Spondylus americanus*, and a few other materials (e.g. Boomert 2007; Cody 1991; Falci *et al.* in prep.; Murphy *et al.* 2000; Narganes Storde 1993; 1995; Rodríguez Lopez 1991; Rodríguez Ramos 2010a; 2011b; 2013; Watters 1997; Watters and Scaglion 1994; see also Knippenberg 2006, 169 and references above). Contemporary communities further west remain characterised as Archaic Age, despite indigenous pottery production occurring in the Greater Antilles long before Saladoid ceramics entered the archipelago (e.g. Keegan and Hofman 2017, 43-47; Rodríguez Ramos *et al.* 2008; Ulloa Hung 2005).

This picture changes with the appearance of new material cultural expressions that are typified as belonging to the Late Ceramic Age (LCA). These first occur in the Greater Antilles at around AD 600 to 700, and are based in demographic, economic, and socio-political developments. The outcomes of these processes included centralised political structures (*cacicazgos*) ruling over dense populations (collectively homogenised as the so-called Taíno) with elaborate and well-developed ceremonial complexes (e.g. Curet 2005; Curet and Oliver 1998; Curet *et al.* 2004; Deagan and Cruxent 2002; Oliver 2009; Rodríguez Ramos 2010a; Rouse 1992; Siegel 2004; 2010; Wilson 1990; 2007). This view is acknowledged to entail significant documentary bias and historical simplification, since the archaeological record indicates a much more heterogeneous past. This is a past comprised of long, local, and interactive historical contingencies culminating in a mosaic of island societies with different settlement strategies, economic orientations, material cultural repertoires, and social identities (Curet 2003; 2014; Keegan 2007; 2013; Keegan and Hofman 2017; Ulloa Hung 2013a; Veloz Maggiolo *et al.* 1981; Whitehead 2011, 29-32; Wilson 1993). Nevertheless, it remains apparent that political developments centred in Hispaniola were outpacing those on other islands and exerting influence as far as the Lesser Antilles (e.g. Crock 2000; Crock and Petersen 2004; Hofman *et al.* 2008a; Hoogland and Hofman 1999). Factors such as human mobility and stylistic influences (the Ostionoid, Meillacoid, and Chicoid ceramic series) connected local communities across (pan-)regional scales, which includes the exchange of socio-political valuables such as cotton, wooden artefacts, precious metals, ritual belts, lithic, shell, and bone paraphernalia, complex bodily adornments, and polished celts (Alegría 1993; Helms 1987; Hofman *et al.* 2008a; 2011; Keegan 2015; Keehnen 2011; 2012; Mol 2011; 2014; Oliver 2009). Such local and regional socio-political structures persisted during the early years of the European encounter, but were rapidly pressured by European greed for gold and riches. The large-scale imposition of feudalist *encomienda* structures collapsed most indigenous socio-political structures in the early 1500s, and the indigenous people of the Caribbean were subsequently written out of the history books. This notion of cultural extinction is now under severe criticism from numerous directions, including archaeology, history, genetic studies, and popular discourse (e.g. Anderson Córdova 2017; Benn Torres 2014; Castanha 2011; Forte 2006; Hofman *et al.* 2018b; Valcárcel Rojas 2016).

Late Ceramic Age changes in the Lesser Antilles are perhaps equally diverse. They are similarly composed of a series of local contingencies and independent transitions that are interconnected in relation to developments on larger scales. The ceramic evidence indicates the co-existence of various series in the archipelago, particularly at AD 600-850 (Saladoid – Troumassoid – Ostionoid) and 1000-1450 (Troumassoid – Suazoid – Ostionoid – Meillacoid – Chicoid – Cayo complex). Locally, micro-style areas reflect the culmination of the (material) cultural diversification observed to begin in the later Early Ceramic Age (Hofman 2013; Keegan and Hofman 2017, 215-216). Socio-political organisation oscillates with certain sites or islands attaining regional importance at certain times, by manipulating social capital through lithic resource and ceremonial material-based interaction networks. The centralised polity developing in Anguilla between AD 850 and 1200 is interpreted as based around regional control over the distribution of St. Martin mudstone celts and calci-rudite threepointers (Crock 2000; Crock and Petersen 2004; Haviser 1991; Knippenberg 2004; 2006). Greater Antillean influences are increasingly felt in those islands, while the Windward Islands show connections with mainland South America, in particular Orinocia and the Guyanas (e.g. Boomert 2000; 2009; 2013; Crock and Petersen 2004; Hofman and Hoogland 2004; 2011; Hofman *et al.* 2008a; 2014a; Hoogland and Hofman 1999; Keegan and Hofman 2017; Mol *et al.* 2015). The northern islands depopulate in the late pre-colonial phase (Keegan and Hofman 2017, 229, 238) while the Cayo ceramic complex appears in the Windward Islands. Its origin is the subject of debate but now appears to represent a social constellation of people from various island and mainland societies coming to inhabit these islands. The Cayo complex correlates to the historical phenomenon of 'Island Carib' and eventually the ethnic Kalinago people. It represents an amalgam of coastal South American motifs (the Koriabo complex of the Guyanas), connections with other mainland areas, local continuities and adaptations, influences from the Greater Antilles, and incorporation of European material culture (e.g. Allaire 1980; 1997; 2013; Boomert 1986; 1995; 2004; 2011; Cody Holdren

1998; Davis and Goodwin 1990; Hofman and Carlin 2010; Hofman and Hoogland 2012; 2015; Hofman *et al.* 2008a; Honychurch 1997; Hulme and Whitehead 1992; Keegan and Hofman 2017, 15, 231-236; Lenink 2012). It became portrayed as a single coherent social unit the early colonial period for a variety of reasons, though it probably entailed more of a diffracted collective. 'Island Carib' communities maintained their presence in the Windward Islands throughout the following centuries, offering cultural and military resistance against European geopolitical aspirations, or supporting them for mercantilist and political gain (Beckles 2008; Fraser 2014).

2.3 Edge-ground tool complexes

Though the emergence of ground stone celts is generally associated with Neolithisation processes, their antiquity often exceeds that. The oldest examples of such tools date back to over 65kya in Australia (Clarkson *et al.* 2017; Geneste *et al.* 2012; Hiscock *et al.* 2016), and axes from Mesolithic Ireland are characterised differently than Neolithic specimens (Cooney 2008; 2015; Little *et al.* 2016). Similarly, Caribbean edge-ground macro-lithic tool complexes precede any kind of 'Ceramic Age package', with both stone and shell celts being common occurrences in Archaic Age sites (Boomert 2000; Keegan 1994; Hofman *et al.* 2018a; Rodríguez Ramos 2010a; Rouse 1992; Veloz Maggiolo 1991). These tools formed an integral component of early Caribbean lifeways. Though biographical contrasts emerge over time, these are for the most part poorly chartered. The frequencies of typological designs change, including an increase in petaloid forms and the disuse of double-bitted 'butterfly' shapes (*hachas mariposoides)* (Veloz Maggiolo 1972). The use of 'bright' polishing techniques for celts (see below) essentially commences with Cedrosan Saladoid contexts, in partial association with the 'plano-convex adze' type (Rodríguez Ramos 2001; 2010a). It is absent in contemporaneous (and nearby) Huecoid deposits. Much publicity has also been given to inter-island exchange ties from the distribution of (newly) identified exotic green-coloured celt materials, primarily jadeitite and St. Martin mudstone (Crock 2000; Mendoza Cuevas *et al.* 2009; García-Casco *et al.* 2011; 2013; Harlow *et al.* 2006; Hardy 2008; Hofman and Hoogland 2011; Hofman *et al.* 2007; 2011; Haviser 1991; Knippenberg 2004; 2006; Rodríguez Ramos 2010a; 2010b; 2011a; 2011b; Roobol and Lee 1975; Schertl *et al.* 2012; 2018). These patterns transform during the LCA, and include the continued utilisation of a mixture of locally available rocks and imports from elsewhere as well as the further materialisation of 'ceremonial' types (Herrera Fritot 1964; Lovén 1935). However, there is not much evidence for the biographical trajectories of individual Caribbean celts. Manufacturing technology, hafting, use, and values remain largely theoretical, and uninformed beyond spatial distribution patterns, chance finds, and ethnohistoric information post-dating the introduction of metal to the islands. This section recounts what we do know, and what expectations have been formulated.

I will first define the main anatomical terms and functional forms of celts, as edge-ground macro-lithic haft heads, since these are continuously referenced throughout this thesis. For the general orientation, imagine a petaloid celt resting on its flatter side with the bladed end facing down. This end holds the cutting edge, which is the sharpened angle that bears the impacts during use. In other contexts it is common for the area directly behind the edge to be slanted, demarcated from the rest of the surface with an abrupt angle; this is called the bevel. In Caribbean celts the transition is always gradual, and I therefore refer with this term to the maximal extent of the use wear in the area behind the edge (generally 10 to 15 mm). The gross exposed surface aspect is referred to as the face, divisible into proximal, medial, and distal zones in relation to the edge. Both face aspects meet side aspects at the lateral margins, but the transitions between them are nearly always smooth curvatures in Caribbean celts. Finally, the distal 'tip' is called the butt or poll and can be variably shaped; the bilateral sides taper towards a point in petaloids, but butts may be sculpted or flare outwards in eared axes and related types. I also refer to the transverse plane, which divides the proximal edge and distal butt (a straight cross-section from side to side), and oblique planes which incline at least 30° thereto.

Axes and adzes comprise two major types in the indigenous edge-ground tool complex(es). These further contain a variety of other functional forms, as well as purported ritual tool forms and capable non-lithic materials. Defined on the basis of their attachment to the haft, axes occupy a lateral position with the edge parallel to the long axis of the handle. Adzes instead occupy a latero-distal position and with the edge perpendicular to the long axis of the handle, which is often also bent to allow for a downwards striking motion (Figure 4). These functional realities need to be extricated from typological classifications, which tend to designate asymmetric planviews as adzes or assume attachment bindings from morphological features such as notches. Such associations are not in reliable agreement with traces of wear or limitations of design, however (Sections 8.3 and 10.2.5), and thus require demonstration. It is mainly for these reasons that I use the term celt as the undefined analogue for physical artefacts, to forego the implication that the relation to haft and function is known.

There are additional reasons why typology is problematic for the interpretation of celt biographies. Any morphometric variation is ill-defined and currently of no interpretative value (Rodríguez Ramos 2010a), while given shapes are continuously altered through the use life (Section 3.1.3.3). Nevertheless, it remains important to describe several common forms as these recur frequently. The majority of materials are petaloids in the broadest sense. In planview these celts have convex or round blades and variable tapering of the bilateral sides towards the butt, ranging from tear-drop shapes ('true' petaloids) to more almond shaped (almonoids) outlines. Median cross-sections are elliptical

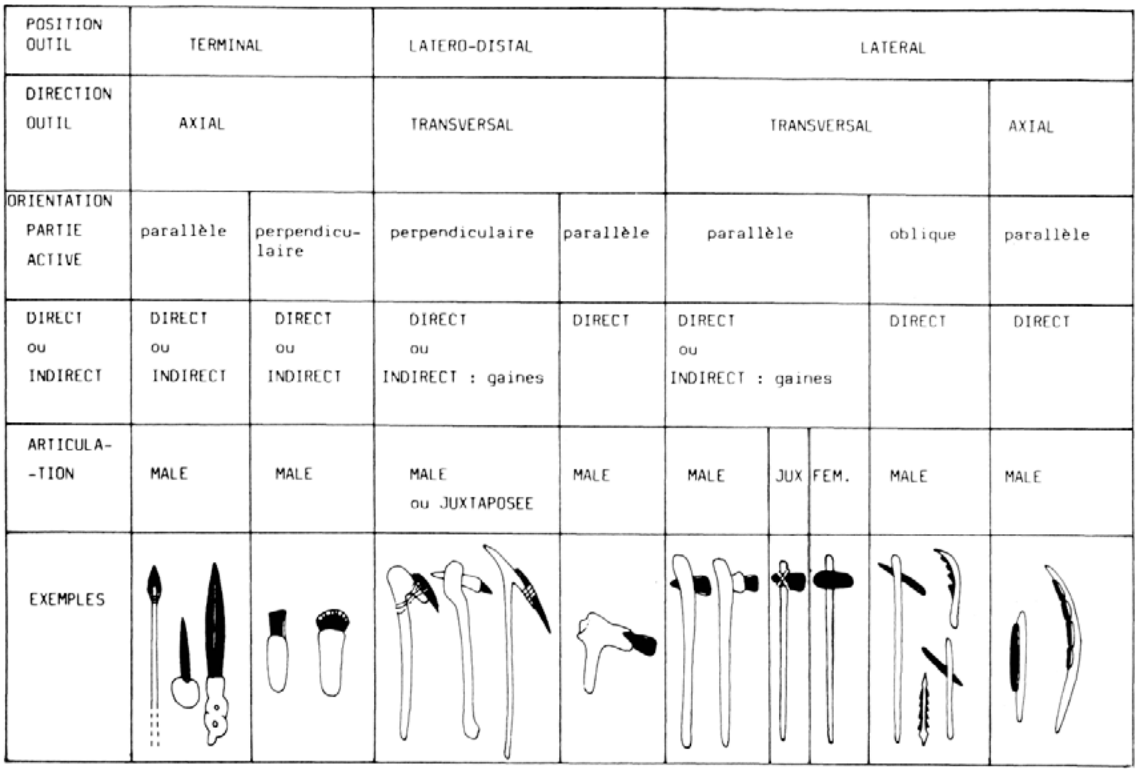

Figure 4: Schematic combinations for different attributes of a haft (Stordeur 1987).

or biconvex (which can be asymmetrical, but opposes more defined plano-convex morphologies), and the transition between edge and side can be gradual or demarcated. Celts with straighter edges, wide butts, or lacking tapering are more generally termed biconvex celts, and will for instance include wedges. Both occur in all sizes, which for the present purposes I define as very small (below 5 cm), small, (5-7 cm), medium (7-10 cm, to 10-12 cm), large (10-12 cm), and very large (above 15 cm). Morphological chisels are usually smaller, elongated tools with straight edges and sides, and rectangular to circular transverse cross-sections. Most typological 'micro-axes' from the literature are either chisels or very small petaloids, some of which were analysed during the present study.

By far the best explored biographical characteristic of Caribbean celts is the variety of raw materials employed to manufacture them. The typifying presence of certain materials in regional contexts has long been recognised and includes early descriptions of the presence of such rocks as 'jadeitite' (Mason 1876, 373) as well as cultural contrasts drawn between Greater Antillean 'greenstones' and Lesser Antillean 'volcanic materials' (e.g. Lovén 1935; Mason 1884, 734-737). More recently, much attention has been given to the ties between source regions and the exotic contexts in which some materials are found. The current focus is on jadeitite, as several recent studies have convincingly reaffirmed both the archaeological exploitation and long-distance exchange of celts from this rare rock material (Cárdenas-Párraga *et al.* 2010; García-Casco *et al.* 2011; 2013; Hardy 2008; Harlow 2007, in Rodríguez Ramos 2010a, 140-141; Harlow *et al.* 2006; Hertwig 2014; Knippenberg 2012; Schertl *et al.* 2012; 2018). However, it is far from the only rock that was transported across the archipelago and thus cannot provide a good picture of the actual complexity of celt exchange. Many of those are commonly described as 'greenstone', the application of which - like that of 'jade' – is inconsistent and problematic. In essence, these groups are ideational units (*sensu* O'Brien and Lyman 2002), constructed upon extensionally derived descriptions (the state of being or having been green for greenstones and added social value for jades). They do not actually correspond to petrological definitions or to empirical units which constrict internally characteristic source locations or geochemical fingerprints. Properly speaking, most Caribbean celt materials described as 'greenstone' are jadeite-bearing rocks or materials associated with greenschist facies metamorphism, which contain the pyroxene mineral jadeite, and green chlorite-group, epidote, and/or actinolite minerals respectively (Section 4.4.3).[4] The ideational unit further includes the grey-green mudstone from St. Martin, the previously mentioned green-coloured lapidary rocks of which serpentinite was used for ECA celt-making in Puerto Rico (Hofman *et al.* 2010), and probably still other green rocks (e.g. green peridotite in Herrera Fritot 1964). Certain green minerals are linked to desirable working properties for celts (Risch and Martínez Fernández 2008; Rostain and Wack 1987), but the colour has long been recognised as having significant cosmological depth: its use is shared with important iconographic-symbolic artefacts (Boomert 1987; Roe 1982).

'Greenstone' is in this sense basically synonymous with the term of 'social jade'. This term is used in Mesoamerican research to describe rocks with greenish hues considered as potentially symbolically interchangeable with the true material (Lange 1993). It has recently been imported into the Caribbean with the equivalent intent of associating 'other greenstones' with the circulation of pure jadeitite (e.g.

4 The rock petrologically defined as greenstone is dominated by chlorite, actinolite, epidote, and albite (the greenschist assemblage, but absent the eponymic schistosity). These rocks are in the present work referred to as (non-schistose) greenschists to avoid confusion with ideational groupings. My use of terms such as 'greenstones' henceforth refers to literature descriptions that lack identifications of the actual rocks.

Rodríguez Ramos 2010a; 2010b; 2011b). Mesoamerican 'social jades' actually comprise, amongst others, "jadeite, omphacite, serpentinite, metagabbro, albitite, basalt, gabbro, and porphyry" (Powis *et al.* 2016, 61; see also e.g. Jaime-Riverón 2010; Tremain 2014), a heterogeneous suite in formation and mechanical properties. These authors caution against the liberal application of such ideational categories, as well as against perpetuating the analytical bias towards singling out jadeitites, especially the presumption that this rock type is a homogeneous 'emerald-green'. This has proven detrimental to an understanding of other valued rock materials in Mesoamerica, both in their own respect and with respect to their valuation against each other, as those materials are currently only assumed to be interchangeable as a form of 'non-pure jade'. Distinguishing the actual rocks involved has clear bearings upon arguments involving source and origin, access to materials, technological procedures, and aspects of materiality, all of which differ immensely between the various lithic resources captured under otherwise generic terms. The pertinence of this discussion to the archaeology of the Caribbean is evident.

Thus far these various greenstones comprise the main metamorphic categories, as blueschists and other metamorphic rocks have only rarely been identified in celts previously (Casagrande in Romon *et al.* 2017, 52-56; Hull 2014; Roobol and Lee 1975). Igneous and sedimentary rocks are both common, however, though as with any material the use and frequency varies between contexts. Basalts and andesites are common volcanic rocks in the region and form the most basic material for celt-making. Nearly all buttressed types are said to be of such materials (Keegan and Hofman 2017, 41; cf. Section 6.1.1). Properly speaking, these are mafic and respectively intermediate volcanic lavas, since the mineralogical and/or geochemical compositions are usually not detailed. Other commonly identified igneous rocks include (siliceous) tuff, black peridotite, plutonic rocks of relatively small grain (often with a salt-pepper texture), and so on. Siliceous shale is also encountered in numerous assemblages. Some of these are region-specific (e.g. black peridotite in Puerto Rico, R. Rodríguez Ramos, pers. comm. 2018) and others associated with particular time-periods (Section 10.2.2), but this variation has only been mapped for the Leeward Islands (Knippenberg 2006). Shell formed an important raw material, since both the lip and the columella of an adult *Lobatus gigas* provide sufficient body and sturdiness for the production of medium to large-sized celts. Such celts are very common in the Lesser Antilles, the Bahamas, and are also frequently seen in the Greater Antilles from the Archaic Age onwards. Other large *Lobatus* molluscs and a few taxa in other genera also grow shells thick enough to be made into hafted edge-ground percussion tools. Additional exceptional materials include tortoise shell and a knapped chert celt in LCA St. Lucia (Negrete Martínez 2015). Chert is otherwise not used at all for such tools in the region.

The technological sequences for Caribbean hard stone celt-making are not well known, as these have been studied in only a few cases. St. Martin mudstone is the proverbial exception, since extensive attention has been paid to the inter-island reduction trajectories of this material (Crock 1995; 2000; Haviser 1999; Knippenberg 2004; 2006). Grey-green material from specific mudstone beds with the best flaking and corrosion properties was acquired on St. Martin in blocks from the primary outcrops by communities from the surrounding islands. Brought to the settlements, the blanks were shaped by a few bifacial thinning blows and subsequently ground, before being used and rejuvenated or exchanged with communities farther away (Knippenberg 2006, 243-253). Similarly, the experimental sequence for shell celt separation involves the separation of the lip through percussion and successive grinding to attain the shape, which is the main feasible route given the architectural particularities of the material (Section 4.4.4). In Aruba, diabase pebbles were reduced at the Coashiati quarry where they occur using either direct conchoidal or bipolar percussion, depending on the size, to be subsequently taken to the settlement for further pecking and grinding (Rostain *et al.* 2005). Other than that, the generically observed trajectory for hard rock materials is procurement of a suitable sized pebble from primary or secondary context, followed by the potential use of percussion (pecking more often than lateral flaking) and then grinding of the edge area. Further abrasion is again optional at all levels, but high levels of lustres ultimately be attained (e.g. Casagrande 2011; Knippenberg 2012; Rodríguez Ramos 2010a).

The manufacture of an edge-ground macro-lithic is therefore a complex and multi-step process, even if choices are often made to avoid certain operations. The aforementioned techniques can be applied in dynamic order, but in sequence they follow progressively finer scales of material removal. The shaping of the blank into a bifacial roughout involves direct percussion divided into fashioning the bifacial (elliptical) contour and finishing the bilateral plane (sides and edges) (Inizan *et al.* 1999, 43-55). In freehand mode this produces flakes and scars approximating conchoidal morphologies on isotropic materials (force radiating evenly, includes feather terminations), but when the blank rests on an anvil counterblow occurs and step fractures and hinge terminations become more common. Hard hammerstones are known in many materials and sizes, which would translate to different attrition rates (Dickson 1982, in Olausson 1982/1983; Pétrequin *et al.* 2012a), whereas there are no reliable indicators for softer hammers in the Caribbean (cf. Rostain *et al.* 2005). Indirect flaking and pressure techniques are also not known from stigma, whereas grades of pecking are exceedingly common.[5] It is through these techniques that basically unmodified blanks are roughed out and thereafter preformed, terms which equate to initial and advanced shaping stages and which are presently employed to distinguish flaked from (subsequently) pecked half-fabricates. It must be observed that there are plentiful ethnographic and argued archaeological settings in which celts were exchanged in this stage of their biography, rather than as finished products (e.g. Boomert and Kroonenberg 1977; Burton 1984; 1989; Frieman *et al.* 2017; Rostain *et al.* 2005; Rosenberg *et al.* 2008; Pétrequin and Jeunesse 1995; Pétrequin and Pétrequin 1993).

Abrasion, which is defined as a mode of wear (Section 4.2.1.1), forms the primary process of the grinding and polishing techniques commonly used to complete the manufacturing process. There is substantial variation in smoothened and lustred surfaces of circum-Caribbean artefacts indicating diverse abrasive technologies. Distinguishing between these sets of techniques remains rather qualitative, however, as there are no established methodologies for separating or ranking the results. For present purposes I define *grinding* as a technique with the primary intent to reduce surface asperity and remove material in the process, and *polishing* (verb) as a technique with the primary intent to form a macroscopically visible lustre. Both are laborious, repetitive processes requiring prolonged contact between media. *Polish* (noun) refers to reflective microwear structures further defined in section 4.2.1.3, and the macroscopic outcome of reflectance from a smooth glossy surface is referred to as *lustre*. Analogous to its use in mineralogy, dull (or earthy) lustres actually denote the absence of any particular reflection, most brighter reflectances being greasy or metallic. Lustres in between are diffuse, scattering light rather than reflecting a smooth adjoined sheen. Practically, grinding and polishing can operate independently, or a single combination of abrasive platform (grinding station),

5 Alternative extraction and blank shaping techniques, such as (string-)sawing and thermal shock treatment, have not been identified from amongst insular Caribbean celt production chains as of yet.

lubrication and additives, and kinematics may yield both primary intents as outcome. The actual variables and successive sequences form the major topic of analysis.

In spite of a large geological variety in rocks and sands of probable suitability, and for several a recurrent archaeological presence as querns/metates or unspecified grinders, what indigenous grinding and polishing technology consisted of remains uncertain. Elkhorn coral (*Acropora palmata*) had been employed for polishing shell (Lammers-Keijsers 2007; Van Gijn *et al.* 2008; cf. also Kelly 2003; 2004; Kelly and Van Gijn 2008; and Breukel and Falci 2015), but it is not suitable for hard rock materials and not distinctive when serving as the surface for a quartz sand abrasive (Chapter 5). The main contending hypothesis is the *polissoir* model, which entails the use of large boulders in riverine or coastal settings as stationary grinding surfaces. Such activities are well documented in the ethnohistory and archaeology of nearby South America (e.g. Amaral 1995; Boomert and Kroonenberg 1977; Bueno 2010; Loncan 1985; Rostain 1994; Rostain and Wack 1987; Tenório 2003; Versteeg 2003, 27; Vieira de Oliveira 2013), and a few promising 'basaltic' boulders are known from the Windward Islands (Barbotin 1974; Hanna 2017; Kirby 1969; cf. Casagrande 2011; Van den Bel 2018). However, in spite of frequent contemplation no convincing identifications of stationary cupuled boulders have yet been provided north of these islands. Lacking any corroboration of materials, then, the primary experimental option will be sandstone as this is the all-purpose class of abrading materials, which is both common in Amerindian ethnohistory (Section 5.1) and as an identified material in various Caribbean archaeological sites (e.g. Boomert and Kameneff 2003; Bullen and Bullen 1973; O'B. Harris 1971; 1979; Knippenberg 2006; López Belando 2013; Rodríguez Ramos 2001).

Celts from the region are typically assumed to be hafted as axes, unless morphological aspects suggest tying or resting in which case they are designated as adzes. This approach is directly correlated to the major dichotomy in use types, between the felling of trees (for land clearing or timber purposes) and the hollowing out of dugout canoes. Caribbean axes are generally assumed to consist of the celt head transfixed in the perforated and embossed distal end of a wooden handle. Direct evidence for this rests in a few surviving wooden hafts known since the 19th century (Herrera Fritot 1964, 135; Mason 1876, 372-373; Ostapkowicz *et al.* 2012), recently augmented by finds from the waterlogged deposits of the Manantial de La Aleta, Dominican Republic (Beeker *et al.* 2002; Conrad *et al.* 2001; Ortega and Atiles 2003) and the LCA habitation site of Los Buchillones, Cuba (Jardines Macías *et al.* 2013; 2015). Furthermore, the skeuomorphic design of the rare category of monolithic axes from the Greater Antilles imitates this particular hafting system in stone (Lovén 1935; Herrera Fritot 1964; Saville 1916). Slightly modifying the classification system of tool attachment modes from Stordeur (1987) stated above, this is a *direct* articulation (protruding the *split*) *male* slot positioned *laterally* from the long axis of the handle, with the cutting edge *parallel* to it and moving in *transverse* orientation from it. The system does not discriminate ligatures and adhesives, which are optional for any type of attachment. Traces of wear form where the head actually connects with the handle and thus distinguish only the type of articulation and slotting, but morphological factors and symmetric distribution of traces of use can contribute to a reconstruction of the position and orientation (e.g. Rots 2010).

Direct evidence for adzes has emerged only in recent years from Los Buchillones, with the discovery of four carved bent handles together with 36 axe hafts of varying lengths. These appear to be within the size range for one-handed use and present triangular depressions for the fastening of a petaloid using a binding system (Jardines Macías *et al.* 2013; 2015). A fifth handle consists of a small (7cm) straight shaft with an oval depression, implying a terminal-axial-juxtaposed fitting. The existence of sea-going dugout canoes and asymmetric celt shapes already indicated the presence of hafted tool designs capable of downward (perpendicular-transverse) motions, though they do not prove juxtaposed attachments. The issues with symmetries have been noted, and to my knowledge, stone adzes are also virtually absent from lowland South America in spite of canoes forming the principle watercraft in that context. Two additional attachment systems are known from ethnohistoric sources, both variants of male articulations for axes. Oviedo describes a hafting system from the Greater Antilles in which the handle is split and the celt inserted in the cleft, secured with twine (Joyce 1916, 236; cf. Carneiro 1979b), and various authors describe hafting by inserting the celt into a hole cut in the living tree and waiting for several months until the wood has grown around it. It was primarily practiced in the Guyanas (Crevaux 1993, 49; Stedman 1806, 412), with purported discoveries of winged axes embedded high in old, hollow trees in Surinam (Penard and Penard 1917). Mason (1884, 737) also associates it with Guadeloupian 'Caribs'. Experimental research has demonstrated the procedure to result in a viable haft (Neves de Souza and Pessoa Lima 2014; Petitjean Roget 1985). Additional attachment types are known from amongst several Amerindian groups in lowland South America (though see sections 3.2.3 and 10.2.4). Those are often based around large buttressed types, such as grooved axes, T-shaped axes, notched axes, semi-lunar axes and so on, though biconvex celts are used by others. The first is termed wrap-around hafting (*sensu* Adams 2013, 171-174) and is not well definable in the system of Stordeur (1987), but consists of a branch that is either bent over or fully wrapped around the medial area of the head (examples in Carneiro 1974; Fernández González 2016). The second consists of axes with juxtaposed abutting, in which the wide butt is positioned to rest against the long axis of the shaft and affixed with adhesive resins and ligatures (examples in Carneiro 1974; Cristiani *et al.* 2008; Rostain and Wack 1987; Versteeg 2003; Versteeg and Rostain 1999).

As was mentioned, woodworking is traditionally considered to be the functional domain for regular-sized Caribbean celts, with tree-felling and canoe making as the main activities. Indeed, there is abundant ethnographic and ethnohistoric information pertaining to them. The dugout canoe was the primary class of indigenous watercraft both in the Caribbean and in lowland South America, eliciting frequent commentary– and when necessary use – by European chroniclers and seafarers (see Callaghan 2007; Fitzpatrick 2013; Glazier 1989; Lovén 1935; McCusick 1960; Slayton 2018). Several rich descriptions survive on the social and technological procedures in making canoes by the inhabitants of the 17th century Windward Islands, who had by then fully transitioned to a steel tool economy (Anonymous flibustier, in Moreau 1990; Breton, in Barbotin 1971; Petitjean Roget 1961; Du Tertre, in McCusick 1960; cf. Glazier 1989; Nicholson 1975). A tree would be felled by axe or girdled with fire, after which the log would be gradually hollowed out by burning small fires and hewing out the char, and perhaps steam-bent. Such watercraft continue to be made until today by the Kalinago of Dominica, as well as Amerindian communities in northern South America: the Warao from the lower Orinoco are historically famous for their canoes.

Tree-felling, as the other main activity, is connected primarily to the clearance of land for horticultural practices. Until recently manioc (*Manihot esculenta*) was considered to be the staple crop of indigenous subsistence strategies (Boomert 2000; Newsom and Wing 2004; Rouse 1992). This tuber is historically cultivated via swidden agroforestry, or slash-and-burn, which involves the periodic clearing and burning of new forested plots following depletion every few years. Nowadays, the pre-colonial extent of manioc cultivation needs to be reassessed in light of the increasing evidence on the importance of staples such as maize (*Zea mays*) (Berman and Pearsall 2008; Mickleburgh and Pagán-Jiménez 2012; Pagán-Jiménez *et al.* 2015) and of concerns raised on stone axe efficacy in Amazonian swidden practices (Section 3.2.3). Nevertheless, indigenous land clearing practices are not limited to swidden alone, but address habitational concerns as well.

Impact marks on house posts and surviving utilitarian and ceremonial wooden objects are strongly suggestive of the use of edge-ground tools in their fashioning (Ostapkowicz *et al.* 2013; Valcárcel Rojas *et al.* 2006), although wood as a contact material on celts has only been demonstrated in a study on shell from LCA Anse à la Gourde, Guadeloupe (Lammers-Keijsers 2007). Here, wear traces evidenced fresh, dry, and burnt woodworking next to a mixture of traces more properly indicative of multipurpose activities. Though woodworking is often presumed from the presence of macroscopic edge scarring, such traces may also develop from other hard contact materials. Alternative use domains are sometimes proposed as well, but have not garnered much inquiry in the Caribbean. Conversely, the ethnographic and archaeological literature from other continents demonstrates uses ranging from underbrush clearing to barkworking and soilworking, the butchery of large carcasses, preparation of leather, and honey gathering. More commonly accepted is re-use of damaged celts, with the sides repurposed as edge-grinders or the faces as anvils, ground surface fragments used as polishing stones, butts used for percussion, or the blade blunted into pounding implements. Examples of such biographical trajectories are known from various places since at least the Early Ceramic Age onwards (e.g. Breukel 2015; Chancerel 2003; Kaplan and Patch 2014; Knippenberg 2006; Rodríguez Ramos 2005a, 61-63). Finally, with respect to deposition, most celts in the Caribbean originate in midden areas or habitation palimpsests, and otherwise as context-less finds in the fields. The only exceptions that I am aware of concern two instances of celts as burial gifts in the sites of Erin and Atagual, Trinidad (Boomert 2000, 317) and the occasional association with burials in ECA Puerto Rico (e.g. Rodríguez Ramos 2010a, 106; Siegel 1992; 2010).

2.4 Perspectives on paraphernalia

The categories of ethnic art produced by the indigenous societies of the Caribbean are incredibly diverse (see e.g. Arrom 1975; Bercht *et al.* 1997; Dacal Moure and Rivero de la Calle 1996; Kerchache 1994; McGinnis 1997; Oliver *et al.* 2008; Vega 1987). The majority of these can be defined as paraphernalia in accordance with the criteria specified previously. However, this only emphasises that the label primarily serves to categorise 'other [special] objects' separable from quotidian artefact groups such as tools or refuse. The variety in this group needs to be unpacked in order to grant the label explanatory meaning. For instance, the object classes traditionally regarded as *zemi* (also spelled *cemí* or *cimi*) in deference to the tangible spirit-physicalities of Ramón Pané (1999) all qualify as paraphernalia, yet an identifier such as *zemi* is specific to its particular context. It is debatable if face-depicting carved shells should be considered as a type of *zemi* (Mol 2014), while inlays are mere components at best, ornamental plaques seem incomparable, and the term is inappropriate to objects indigenous to the 'Island Carib'. There are myriad ways in which such things can relate, constitute, or interfere with social, ceremonial, or quotidian processes, which is why again each biography must be considered on their individual trajectories.

The carved shell object types in the present work comprise inlays, plaques, and various face-depicting shells. The osseous materials include tooth pendants and carved bone instruments, primarily aerophones. What each of these classes consist of and how they are understood in relation to the Caribbean archaeological record is discussed here in the necessary detail. Unlike for the celts there is little point in defining a terminology, since these terms usually describe outcomes of the analysis. For the more complicated artefacts, standard anatomical terminology is used where applicable to bony features or iconographic designs.

Carved shell objects are a common occurrence in the circum-Caribbean, owing to the great diversity and abundance of suitable shells in the region. Besides a plethora of expedient and simple formal tools, the prolific diversity of regalia carved from them ranges from small personal adornments and figurative pendants to engraved trumpets, and includes many types of objects of whom the function is not well understood (see e.g. Clerc 1973; Keegan 2018; Lammers-Keijsers 2007; O'Day and Keegan 2001; Ortega 2001; Serrand 1997; Sutty 1977; Van der Steen 1992). The inclusion of some of these as potential paraphernalia in the present sample also reflects my intent to examine their biographies to affirm how they should be regarded as such (Chapter 9). The technological possibilities offered by shell are relatively well understood, since significant work has been done on the experimental replication of the various tools and ornaments made in this material (e.g. Breukel and Falci 2015; Dacal Moure 1997; Falci *et al.* 2017b; Golding-Frankson 2009; Keegan 1984; Lammers-Keijsers 2007; Lundberg 1983; Vargas Arenas *et al.* 1997).

A frequently encountered class of such artefacts are inlays, objects of whom the presumed function is to be embedded within a host material of wood, stone, or pottery (Alegría 1981; Boomert 2000, 477-478). The majority of Caribbean anthropozoomorphic sculptures retain negative features with rough production stigma, particularly on the facial area, that may have carried encrustations in the past to complete or enhance their imagery. Some stone and wooden sculptures still retain their linkage with inlays of shell and nacre, precious metals, and other materials as their eyes and mouths (see e.g. Alegría 1981; Oliver *et al.* 2008; Rodríguez Ramos *et al.* 2013). Furthermore, the few extant cotton idols display a complex joining of inlays, including European materials such as mirrors, also in ear and palm depressions (Alegría 1993; Martina *et al.* 2010; Ostapkowicz 2018; Ostapkowicz *et al.* 2012; 2013; Taylor *et al.* 1997). As separate artefacts the most commonly identified inlay forms are incised bared-teeth motifs, easily associable with the mouthpieces of aforementioned carvings and adornos. Oval to circular pieces with concentric motifs are sometimes interpreted as the inlays for eyes, particularly rare nacreous ones. Once encrusted, the biography becomes that of a composite artefact – a merge of materialities –, which is archaeologically identified with the bare host sculpture rather than the isolated material of the inlay. However, at least one alternative biographical joining is suggested by the placement of a bared-teeth inlay in the mouth of a human burial at the site of Paso del Indio, Puerto Rico (Walker 2005, 76). Potential types of inlays that lack such diagnostic motifs are not commonly identified, though they undoubtedly existed. It is imaginable that many smaller geometric shapes that otherwise appear to serve no particular function were once encrusted into a wider variety of larger artefacts than presently suspected. Such inferences are sometimes made likely by the presence of wear and residues, but these indicators usually lack; the present dissertation is limited to typological eye and mouth inlays.

Shell plaques form a second category of which examples are widely distributed; they can be blank or engraved and appear in two-dimensional (flat) and three-dimensional (sculpted) forms (e.g. Clerc 1973; Lammers-Keijsers 2007; Turney 2001; Sickler Robinson 1979). These objects are commonly regarded as decorative, emphasised by the recovery of such plaques from a burial context at the site of

Golden Rock 1, St. Eustatius (Van der Steen 1992). However, the literature is undecided with respect to their precise functioning. Some could be strung as pendants, others link unconnected strings (whether part of an ornamental configuration or not), be sewn onto clothing or composite artefacts, or have had yet unconsidered uses. A specific three-dimensional sub-variant thereof contains a central ridge on the long axis that ends in dual oblong projections, isolated examples of which are known from numerous sites.[6] The primary hypothesis infers these plaques as bead spacers. This is suggested by the specimen acting as a bead and string separator in the beaded belt displayed at the Fundacíon García Arévalo in Santo Domingo, supposed from an archaeological context (Alegría 1993). Conversely, both Cartwright *et al.* (1991) and Lammers-Keijsers (2007, 90) interpret these plaques as potential fishing lures. Considering the inferred relation of plaques with composite ornamentation, in particular chiefly regalia, the purpose behind their inclusion is also to figure out how diverse such applications are.

The various face-depicting shells include several shells that are (completely) transformed into depictions of the heads or faces of beings, a particular type known from ethnohistoric descriptions as *guaízas*, as well as a few artefacts to which the addition of a zoomorphic face is secondary to the primary function. Specifically, these include a ring-like object, a zoomorphic pendant, and a geometrically engraved tinkler (since these are otherwise always face-depicting when engraved). *Guaízas* are social valuables that were frequently exchanged in the strengthening of indigenous political relationships between local and regional elites (Arrom 1975; Mol 2007; 2010; 2011; 2014; Oliver 2009). Furthermore, these artefacts are understood to physically exemplify, signal, and embody (to index, in the terminology of Gell 1998) the *perspectives* of living beings (Section 3.2). They therefore have certain (latent or agentive) spirit-like properties of their own. *Guaízas* are a Late Ceramic Age phenomenon which have a clear connection to the societies of the Greater Antilles. Their occasional provenience deep in the Lesser Antilles therefore signals the geographic breadth to which those political institutions exerted some degree of cultural presence (e.g. Crock 2000; Crock and Petersen 2004; de Waal 2006; Hofman 1995; Hofman and Hoogland 2011; Hofman *et al.* 2008a; Mol 2007; Sutty 1977). The precise functional application of these objects remains enigmatic, though it has been suggested that they were worn on the body in various guises or in belts and headdresses, and could support inlays from precious metals and small adornments themselves.

As for the other objects, they form more classic examples of iconographically embellished paraphernalia. Ring-like artefacts are not well known from the Caribbean, though rings and larger bracelets made of bivalves such as *Spondylus* spp. were prized exchange valuables in other premodern contexts, e.g. the Neolithic Balkans (Chapman and Gaydarska 2007; 2012; Dimitrijević and Tripković 2006; Gaydarska *et al.* 2004) the Lapita complex of Melanesia (Szabó 2010), and Mesoamerica (Price 2012). Rare examples from the eastern Caribbean are mostly broken (e.g. Van der Steen 1992, 114), though lavishly sculpted intact specimens survive (Dacal Moure and Rivero de la Calle 1996, 116-122; Petitjean Roget 2015b, 305). Their functions are unknown. The ornamental implication found these other studies is merely hypothetical, since such objects may also have anchored strings in any

6 Amongst others, the Le Moule museum and Anse à la Gourde, Guadeloupe (Lammers-Keijsers 2007, 90), Carriacou (Sutty in Lammers-Keijsers 2007, 90), 'Pearls' (personal observation), St. Kitts (Fewkes 1922, 163), Spring Bay 1a, Saba (Hoogland 1996, 87), Puerto Rico (Rainey 1940, 203), the Dominican Republic (Alegría 1993), and Elliot's, Antigua (Turney 2001, 77-79). Small plaques without ridges from Tanki Flip bear the same perforation structure (Serrand 1997), and related objects with different perforation configurations occur in Silver Sands and Hillcrest, Barbados (Cartwright *et al.* 1991).

sort of other configuration. Finally, tinklers are struck idiophones that produce sound when they impact each other when dangling from a string. They are common in the archaeological records of the islands and are typically made of shells from the *Oliva* genus, which are modified for resonance and suspension (see e.g. Falci 2015c; Lammers-Keijsers 2007; Sickler Robinson 1977). Examples are known from the Greater Antilles in which morphological tinklers are technologically merged with the expressive three-dimensional facial design styles normally reserved for *guaízas* (Dacal Moure and Rivero de la Calle 1984, 144-145; 1996, 120-121), but little attention has been paid to these artefacts specifically.

Carved bone materials form the final aspect of indigenous material culture of high interest to the present study. Bone as a raw material was not in regular use by Ceramic Age communities in the insular Caribbean. When modified osseous elements are found, they were virtually always made into ornaments, snuff paraphernalia, portable figurative art, or related object categories. The present assemblage divides into two distinct technological categories.

Tooth pendants consist of dental elements from a variety of animals that are pried loose from jaw structures (presumably skeletonised) and perforated, but usually not further modified. The vast majority of archaeological tooth pendants are canines and molars of dogs (*Canis lupus familiaris*), thousands of which are known some of which are engraved with geometric or facial designs (Boomert 2000; Ortega 1978a; 1978b; Narganes Storde 2003; Roe 1989; Walker 1983). The dog is argued to have occupied an elevated social status within the societies of the islands (e.g. Boomert 2000; Giovas 2018; Grouard *et al.* 2013; Newsom and Wing 2004; Plomp 2013; Rodríguez López 2007; Roe 1982; 1989; 1993; Shev 2018), and isotopic studies have revealed how both osseous elements as well as the animals themselves were widely exchanged in pre-colonial times (Laffoon *et al.* 2013; 2016; 2017a). Dental elements from mainland mammals, such as tapirs, peccaries, and jaguars are occasionally found in insular context as well (Giovas *et al.* 2012; Laffoon *et al.* 2014), the latter thus far only in the Early Ceramic Age. Such pendants are principally thought to have been strung in necklaces by the hundreds, as this is their most common mode of use in ethnographic contexts (Ribeiro 1988; cf. Breton, in Petitjean Roget 1961, 58). Nevertheless, teeth pendants can also be incorporated in clothing such as aprons or belts, or used to decorate artefacts (e.g. the Quebradillas vessel, in Ostapkowicz *et al.* 2012). A great variety of animal species contributed to the adornments of various communities in the Guyanas, as Roth (1924, 432) illustrates.

Often ignored in this discussion of (arguably pan-)Caribbean material culture and human-animal-thing relations is the propensity to adopt the osseous elements of large marine animals for the same adorning purpose. The ethnographic use by Amerindians of dental elements from fish and sea mammals as objects of personal ornamentation is nowadays rarely observed, but not entirely unheard of (Roth 1924, 433). The conceptual contrast rests between the inland riverine lowlands, and the marine setting of the Caribbean archipelago: perforated seal and shark teeth, fish vertebrae and dental plates, and so on were evidently widespread, sometimes in significant numbers.[7] With the exception

7 From a cursory review of the literature, such artefacts were found in Cuba (Dacal Moure and Rivero de la Calle 1984, 92-98; 1996), Playa Grande, Dominican Republic (López Belando 2012, 203), Sanate, Dominican Republic (Hall 1978, 38); Cagüitas, Puerto Rico (Rodríguez Lopez 1985), San Salvador Island, Bahamas (Winter and Wing 1993), Barnes Bay, Anguilla (Crock 2000), Anse à la Gourde, Guadeloupe (Grouard 2003 in Lammers-Keijsers 2007, 50), Grand Bay, Carriacou (Sutty 1977; 1989), Pearls, Grenada (Cody 1989), Golden Grove, Trinidad (O'B. Harris 1975), Tanki Flip, Aruba (Grouard 1995) and the Archaic Age Spaanse Water site in Curaçao (personal observation). Furthermore, De Wolf (1953, in Allsworth-Jones 2008,157), reports a perforated tooth of a crocodile in the Jamaican site of Retreat (A13).

of sea turtles, whom feature prominently in the few recorded mythologies (Pané 1999; see Section 3.2.1) and manatee, whose bones were frequently used for making paraphernalia, little is known about the significance attributed to these particular animals by indigenous communities.

With respect to carved bones, the present research involves wind instruments and a long bone decorated with anthropomorphic curvilinear design. Other types include snuff pipes and bowls, vomiting spatulas, engraved pectorals, small carved figures, geometrically incised bones, and so forth, known from various time periods and cultural contexts. Such objects are presumed to have fulfilled important functions in the ritual, political, and perhaps social landscape, the exact domain of use depending on the type of artefact (Oliver 2009; Rouse 1992; Stevens-Arroyo 2006; Vega 1987). These are made predominantly of manatee bone, but occasionally from other large species such as deer, dog, or human. Modification of the latter is nowadays viewed mainly in the light of ancestor veneration practices, though trophy taking remains a distinct possibility (Petersen and Crock 2007; Roe 1989). Bone tubes may have functioned specifically as containers for narcotic products, in light of ceramic pipe finds containing rolled tobacco leaves (Boomert 2000, 480). Both occur in mainland and insular Saladoid contexts, and many parallels exist in ethnohistoric Antillean ethnohistory and Guyanan ethnography (Boomert 2000, 452-453). For many Amerindians hollow tubes such as blowpipes channel and transmogrify the force of breath into other ambiguous energies, relating to variably expressed shamanic inquisitions during hunting, ritual, sickness, and warfare (Chaumeil 2001; Erikson 2001; and see e.g. Lévi-Strauss 1966; Rivière 1969).

Aerophones are part of this continuum of hollow tubular instruments (Hill and Chaumeil 2011b). There is a tremendous variety in aerophone design, material, and taboo amongst Amerindian groups, ranging from small panpipes to the sacred Yurupari instruments of northwestern Amazonia, and from manipulated animal skulls to enormous rolled bark trumpets (e.g. Aretz 1991, 451; Biocca 1965, 337-338; Chaumeil 1997; 2007; Izikowitz 1935; Koch-Grünberg 1921, 191; Ribeiro 1988, 195-212; Roth 1924, 451; Yde 1965, 190-194). wind instruments[8] made of long bones find widespread expression, if somewhat less common today, and are designed both as end-blown or side-blown flutes, with our without duct. The placement of mouthpieces, ducts, and tone holes varies, though three holes seems the most common. Such instruments date back to at least ca. 8000 BP in northern Amazonia (an end-blown flute made of a human radius, Groot de Mahecha 1992, 56-58), and ethnographic examples are commonly made of deer (*Odocoileus virginianus* and *Mazama* spp.), jaguar (*Panthera onca*), tapir (*Tapirus* spp.), or monkey (*Platyrrhini*) long bones.[9] Few bone wind instruments are archaeologically known from the Antilles, predominantly in association with burial contexts in the ECA Puerto Rican archipelago (Alegría 1947, in Roe *et al.* 1985; Hardy 2008, 125; Lovén 1935,

---

8 Following the Hornbostel-Sachs system, aerophone instruments (that produce sound from vibrating air) are defined as flutes if they are edge-blown wind instruments, which are defined as producing sound by blowing a narrow stream of air against the edge (of the mouthpiece) while containing the vibration within the instrument (the pipe, which acts as the resonator) (von Hornbostel and Sachs 1961). Closely related designs include trumpets, in which the player's lips vibrate the air, and reed pipes, which vibrate a reed insert in the mouthpiece.

9 The modification of human bones into flutes is reported occasionally, these bones originating either as trophies from warfare or with the recently deceased, whom conceptually transform into 'enemies' of the community also (Chaumeil 2007). The Tupinamba in mid-16th century coastal Brazil were described as using the long bones of their enemies (De Léry 1993 [1580], 127), the Kalinago of the 17th century were accused of it (de Rochefort 1666, 307; Moreau 1990, 166-167, 221-223), and the same practice is described for various communities of the Guyanas (Roth 1924, 458, 592-594), as well as the Cashibo (Estrella and Shell 1977, cited in Roe 1989, 856) and formerly the Yagua (Chaumeil 2001, 89) of the Peruvian Amazon. Despite these popular notions archaeological examples of identified human bones made into musical instruments are rare, and one may wonder to what degree animal bones were misidentified by historiographically minded observers.

498-499), LCA Cuba (Hernández Ramírez and Izquierdo Díaz 2011), and as caches in the southern Caribbean (Antczak 1995; 1998, Figure 49; Antczak and Antczak 2006, Figure 408). In contrast, the existence of various aerophone instruments and their socio-mythological associations had been well documented ethnohistorically. Pané (1999, 20) describes an instrument called *mayohabao*, which appears to be a wind instrument and probably a flute or trumpet (contra Arrom's footnote). As for the Kalinago, most late 17th century sources describe their "immusical" use of various wind instruments during the morning hours before bathing or at the celebration of *cayounage* (inter-communal festive gatherings) (Anonymous flibustier, in Moreau 1990, 171, 187-191; Breton, in Petitjean Roget 1961; de Rochefort 1666, 307; Labat 1722, in Hulme and Whitehead 1992, 163). These instruments are variously described as flutes, fifes, flageolets, panpipes, and so on, but invariably produced "boring" and "immusical" sounds. However, experiments with Paleolithic designs has shown reconstructing the sound ranges on the basis of bone pipes to be extremely difficult (d'Errico *et al.* 2003; Safa *et al.* 2016). Not only are the artefacts factually resonance chambers that may have been tuned through perished components such as reed fiddles, waxes to narrow their openings, and so on, but the volumetric configurations are unique to the internal morphology of the specimens. These acoustic matters cannot be explored for the artefacts of the present research, but are important to be aware of.