Journal of Anthropological Archaeology 70 (2023) 101504

Contents lists available at ScienceDirect

Journal of Anthropological Archaeology

journal homepage: www.elsevier.com/locate/jaa

"For there is no rock": Lucayan stone celts from The Bahamas and Turks and Caicos Islands

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ARTICLE INFO

Keywords:
Pre-Columbian Caribbean
The Bahamas/Turks and Caicos Islands
Jade
Stone axes
Museum collections

ABSTRACT

This paper presents the first systematic study of pre-Columbian imported stone celts recovered from the limestone islands of the Lucayan archipelago, comprising The Bahamas and the Turks and Caicos Islands of the northern Caribbean/West Atlantic. The majority derive from antiquarian collections and early archaeological investigations, prior to the destruction of many sites due to guano mining and development; only a handful have been recovered during archaeological investigations since the 1960s. The corpus includes 224 celts, of which 162 are complete and provide the measurements for a comparison with width/length ratios of celts from the proximate source islands of Cuba and Hispaniola. While the Lucayan archipelago shows a slightly higher proportion of wider celts, consistent with more reworking, overall the corpus suggests that exchange networks were sufficient to meet demand. This conclusion is supported by the absence of any clear diminution in size with distance from sources. The majority of stone celts (71.9 %) have been identified as various forms of "jade," supplemented with a range of other materials. Despite the higher value often attributed to jade cross-culturally, we find no clear evidence for its differential treatment, though the archipelago's northern islands do have a lower proportion of jade versus non-jade celts.

> "*…the occasional discovery of beautifully polished stone implements proves that* [the Lucayans] *were in communication with distant lands, for there is no rock, except soft coral limestone, anywhere in the archipelago.*"
> Brooks 1889b:97-98

1. Introduction

Celts and other hard stone artefacts recovered from The Bahamas and Turks and Caicos Islands (collectively, the Lucayan archipelago, named after the region's pre-Columbian Indigenous inhabitants) have long been acknowledged as imports into these entirely limestone islands, *prima facie* evidence for connections to the more geologically varied islands to the south, if not beyond (e.g., Berman, 2011; Daggett, 1980; Goggin, 1939; Keegan, 1997a; Rose, 1987; Ober, 1894) (Fig. 1). Their study has been limited, however, due in part to the majority being historic finds acquired during 19th/early 20th centuries, occasionally during commercial guano mining, avocational investigations or in early archaeological excavations. When faced with a drawer of celts and miscellaneous artefacts bearing a general island provenance, the researcher's task is a challenging one. But, as has been shown in recent studies (e.g., Knaf et al., 2021, 2022; Ostapkowicz, 2015; Ostapkowicz et al., 2012, 2022), engagement with historic museum collections can yield important results, expanding our understanding of the region's material culture and its social and political contexts. Further afield, there have been groundbreaking studies on legacy stone celt collections, such as *Projet Jade*, which sourced European Neolithic (5th – 4th millennia BC) jadeitite axeheads, demonstrating their exchange over more than 1000 km (Pétrequin et al., 2012). The rationale behind such studies is that each object embodies a life history – from raw material selection to manufacture, use and eventual deposition – that can contribute to its placement within a historical context.

Project SIBA – an acronym for *Stone Interchanges in the Bahama Archipelago* and the word for stone in the 16th century circum-Caribbean Arawak language (Tejera, 1977) – aims to bring stone artefact collections provenanced to The Bahamas and Turks and Caicos Islands into wider discourse via an investigation of their material, manufacture,

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https://doi.org/10.1016/j.jaa.2023.101504
Received 28 October 2022; Received in revised form 19 March 2023;
Available online 28 March 2023
0278-4165/

typology and use-lives. Over 350 stone artefacts have been documented, including the 224 celts that are the focus of this paper (Table S1; Figs. 2-3). The majority lack archaeological context, a situation that is not unusual for stone axes, with parallels in many other countries (e.g., Hodder and Lane, 1982). Nevertheless, their simple attribution to island or even only to island group allows a number of relevant questions to be addressed. We provide a brief history of legacy collections and recent finds, assigning celts to islands and comparing their distribution across the archipelago in terms of raw materials, numbers and dimensions.

Given their off-island origins and relative scarcity, it might be expected that stone celts had a prestige value over and above their utilitarian use. To address this, we investigate the distribution of celts and whether their number and/or size decreases with distance from proximate source (cf. Hodder and Lane, 1982; Leighton, 1992; Tibbett, 2002), which is here assumed to be the north coasts of Cuba and Hispaniola (the Dominican Republic and Haiti; any celts from more distant sources, such as Guatemala [Harlow et al., 2006; 2019; Knaf et al., 2021; 2022; Rose, 1987], would probably have arrived via the Greater Antilles rather than through direct exchange). As detailed below, the majority of celts from the archipelago were manufactured from a variety of jade types. Being among the hardest stone known and capable of being polished to a high sheen, jades in a cross-cultural context have often been perceived as having high prestige and/or symbolic value (e.g., Cassen and Pétrequin, 1999; Darwent, 1996; Hayden and Schulting, 1997; Huang, 1992; Kovacevich, 2013; Leighton, 1992; Liu, 2003; Pétrequin et al., 2012; Taube, 2005). Thus, they might be expected to operate more often within a prestige rather than utilitarian sphere, visible in retaining greater length and exhibiting higher polish than their non-jade counterparts. We therefore also investigate whether there is any evidence for the differential treatment (in terms of use-life, i.e., degree of re-working) of jade and non-jade celts.

1.1. The Lucayans

Indigenous migrants from Hispaniola (Dominican Republic and Haiti) and/or Cuba first started exploring the islands of what are now The Bahamas and Turks and Caicos relatively late, ca. AD 700, well within the Caribbean's Late Ceramic Age (post-AD 600) (Berman et al., 2013; Keegan and Hofman, 2017). Some of these temporary resource extraction sites eventually became permanent communities, adapting to these limestone islands and developing their own unique ceramic tradition (Palmetto Ware) and distinctive forms of the ceremonial/elite wooden seats known as *duhos* (Ostapkowicz, 2015). These permanent settlers are identified as Lucayans, a name thought to derive from the Indigenous Taíno/Arawak word *Lukku-Cairi*, "people of the islands." They were fishers and horticulturalists living primarily in small villages, with evidence for at least some level of sociopolitical differentiation (Berman, 2011; Ostapkowicz, 2015). In addition to its importance for subsistence, the sea formed a vital route for communication with both nearby and more distant islands (e.g., Hofman et al., 2010).

The Lucayans were the first people encountered by Columbus on October 12th, 1492. Their population was rapidly decimated by introduced disease and by enforced removal from the islands as slaves, such that by ca. 1520 the entire archipelago was reportedly uninhabited (Sauer, 1966; Keegan, 1997a). However, recent radiocarbon dating of 60 individuals from the region – together with some late dates from Lucayan occupation sites – suggests that there may have been an Indigenous presence on the islands some decades beyond this (Schulting et al., 2021; Morsink, 2013). No Indigenous inhabitants were encountered when the islands were resettled by English colonists beginning from 1648; at least no record of such encounters have as yet emerged. During the 18th century, large numbers of African slaves were brought to the archipelago and to other Caribbean islands to work the

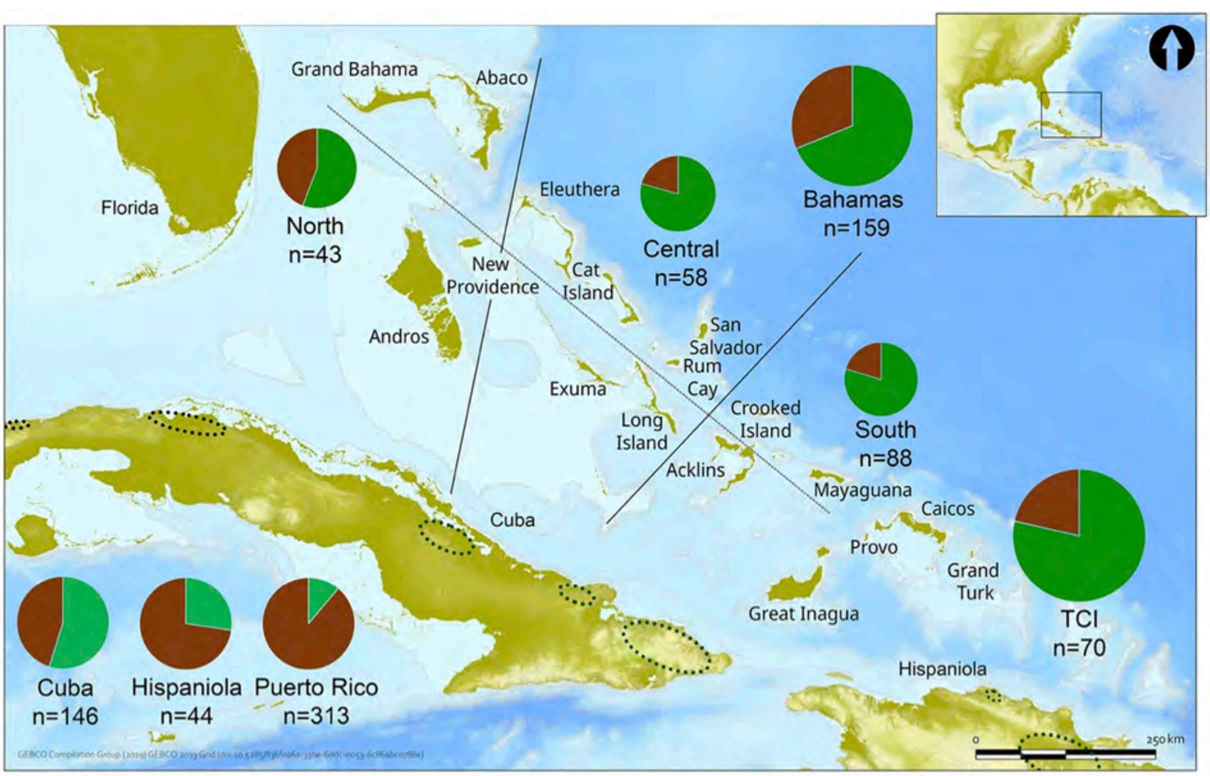

Fig. 1. The study area showing divisions into north, central and south island groups. The pie charts show the number of hard stone celts from the three island groups as well as The Bahamas and TCI overall, divided into jades (green) and non-jades (brown). The dotted line divides the in-group and out-group islands as defined in the text. The dotted ovals on Cuba and Hispaniola mark known ultramafic zones that present potential jade sources (after Harlow et al. 2019); other important sources are present off-map in Guatemala. Base map created by John Pouncett. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

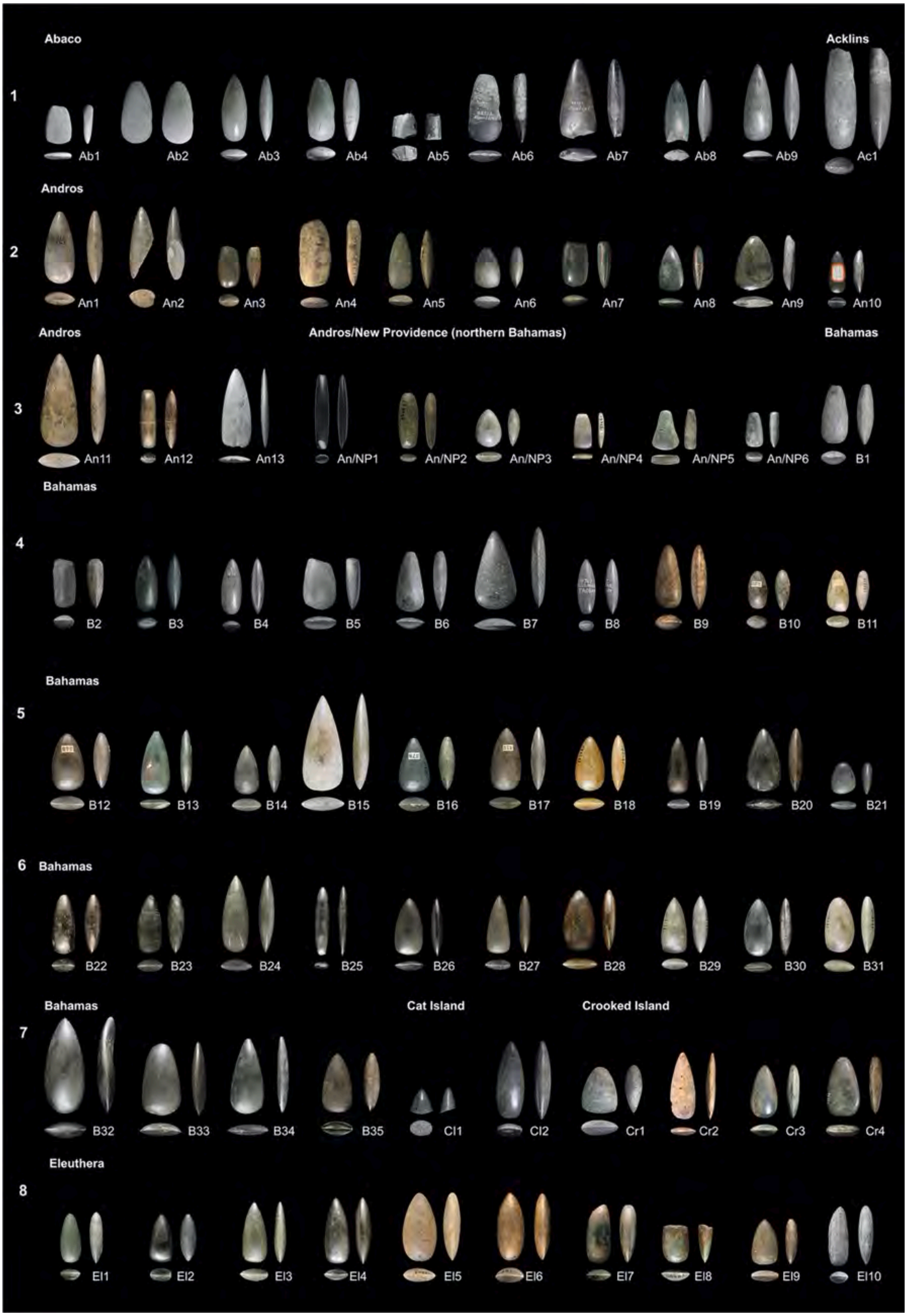

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Fig. 2. Celts recovered from The Bahamas (for dimensions see Table S1). Two additional celts - one attributed to San Salvador (AMNH 25/222) and one to Clarence Harbour, Long Island (PMAE 93–16-30/62796) - were not photographed and so are omitted from this composite image. a) Row 1: Abaco: Ab1 – Lowe Museum 1; Ab2 – Lowe Museum 2; Ab3 – Lowe Museum 3; Ab4 –Lowe Museum 4; Ab5 – Lowe Museum 5; Ab6 – NMNH A098726; Ab7 – NMNH A098727; Ab8 – NMAI 032566; Ab9 – NMAI 059187. Acklins: Ac1 – NMAI 032559. Row 2: Andros: An1 – AMNH 25.0/3765; An2 – AMNH 25.0/3766; An3 – AMNH 25.0/3767; An4 – Max 38.2.1; An5 – Max 38.2.8; An6 – NMAI 059205; An7 – PMAE 35–46-30/986; An8 – PMAE 35–46-30/987; An9 – PMNH ANT.137366; An10 – PMNH ANT.137367. Row 3: An11 – PMNH ANT.137371; An12 – PMNH ANT.058330; An13 – NMAI 059201; An/NP1 – PMNH ANT.137656; An/NP2 – PMNH ANT.137657; An/NP3 – PMNH ANT.137658; An/NP4 – PMNH ANT.137660; An/NP5 – PMNH ANT.137661; An/NP6 – PMNH ANT.137662. Bahamas: B1 – NMAI 059175A. Row 4: B2 – NMAI 059175B; B3 – NMAI 059175C; B4 – NMAI 059175D; B5 – NMAI 059176; B6 – NMAI 220407A; B7 – NMAI 220407B; B8 – NMNH A170747; B9– PMAE 45–16-30/4316; B10 – PMNH ANT.137368; B11 – PMNH ANT.137374. Row 5: B12 – PMNH ANT.137375; B13 – PMNH ANT.137376; B14 – PMNH ANT.137377; B15 – PMNH ANT.137379; B16 – PMNH ANT.137380; B17 – PMNH ANT.137386; B18 – PMNH ANT.137387; B19 – PMNH ANT.137388; B20 – PMNH ANT.137389; B21 – PMNH ANT.137391. Row 6: B22 – PMNH ANT.137393; B23 – PMNH ANT.137394; B24 – PMNH ANT.137395; B25 – PMNH ANT.137396; B26 – PMNH ANT.137397; B27 – PMNH ANT.137398; B28 – PMNH ANT.137399; B29 – PMNH ANT.137400; B30 – PMNH ANT.137401; B31 – PMNH ANT.137402. Row 7: B32 – PMNH ANT.137403; B33 – PMNH ANT.137404; B34 – PMNH ANT.137405; B35 – PMNH ANT.137406. Cat Island: CI1 – FAU A1026; CI2 – NMAI 059198. Crooked Island: Cr1 – NMAI 032560; Cr2 – NMAI 032561; Cr3 – NMAI 059200; Cr4 – PMAE 93–22-30/62797. Row 8: Eleuthera: El1 – PMNH ANT.028857; El2 – PMNH ANT.028858; El3 – PMNH ANT.028859; El4 – PMNH ANT.028860; El5 – PMNH ANT.028879; El6 – PMNH ANT.028880; El7 – PMNH ANT.028881; El8 – PMNH ANT.028882; El9 – PMNH ANT.028883; El10 – NMAI 032568.

plantations (Craton and Saunders, 1999), and in the 19th century, after the abolition of slavery, Africans liberated by the British navy from foreign slave ships were resettled on some of the islands (e.g., *Trouvadore*, TCI; Sadler, 2008). Today, a growing local interest in the (pre) history of the region, and strict enforcement of heritage protection laws (Antiquities, Monuments and Museums Act, est. 1998), have brought the Lucayans, their material culture, and their adaptation to the archipelago into greater focus in school curriculums, museum displays and artistic outputs (Ostapkowicz, 2023).

1.2. Celts in the Lucayan archipelago

The presence of stone celts in the Lucayan archipelago presumably coincides with its initial settlement from the Greater Antilles ca. AD 700, though only rare examples have been recovered from the few known sites of this early period (e.g., a "greenstone axe" spall from Coralie, GT-3; Keegan, 1997a; Keegan, 1997b; this has since been identified by SIBA as calcareous mudstone). Perhaps the most unusual stone tool reportedly recovered from Long Island, The Bahamas, is a plano-convex adze (Fig. 2, LI13). Such adzes are thought to be confined to Saladoid (ca. 500 BCE – AD 500) contexts (Rainey, 1940; Rouse, 1952; Siegel, 1992; Rodríguez Ramos, 2007); their production was in decline by ca. AD 500, disappearing altogether from the archaeological record by ca. AD 800 (Rodríguez Ramos, 2007). This was from one of H.W. Krieger's "excavations" (ca. 1930–1940s), but its context is unfortunately not clear (Ostapkowicz, 2023). This joins a small number of other rare finds of potentially early date in the archipelago, such as a stone spherolith from Pure Gold, Andros (Goggin, 1937 ms), a form that has been associated with earlier Archaic or 'pre-Arawak' periods (Rodríguez Ramos et al., 2013).

The earliest directly dated hafted celt (i.e., the wooden handle was dated), recovered from North Caicos in 1876, is cal CE 1032–1174 (95.4 % confidence, 932 ± 26 BP, OxA-19172, recalibrated here in OxCal v4.4 using IntCal20) (Ostapkowicz et al., 2012). Of course, this may not date the celt, as the handle may have been replaced numerous times. The few other celts found in archaeological contexts predominantly post-date CE 1000 (e.g., North Storrs Lake and Pigeon Creek, Dune 1, San Salvador: Harlow et al., 2019; Fry and Delvaux, 2006; site MC-6, Middle Caicos: Morsink, 2012; Hawk's Nest Road, Cat Island: MacLaury, 1970). It is likely that hard stone continued to be acquired by exchange throughout the occupation of the islands. Indeed, their acquisition may have increased during the rise of small chiefdom-level or 'big men' societies post-CE 1200 (cf. Berman, 2011), fulfilling sociopolitical as well as utilitarian needs (cf. Keegan, 1997a; Morsink, 2013; Ostapkowicz, 2023). While stone celts no doubt would have been useful for large-scale woodworking (e.g., felling moderate-size trees for the construction of small dwellings known as *bohios* and much larger trees for ocean-going canoes), suitable other materials were available for most day-to-day tasks (e.g., Keegan, 1981; Wilkie and Farnsworth, 1999). Most notable among these would have been shell tools ranging from unmodified or minimally retouched shells supplying expedient scraping and cutting edges, to those showing more substantial modification through flaking, grinding and polishing (Jones O'Day and Keegan, 2001). Adzes made of Queen conch (*Aliger gigas*) for example, take advantage of the shell's natural shape, their proximal ends typically twisting to one side, and their sides ground down, approximating a stone petaloid celt in profile (Jones O'Day and Keegan, 2001). Experiments have demonstrated that shell axes and adzes are fully capable of chopping down trees, particularly when combined with fire (Lammers, 2007).

1.3. Find locations

From the available documentation, celts have been most frequently recovered from open air-sites, such as the "mounds" noted by de Booy (1912; see Fig. 3, MC5) around the site of Lorimers, Middle Caicos, or the middens of Pigeon Creek and North Storrs Lake, San Salvador (Harlow et al., 2019). Caves have also yielded celts, including the abovementioned hafted celt from North Caicos. On separate occasions a duho, as well as stone celts and other artefacts, were recovered from Hamilton's Cave, Long Island (Ostapkowicz, 2023); unfortunately any association between them, if indeed there was one, is now lost. In one of the caves of Juba Point, Providenciales, de Booy (1912) found a monolithic axe (a "hafted" celt entirely made of stone) together with conch shells and burned wood, beneath 45 cm of bat guano. A celt and chisel were found in a cave at Sandy Point, North Caicos, together with turtle bone and ceramic sherds (de Booy, 1912). While Lucayan human remains have also been recovered from numerous caves (Ostapkowicz, 2023; Schulting et al., 2021), no evidence has yet emerged for celts accompanying burials (but see Saunders and Bohon, 2000; Turner, 2013). If any such associations existed, they have been obscured by the historic removal of bat guano for fertiliser.

1.4. Collection histories

The majority of celts under study are historical finds, with good provenance to the islands from which they were recovered. Celt finds in the Lucayan archipelago have been documented over the past two centuries (Table S1); among the earliest, in 1802/1803, is reference to "many … axes, wrought from siliceous stone not met with in the Bahamas… found among the rocks" of Crooked Island (McKinnen, 1804:165). The mid- to late 19th century saw the rise of antiquarian interest in the region's prehistory, with the emergence of collectors such as George Gibbs, a resident of Grand Turk, who acquired a significant collection of stone celts between 1860 and 1887 (Fig. 4). Some of the artefacts in the corpus derive directly from early archaeological investigations – both amateur and professional – including those of Lady Edith Blake (b. 1846, d. 1926), wife of Henry Arthur Blake, Governor of The Bahamas between 1884 and 1887. Blake had a strong interest in the

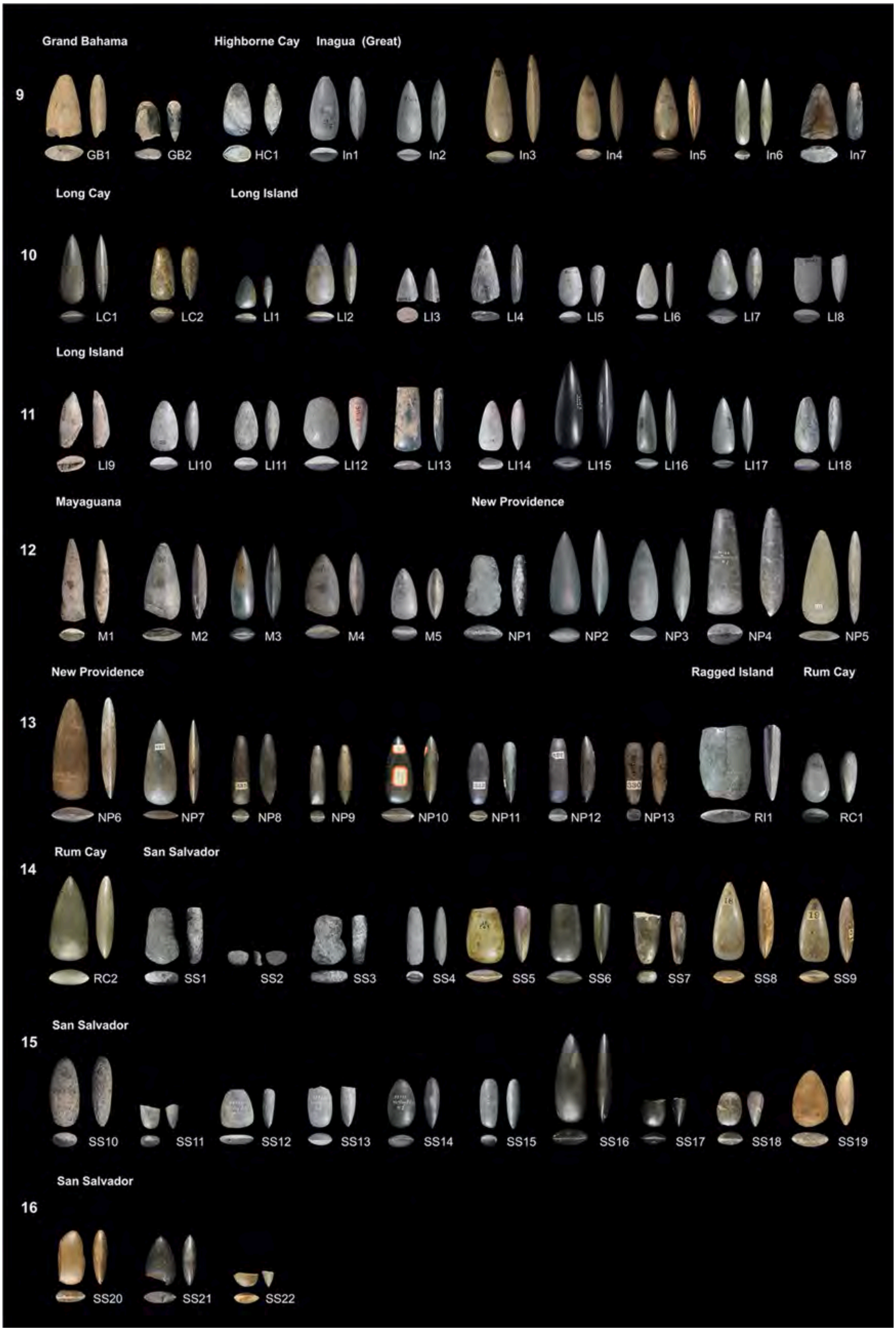

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Fig. 2b. Row 9: Grand Bahama: GB1 – PMNH ANT.028869; GB2 – PMNH ANT.028870. Highborne Cay: HC1 – Ships of Discovery. Inagua: In1 – NMAI 032564A; In2 – NMAI 032564B; In3 – PMAE 33–27-30/131; In4 – PMAE 33–27-30/132; In5 – PMAE 33–27-30/133; In6 – PMNH ANT.028854; In7 – PMNH ANT.028884. Row 10: Long Cay: LC1 – PMAE 93–22-30/62798; LC2 – PMAE 93–22-30/62799. Long Island: LI1 – AMMC NMB.NP.1992.4.4; LI2 – NMAI 059189; LI3 – NMNH A431158A; LI4 – NMNH A431158B; LI5 – NMNH A431158C; LI6 – NMNH A431158D; LI7 – NMNH A431158E; LI8 – NMNH A431158F. Row 11: LI9 – NMNH A431158G; LI10 – NMNH A431158H; LI11 – NMNH A431158I; LI12 – NMNH A431159; LI13 – NMNH A431165A; LI14 – NMNH A431165C; LI15 – NMNH A554667; LI16 – NMNH A554668; LI17 – NMNH A554669; LI18 – NMNH A431165B. Row 12: Mayaguana: M1 – NMAI 032229A; M2 – NMAI 032229B; M3 – NMAI 032229C; M4 – NMAI 032229D; M5 – NMAI 032229E. New Providence: NP1 – AMMC NP12-181–13; NP2 – FM 0.171.23747; NP3 – NMAI 032569; NP4 – NMNH A098728; NP5 – PMNH ANT.137365. Row 13: NP6 – PMNH ANT.137369; NP7 – PMNH ANT.137372; NP8 – PMNH ANT.137378; NP9 – PMNH ANT.137381; NP10 – PMNH ANT.137382; NP11 – PMNH ANT.137383; NP12 – PMNH ANT.137384; NP13 – PMNH ANT.137385. Ragged Island: RI1 – PMNH ANT.137365; Rum Cay: RC1 – NMAI 059204. Row 14: RC2 – PMNH ANT.137370. San Salvador: SS1 – AMMC 198/2000; SS2 – AMMC 882; SS3 – AMMC SS3/09–5; SS4 – AMMC PCdune1; SS5 – AMNH 25/208; SS6 – AMNH 25/209; SS7 – AMNH 25/221; SS8 – AMNH 25/260; SS9 – AMNH 25/261. Row 15: SS10 – NMAI 059158; SS11 – NMAI 059159; SS12 – NMNH A098731; SS13 – NMNH A098732; SS14 – NMNH A098733; SS15 – NMNH A098734; SS16 – PMNH ANT.137390; SS17 – PMNH ANT.028855; SS18 – PMNH ANT.028856; SS19 – PMNH ANT.028874. Row 16: SS20 – PMNH ANT.028875; SS21 – PMNH ANT.028876; SS22 – PMNH ANT.028877. Photos: Ostapkowicz, courtesy of the Albert Lowe Museum; Division of Anthropology, American Museum of Natural History (AMNH); Field Museum (FM); Florida Atlantic University (FAU); National Museum of the American Indian (NMAI); National Museum of The Bahamas, Antiquities, Monuments and Museums Corporation (AMMC); National Museum of Natural History, Department of Anthropology, Smithsonian Institution (NMNH); Peabody Museum of Archaeology and Ethnology, Harvard University (PMAE); Peabody Museum of Natural History (PMNH).

region's prehistory, excavating a cave on New Providence (Brooks, 1889a) and amassing a collection of over 150 artefacts through various sources, including the only surviving hafted celt, a monolithic axe, as well as 23 stone celts (Ostapkowicz, 2023).

The next substantial collection of 36 stone celts, as well as a rare fossil shell celt (Fig. 2, Cr2), entered George Heye's Museum of the American Indian (now part of the National Museum of the American Indian, Smithsonian) between 1911 and 1919, as part of the surveys undertaken by Theodoor de Booy (b. 1888; d. 1919). De Booy's work is considered by many to mark start of professional archaeology in the Lucayan archipelago, and his 1912 Bahamian investigations, sponsored by Heye, were the first of a number of American museum-sponsored expeditions to the region.

Froelich Rainey's 1934 fieldwork in The Bahamas on behalf of the Peabody Museum of Natural History (the Armour Caribbean Expedition), which included investigations at 15 sites on 11 islands, acquired 19 celts through direct purchases from locals (Rainey 1934 ms). Rainey also brought to the attention of the museum board the substantial private collection of Benjamin Arnold, which eventually entered the museum and added a further 46 celts to the Peabody's Bahamian holdings.

The Smithsonian's Herbert Krieger investigated eight Bahamian islands in 1936, and returned in 1947 as part of the Earnest N. May-Smithsonian Expedition (Ostapkowicz, 2023). He worked on several important sites, including Hamilton Caves, Long Island: nine of the 19 celts attributed to him in the collections are from Hamilton's Cave, the others being provenanced only to Long Island. Other expeditions to the region during the 1930s, led by natural historians rather than archaeologists, also obtained archaeological material, including James C. Greenway of Harvard's Museum of Comparative Zoology, who not only acquired celts on Great Inagua, but was instrumental in securing the large collection of A. Godet, resident of Belleview, North Caicos, which included two celts found in the vicinity of that settlement.

Like Rainey before him, John Mann Goggin – another significant figure in American archaeology (Rouse, 1964; Weisman, 2002) – purchased 14 celts during his reconnaissance of Andros in 1937, three of which eventually entered two museums. Goggin was candid about their acquisition, noting that celts are "…very rare… some of them had been in the possession of the owner's family for more than 50 years" (Goggin, 1939:23). Many early archaeologists in the region have noted the locals' reluctance to part with stone celts, which were known as "thunderbolts" and used as talismans. Goggin, among others, also documented both public and private collections of celts on the islands (Fig. 5) – collections that disappeared from public record, suggesting that the examples in museum collections are but a fraction of those that originally existed.

In the late 1960s, archaeologists Charles Hoffman and James MacLaury on San Salvador and Cat Island, respectively, recovered celts in their excavations (Hoffman, 1967; MacLaury, 1970). Other open-air sites on San Salvador have also yielded a number of complete and fragmentary examples (Blick et al., 2009; Harlow et al., 2019; Fry and Delvaux, 2006). *In situ* examples include the re-worked celt from New Providence's Pink Wall site (Saunders and Bohon, 2000) and both complete and fragmentary petaloid celts from Plaza I at MC-6, Middle Caicos (Sullivan, 1981). But the majority of the celts recovered over the last six decades remain chance finds, often from the surface of archaeological sites (e.g., Donna Cay [Fig. 3, Pr6]; Sullivan, 1981), and sometimes in the aftermath of disturbance to sites as a result of development (Keegan, 2007; Morsink, 2012). Where context is known, excavated celts have most frequently been found in association with open-air midden deposits – though of course these are the sites that are targeted by archaeologists, most of the caves having been emptied by guano mining.

2. Celts: beliefs, typologies and characteristics within the Lucayan archipelago

In addition to its usefulness, finely polished celts are tactile, desirable objects cross-culturally (cf. Evans, 1897; Pétrequin et al., 2012). This appreciation is often more than purely aesthetic; they may be perceived as embodying supernatural forces, and have been ascribed curative or protective virtues, whether in Europe, Africa, Asia or the Americas. One unifying theme is the belief – prevalent in the Lucayan archipelago and the wider Caribbean during the 19th century, if not earlier (Ober, 1894; Goggin, 1939; Fewkes, 1915) – that celts were thunderbolts that fell from the sky during storms. Writing in 1894 during a visit to San Salvador, Frederick Ober (1894:275) notes that "throughout the islands, the smaller celts are known as 'thunderbolts' and are treasured by the present natives as of celestial origin, and possessing supernatural virtues… [falling] from the clouds, in time of storm", while Goggin (1939:23), visiting Andros, wrote that Bahamians "have a great many superstitions pertaining to the 'thunderbolts.' They believe the stones come down in lightning and that it takes them seven years to come back to the surface of the earth." Referring to the wider Caribbean, Fewkes (1922:175) noted that celts were believed to be "endowed with magic powers, and are regarded as efficacious in healing diseases. They are like-wise supposed to protect the natives from lightning, being frequently deposited for that purpose under the thatch forming the roof of the cabins." They were placed in water to purify it, and were thought to infuse it with beneficial properties that ensured health and long life (Evans, 1897; Fewkes, 1922). Of course, it is impossible to say whether these beliefs have any basis in the pre-Columbian history of the islands, but intriguingly, the earliest ethnographic accounts from neighbouring Hispaniola (Arrom, 1999) note how carved stones (often assumed to be anthropo/zoomorphic *cemís*) were used as protective talismans, some

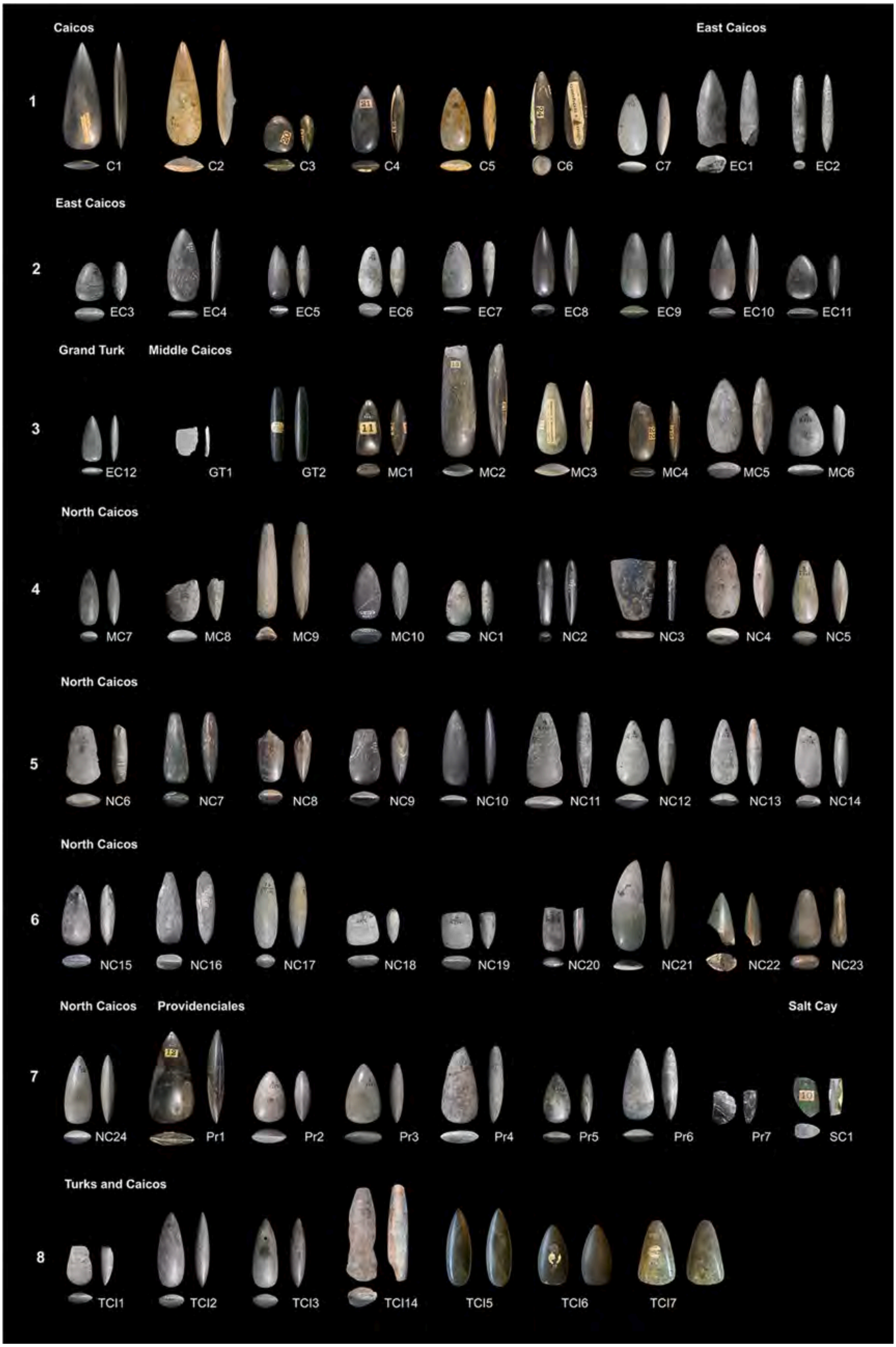

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Fig. 3. Celts recovered from the Turks and Caicos Islands (for dimensions see Table S1). Note that an additional celt, attributed to Flamingo Hill, East Caicos (NMAI 031922.000A), was not photographed and so is omitted from this composite image. Row 1: Caicos: C1 – AMNH 25/236; *C*2 – AMNH 25/237; C3 – AMNH 25/262; C4 – AMNH 25/263; C5 – AMNH 25/265; C6 – AMNH 25/266; C7 – NMAI 090116. East Caicos: EC1 – NMAI 031917; EC2 – NMAI 031918. Row 2: EC3 – NMAI 031920; EC4 – NMAI 031922.000B; EC5 – NMAI 059184; EC6 – NMAI 059184.001; EC7 – NMAI 059203; EC8 – TCNM/E-0130; EC9 – TCNM/E-0131; EC10 – TCNM/E-0132; EC11 – TCNM/E-0133. Row 3: EC12 – TCNM/E-0134. Grand Turk: GT1 – TCNM/Z212; GT2 – BM 95–3. Middle Caicos: MC1 – AMNH 25/244; MC2 – AMNH 25/246; MC3 – AMNH 25/259; MC4 – AMNH 25/264; MC5 – NMAI 031914; MC6 – NMAI 032210. Row 4: MC7 – NMAI 032217; MC8 – NMAI 059188; MC9 – TCNM/2010.45; MC10 – TCNM/M−0343. North Caicos: NC1 – NMAI 031919; NC2 – NMAI 031921; NC3 – NMAI 031923; NC4 – NMAI 032218.000A; NC5 – NMAI 032218.000B. Row 5: NC6 – NMAI 032219; NC7 – NMAI 032224.000A; NC8 – NMAI 032226; NC9 – NMAI 032558; NC10 – NMAI 059207; NC11 – NMAI 186714A; NC12 – NMAI 186714B; NC13 – NMAI 186714C; NC14 – NMAI 186714D. Row 6: NC15 – NMAI 186714E; NC16 – NMAI 186714F; NC17 – NMAI 186714G; NC18 – NMAI 186714H; NC19 – NMAI 186714I; NC20 – NMAI 186714.000 J; NC21 – NMAI 60000; NC22 – PMAE 36–57-30/1376; NC23 – PMAE 36–57-30/1377. Row 7: NC24 – NMAI 32224B. Providenciales: Pr1 – AMNH 25/245; Pr2 – NMAI 032227A; Pr3 – NMAI 032227B; Pr4 – NMAI 032227C; Pr5 – NMAI 032205; Pr6 – TCNM/Donna Cay; Pr7 – TCNM/Finney; SC1 – AMNH 25/243. Row 8: Turks and Caicos Islands: TCI1 – NMAI 059181A; TCI2 – NMAI 059181B; TCI3 – NMAI 059181.001; TCI4 – NMAI 059182; TCI5 – BM 9749; TCI6 – BM 9750; TCI7 – BM 9751. Photos: Ostapkowicz, courtesy of the Division of Anthropology, American Museum of Natural History (AMNH); National Museum of the American Indian (NMAI); Peabody Museum of Archaeology and Ethnology, Harvard University (PMAE); Turks and Caicos National Museum (TCNM).

Fig. 4. Extracts from George Gibb's manuscript (ms. 7173, left and right), documenting the finds he made in the 1870s, together with the artefacts (for dimensions refer to Table S1). Manuscript 7173 courtesy National Anthropology Archives, Smithsonian Institution. Photos: Ostapkowicz, courtesy of the Division of Anthropology, American Museum of Natural History.

even used to portend hurricanes.[1] This highlights the potential multiple meanings of celts, well beyond their utilitarian uses.

2.1. *Typology*

The term "celt" is used here in its broadest sense, subsuming axes, adzes, and chisels.[2] This is for a number of reasons, not least because celts – particularly petaloid celts – are the most common category of Lucayan stone artefacts; very few chisels and adzes have been found in museum collections or in recent excavations. The other issue is that, even though we can categorize a tool based on its shape (e.g., chisels are small and narrow), we cannot necessarily confirm its function. Generally, bifacially symmetrical bevelled celts are hafted parallel to their wooden haft,[3] while adzes or hoes have asymmetrical (unifacial or irregular) bevelling, and are hafted perpendicular to the haft. Chisels with an elongated and cylindrical ('cigar') shape, a narrow sharp blade and rounded butt may have been wedged into a small wooden handle (Granberry, 1955; for illustrations of various hafts see Breukel, 2019). There is, however, considerable variability within all such categories. And while some have argued that the morphology of celts is not particularly important given the degree of reshaping during the course of an object's use-life (Breukel, 2019; Rodríguez Ramos, 2007), they are nonetheless highly informative precisely for charting their histories. For example, 'waisted' celts (Fig. 2, Ab6; NP1; SS1; SS3; see also Fig. 10),

[1] The Indigenous groups (Macorix, and possibly Taíno) believed that stone cemís (spiritual objects, carved in various forms) ensured a healthy pregnancy and birth, and that some would 'sweat' before a hurricane (i.e., forecast severe weather fronts). Evans (1897:58) notes strikingly similar beliefs in Europe – for example, Germany and Ireland – where celts were thought to "…perspire when a storm is approaching [and] assist the birth of children.".

[2] There are inconsistencies in the ways in which various terms have been used over the years. Herrera Fritot (1964:56) chose not to use the term 'celt,' to avoid confusion with prehistoric European celts, but referred to them as 'petaloid axe' (*hachas petaloides*). Fewkes (1907; 1922) subsumed all varieties as celts, but distinguished axes, which featured a broader blade with a neck or a transverse groove, from petaloids, with their characteristic petal or almond shape and pointed tip at the proximal end. More recently, the terms celt and axe have been used interchangeably (e.g., see various chapters in Keegan et al., 2013). Rodríguez Ramos (2010:173) has urged caution with the use of umbrella terms such as "petaloid celts," as this may gloss over considerable variability.

[3] One of the earliest illustrations of a hafted celt is provided by Oviedo (1992: Lamina I), and monolithic axes (Lovén, 2010:155–162) also document hafting techniques. Some waterlogged sites have preserved examples of wooden hafts, including Los Buchillones, Cuba, and Manatial de la Aleta, Dominican Republic (Jardines Macías et al., 2013; Ostapkowicz, 1998).

Fig. 5. Archival images of Bahamian artefacts that have disappeared from public record. a. Image sent to Irving Rouse by Ruth Wolper, ca. 1960s, possibly of artefacts held at the World Museum, San Salvador, Bahamas. Courtesy, Peabody Museum of Natural History, Rouse Archives. b. 27 celts from “Long Island and Long Bay Cays, Andros, Cherokee Sound and Moors Island.” John Goggin Papers, Box 8, Special and Area Studies Collections, George A. Smathers Libraries, University of Florida. c. “Celts from all of The Bahamas collected over a period of years [in] the Nassau Public Library. Taken there July 1, 1937”. Photo and inscription by John Goggin, ‘Goggin’s Notes’, card catalogue in the Florida Museum of Natural History, Goggin Archives. d. “Celts collected at Mores Island, Bah[amas] by E. Forsyth (Andros Sponge Commissioner). Photographed aboard his boat Nassau Harbor July 1937.” Photo and inscription by John Goggin, ‘Goggin’s Notes’, card catalogue in the Florida Museum of Natural History, Goggin Archives. e. Celts photographed by Shaun Sullivan 1976/77 at the Victoria Library, Grand Turk. They were on display with two duhos and two platters, and it is assumed that all were stolen from the Library in the late 1970s. Courtesy, Turks and Caicos National Museum.

their once-polished surfaces pitted from reworking for a different way of hafting or task, suggest the re-purposing of limited stone resources.

The transverse plane presents a cross-section of the celt through the widest point, clearly showing its form, which can be seen in the blade view of the accompanying composite photographs (Figs. 2-3). These document minor differences in their sides, which can be categorised according to Evans’ (1897:98) divisions: 1/ biconvex (sharp or slightly rounded sides, i.e., “pointed ovals” or lenticular); 2/ celts with flat sides (or ridges); 3/ celts with rounded sides (“oval” or elliptical); and 4/ what Evans calls “those presenting abnormal peculiarities.” The majority of Bahamian/TCI celts are lenticular in cross-section, with only a few being ridged: there are approximately 25 examples, mostly provenanced to Long Island and TCI (Fig. 7). The latter show parallels to eastern Cuba, where this style appears to be more common (Herrera Fritot, 1964:98). They are sufficiently distinctive to tentatively propose that the ridged Bahamian examples originated from Cuba, though with the caveat that thorough syntheses of celts from other islands, which have yet to be undertaken, may raise alternative possibilities.

Most petaloid celts from The Bahamas/TCI feature smooth, well-ground surfaces, with gently sloping edges and sides. The blade rarely has a sharply angled, unifacial bevel to one side, a feature of adzes and most chisels (see below). They are typically symmetrical, with various blade styles, from rounded to semi-circular to more rectilinear or angled (Fig. 8) – the same forms first noted by Goggin (1939), who suggested they served different functions. Continued use may occasionally create asymmetrical left or right angles to the blades, reflecting preferences in the way a tool was held when in use or a carving technique, or perhaps they may simply echo the original shape of the raw material from which they were made. The butt (or poll) also varies in shape, from pointed to domed. And just as there are angles to the blade, there are also angles to the butt, which may relate to the desired weight of the tool, or to a particular style of hafting.

A small number of examples exhibit elaborations on the basic petaloid form, including a celt with a central protrusion (Fig. 6), the meaning of which is unclear (it is unlikely to be purely functional). This is the only known example in Bahamian/TCI corpus, acquired from the “Caicos” in the 19th century, though parallels can be drawn with examples from the Dominican Republic (e.g., Herrera Fritot, 1964:Lam XVI). More striking are the seven anthropomorphic ‘effigy’ celts, featuring a carved face, and occasionally a schematic body on one side. Granberry (1955) suggests they served as cemís (carvings animated by spiritual forces) rather than celts, but the alignment of the body within the celt shape is significant, implying a connection between the two. These will be explored further in another publication.

2.2. *Use-lives: Wear and reworking*

While the importance of the presence of hard stone celts within the Lucayan archipelago has been widely acknowledged, and there is general agreement that most celts saw use (Granberry, 1955; Keegan,

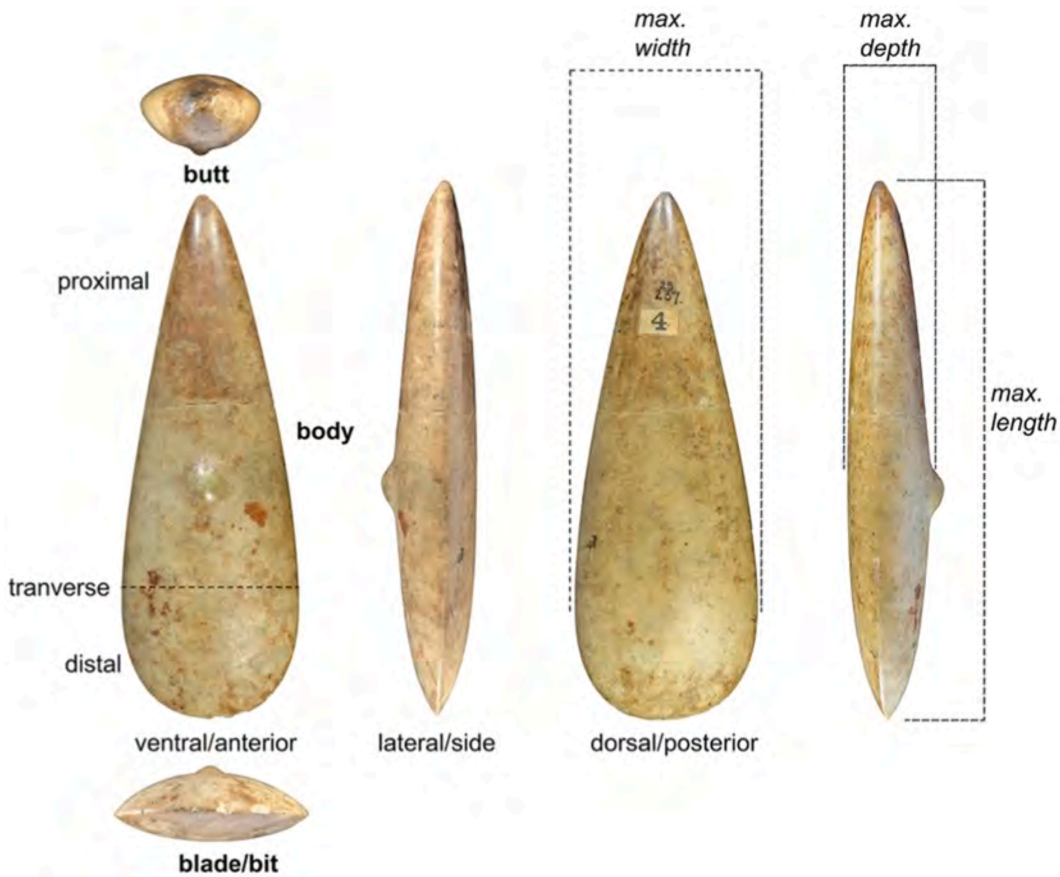

Fig. 6. Terminology for celt morphology and orientation, with overview of standard measurements taken. The applicability of such terms ventral (anterior)/dorsal (posterior) to symmetrical tools with largely indistinguishable faces work best when there are distinctive features on the celt to distinguish the sides, such as the raised central projection in this example. Photos: Ostapkowicz, courtesy of the Division of Anthropology, American Museum of Natural History, 25/237 (max length = 255.0 mm).

1997a), there has been little consideration of the specific evidence for this. While a detailed analysis, including microwear traces, awaits a future study, we present here a brief overview of some of the more distinguishing features of distal use-damage. Of the 224 specimens, the majority (162, 72.3 %) are complete, though this may reflect collector bias favouring complete specimens, especially for early museum collections. There are a relatively small number that appear "pristine" (e.g., Fig. 3, C1) or exhibit very minor nicks on the blade (e.g., Fig. 2, B1; SS7). A range of damaged blades is shown in Fig. 9, progressing from pristine edges to those exhibiting increasing use-wear and finally to what may well be intentional blunting unrelated to use. Those showing heavier damage are predominantly distal fragments, retaining roughly two-thirds of the distal end (e.g., Fig. 2, El8; LI5; SS12) and occasionally only a very short distal fragment (Fig. 2, SS2; SS21). A smaller group consists of only the proximal part of the celt (Fig. 2, An2; CI1; LI9). These are of typical in-haft medial breakages, usually resulting from torsion to the centre of the celt during use (Breukel, 2019).

Other celts have been reduced to only body fragments (Fig. 2, Ab5; Fig. 3, SC1), some of which retain their highly polished surfaces. Notably, even celts with labor-intensive, highly polished surfaces – often assumed to be prestige items – show evidence of use/alteration. While it is not always clear when breakages occurred (some have proposed that these are more recent, e.g., de Booy, 1915; Fewkes, 1907), recent archaeological investigations have recovered celt fragments at various sites across the region, including on San Salvador (Harlow et al., 2019), New Providence (Turner, 2017) and Cat Island (MacLaury, 1970). Four broken celts were recovered at MC-6, Middle Caicos, during excavations in the 1970s (Sullivan, 1981). Another celt fragment (ca. 5 cm length) was recovered at the same site during re-newed excavations in 2010. Morsink (2012:256-257) considered this celt, when complete, to be too small for cutting down trees and so not manufactured "for only utilitarian purposes"; however, when complete it would have been within the range of other celts found in the archipelago, some of which do show blade damage suggesting use (e.g., Fig. 3, NC24, L:7.6 cm). Indeed, most celts fall within the 7–12 cm length range (see further discussion below, and also Breukel (2019) for examples from the wider Caribbean). The range in size may reflect a variety of uses, from felling trees to fine woodcarving.

The legacy museum corpus parallels the more recently excavated material in other ways: reworked celts are in evidence, such as the example from Pink Wall, New Providence (Saunders and Bohon, 2000) (Fig. 2, NP1). Notches, pecked into once-polished surfaces, appear on either side of the celt, roughly half way down the body, seemingly to facilitate a different means of hafting (cf. Breukel, 2019) (Fig. 2, Ab6; EC1; NC6; NC11; SS1, SS3, TCI4). Saunders and Bohon (2000:84) have suggested that the Pink Wall example was made for ceremonial purposes, though the "scarcity of hard lithic material needed for more utilitarian implements in The Bahamas may have necessitated its subsequent conversion to more practical uses." But not every celt need be ascribed a ceremonial function: their use-lives were likely complex, and may have shifted over the lifetime of the object, as discussed further below.

The reworking of celts begs the question of how modifications to hard stone artefacts were achieved on these exclusively limestone islands. The assumption has long been that they arrived in finished form, but even so they must have been repeatedly re-sharpened to maintain

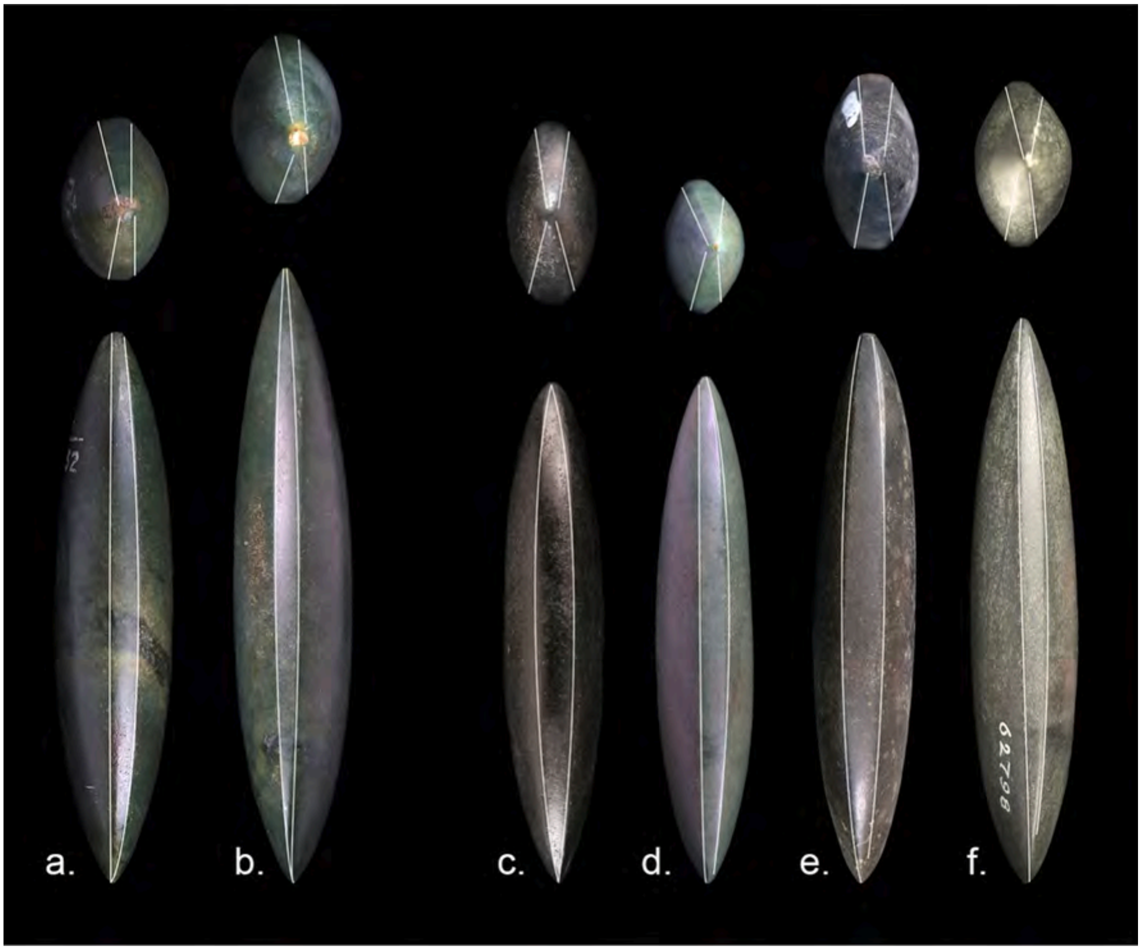

Fig 7. Profile views of ridged celts from Cuba (a-b) and The Bahamas/TCI (c-f), the edges enhanced with white borders for clarity. The square edged sides, or 'ridges', are infrequent in the Bahamian/TCI corpus, but are reportedly common in eastern Cuba (Herrera Fritot 1964:98). a. Monte Cristo Village, Baracoa, Guantanámo, Cuba, L: 97 mm, ridge W: 5 mm max, NMAI 041852B. b. Maisi, Baracoa, Cuba, L; 140 mm; ridge W: 6 mm max, NMAI 045747D. c. Bahamas, L: 77 mm, ridge W: 5 mm max, PMNH ANT.137397. d. Long Island, L:83 mm; ridge W: ca. 5 mm max, NMNH A554669. e. East Caicos (?), TCI, L: 99 mm; ridge W: ca. 6 mm, TCNM E-0132. f. Fortune Island, L: 114 mm, ridge W: ca. 6 mm max, PMAE 93–22-30/62798. Photos: Ostapkowicz, courtesy of the National Museum of the American Indian (NMAI); National Museum of Natural History, Department of Anthropology, Smithsonian Institution (NMNH); Peabody Museum of Archaeology and Ethnology, Harvard University (PMAE); Peabody Museum of Natural History (PMNH); Turks and Caicos National Museum (TCNM).

their working edge. Given the paucity of evidence for primary reduction, most celts were no doubt imported as finished objects, but there are hints that raw material was acquired on occasion. Goggin (1939) refers to waterworn igneous boulders and pebbles being found on Andros; moreover, he was able to secure an unfinished celt (Fig. 2, An4) that had "progressed so far that the blade had been formed by working two sides of the stone, but had not been shaped or polished" (Goggin, 1939:24). Unpolished "greenstone" pre-forms and flakes have been reported from North Storr's Lake and Pigeon Creek dune 1, San Salvador (Berman, 2011) and Middleton Cay, TCI (Sinelli, 2010:265; Figs. 5-44), though those from the latter site have been interpreted as the "remains of a celt or celts that were broken through use and discarded." On Eleuthera, Sinelli (2013: Fig. 15) found large "greenstone basalt" cobbles – one ca. 30 cm in length – at what he called the "Greenstone" site. Their transformation into useful tools likely also depended on imported hard stone materials, including those used in knapping roughouts, followed by pecking and grinding. Jadeites may have been shaped by pecking, grinding and polishing, as suggested by the axe manufacture site at Playa Grande, Dominican Republic, which lacks evidence for knapping preforms (Schertl et al., 2019). Quartzite sandstone, which may have been used to shape stone artefacts, has been found in some Bahamian sites, such as Three Dog, San Salvador, as well as Kendrick, Middle Caicos (Berman, 2011). In the absence of sandstone, a sand slurry could have provided an easily accessible abrasive. As Breukel (2019:101-102) notes, however, while coral and limestone sands are effective for grinding and polishing shell materials, they are not suitable for abrading harder rocks. After polishing experiments he concludes that "technological choices in abrading rock surfaces… [depend] in having knowledge of and access to both best practices and local alternatives" – and these, for the Lucayan archipelago, currently remain unknown, given the absence of convincing manufacturing sites. To provide some context for the labour involved in celt production, Pétrequin et al. (2012) suggest that making a 20 cm long polished jadeitite celt would take approximately 100 h, while subsequent repolishing and re-shaping celts over the course of their lives could equate, in some exceptional examples, to an estimated 1000 h of labour.

2.3. Stone identification

Previous material identifications of hard stone celts in the study area have been mainly undertaken by archaeologists and, although well intended, were often little more than educated guesswork, leading to some misclassifications (see discussion in Ostapkowicz et al., 2022). Goggin (1939:23), for example, proposed that all the Andros celts he acquired were altered "peridotite (probably serpentine)… there are large deposits of this serpentine in Central Cuba, and possibly that is the

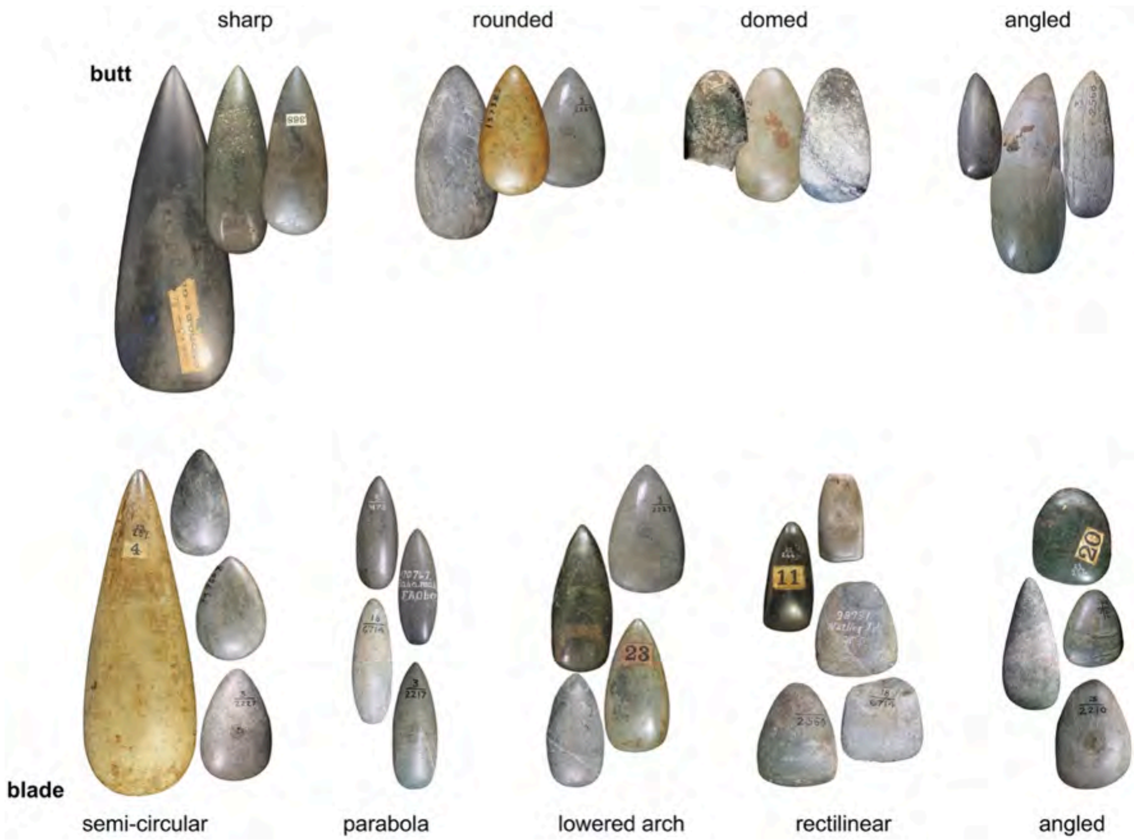

Fig. 8. Petaloid celt terminal end characteristics. Compare Herrera Fritot 1964:86 Figs. C and D. Top row, butt, sharp (*left to right*): AMNH 25/236 (C1); NMAI 137395 (B24); NMAI 137372 (NP7). Rounded: NMAI 031914 (MC5); NMAI 137387 (B18); NMAI 032227B (Pr3). Domed: PMNH ANT.028870 (GB2); B32; Highborne Cay (HC1). Angled: NMAI 059184 (EC5); NMAI 06000 (NC21); NMAI 032568 (El10). Bottom row, blade, semi-circular (*clockwise, from lower left*): AMNH 25/237 (*C*2); NMAI 032205 (Pr5); PMNH ANT.137658 (An/NP3); NMAI 032227A (Pr2). Parabola: NMAI 186714G (NC17); NMAI 059175D (B4); NMNH A170747 (B8); NMAI 032217 (MC7). Lowered arch: TCNM M−0343 (MC10); PMNH ANT.137394 (B23); NMAI 032227B (Pr3); AMNH 25/265 (C5). Rectilinear: NMAI 032560 (Cr1); AMNH 25/244 (MC1); PMNH ANT.137660 (An/NP4); NMNH A098731 (SS12); NMAI 186714H (NC18). Angled: Donna Cay; AMNH 25/262 (C3); NMAI 031920 (EC3); NMAI 032210 (MC6). Photos: Ostapkowicz, courtesy of the Division of Anthropology, American Museum of Natural History (AMNH); National Museum of the American Indian (NMAI); National Museum of Natural History, Department of Anthropology, Smithsonian Institution (NMNH); Peabody Museum of Natural History (PMNH); Turks and Caicos National Museum (TCNM).

source of the raw material used on Andros." Granberry (1955) considered serpentine to be the primary material used in the manufacture of celts found in the region. Our study of the Lucayan celt corpus, however, found only a single serpentinite example (Fig. 2, B20), while a review of the extensive range of NMAI comparative celt collections from the wider Caribbean (ca. 500), did not identify any serpentinite examples from Cuba, Dominican Republic or Haiti (ca. 200) (see also Ostapkowicz et al., 2022); only Puerto Rico was represented by three examples out of a total of 310 celts. Breukel (2019:246) also notes the limited use of this material in the wider Caribbean region. Serpentinite is typically a soft, fine-grained material with strong cleavage tendencies, making it less suitable for the manufacture of celts (Ostapkowicz et al., 2022); nevertheless, it would appear that it was used in Puerto Rico for celts during the Early Ceramic Age (ca. 400 BCE – AD 600) (Breukel, 2019:32; 246; Reniel Rodríguez Ramos, 2022, pers. comm.).

The Lucayan celt corpus was subjected to visual analysis that included examination by hand lens with up to 20x magnification (cf. Ostapkowicz et al., 2022). The exception to this is a small group of celts from TCI, identified through high-resolution photographs. Based on the observed mineralogy and texture, four main groups can be identified (Fig. 11). First, in lowest frequency (2.7 %), are igneous rocks formed by volcanic processes that retain clear textures and mineralogical abundances typical of: i) lavas flows; ii) fine-grained intrusive dykes; and iii) coarse-grained intrusive bodies with plagioclase crystals up to 1 cm across. All three subgroups are found widely throughout the Caribbean and record marked diversity in texture and mineral compositions. Hence, with few exceptions, such as the lavas from the southernmost Lesser Antilles, it is difficult to provenance these rocks based only on low-magnification examination. The next category of celts were initially sedimentary in origin (7.6 %). Due to their soft nature, most sediments are relatively weak and hence less suitable for high-impact implements. Even when subjected to metamorphism, most rocks of sedimentary origin remain weak as they have a strong fabric, such as shales and slates. Even quartz-rich sandstones tend to retain a fabric so that they will fracture preferentially in specific directions. The majority of metamorphosed sediments used for the manufacture of celts appear to have been siltstones and sandstones made predominantly of quartz that recrystallised to a relatively homogeneous texture. In several cases these rocks may be partly volcanic in origin, representing tuffs interbedded within sediments. Third are metamorphosed igneous rocks (17.9 %), i.e. rocks initially formed by volcanic processes that have been subjected to changes in pressure and temperature leading to changes in the mineralogy and texture, generally associated with the addition of water. Metamorphic rocks are common throughout the Greater Antilles and the mainland and, as with the volcanic rocks, record a huge diversity of textures and compositions.

Finally, the majority of the celts, 71.9 %, are comprised of "jades" (cf. Ostapkowicz et al., 2022). This is a group of rocks that contain a large proportion of pyroxenes (sodium-rich jadeite or calcium- and sodium-bearing omphacite) or amphiboles (calcium-bearing nephrite or

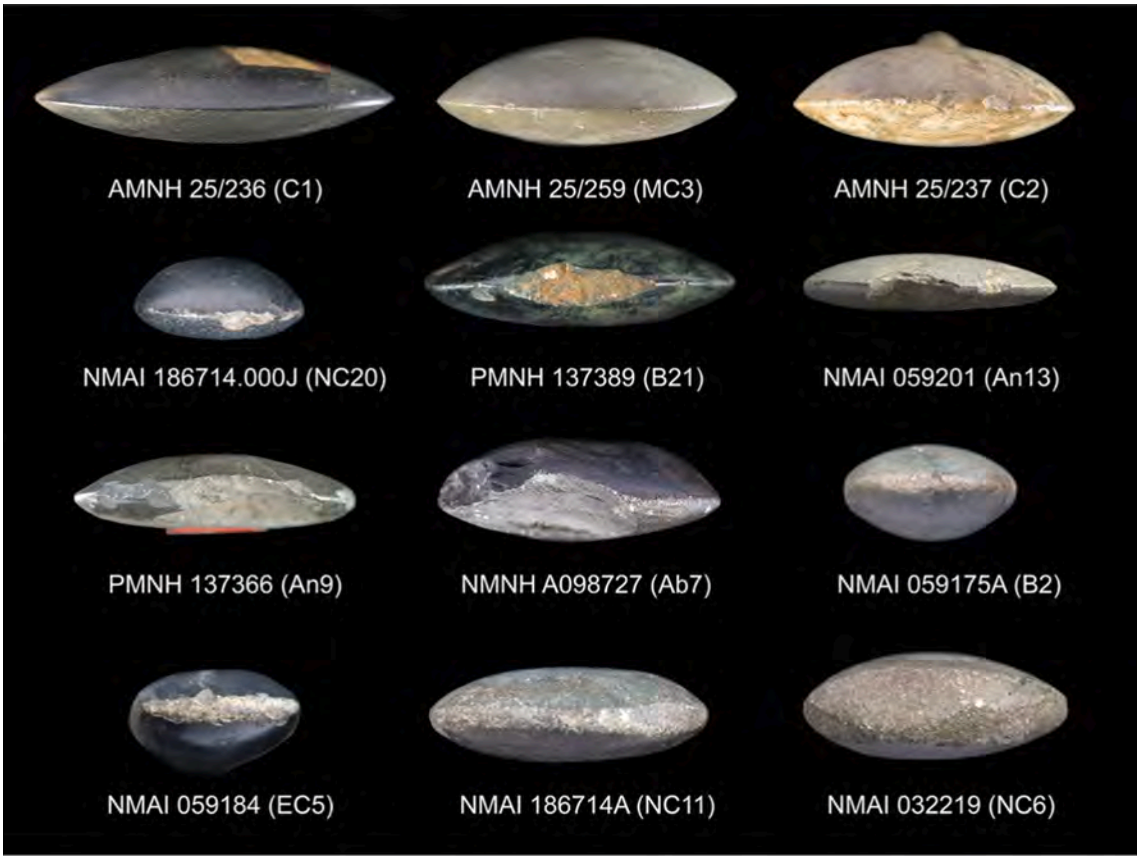

Fig. 9. Celt blades showing progressive damage, from pristine through minor to more significant chips to intentionally blunted edges. Cross reference codes (e.g., C1) with Figs. 2-3 for ventral and lateral views. Photos: Ostapkowicz, courtesy of the Division of Anthropology, American Museum of Natural History (AMNH); National Museum of the American Indian (NMAI); Peabody Museum of Natural History (PMNH).

calcium- and sodium-bearing glaucophane). Glaucophane is characteristic of the so-called blueschists due to its blue colour. Despite the chemical differences between the minerals, optical distinction between these phases can be difficult, especially when fine-grained. The majority of celts were therefore subjected to portable XRF analysis. Although not fully quantitative (see Ostapkowicz et al., 2022), it is possible to distinguish sodium-bearing phases. No sodium-free, nephrite-bearing rocks were recognised in the collections. Glaucophane-bearing examples are rare (n = 2), as they tend to have a well-developed fabric and fracture relatively easily. The jade corpus represents a highly variable mix of jadeite and omphacite with both minerals locally reaching close to 100 % in individual celts (Table S1). There are a number of recognised jadeite deposits in the circum-Caribbean region (Fig. 1), including: the Motagua valley mélanges, Guatemala; the Escambray and Sierra del Convento mélanges, Cuba; and the Río San Juan mélange, Dominican Republic; other as yet unknown sources on Cuba, Hispaniola or Jamaica have also been proposed (e.g., Garcia-Casco et al., 2009; Harlow et al., 2011; 2019; Schertl et al., 2012; 2019).

Not included in the above is a small petaloid celt from Fairfield, Crooked Island (Fig. 2, Cr2), made of fossilised shell; it may have been perceived and treated as stone rather than as shell (see also Ostapkowicz et al., 2022). Also excluded from the material, typological and metric analyses are a small number of stone fragments and flakes, some of which may represent spalls from celts. Some (e.g., those from North Storrs and Pigeon Creek, Dune 1, San Salvador) have been identified as jadeite (Harlow et al., 2019).

Further work is underway on sourcing the jades through various analytical techniques, including electron probe microanalyzer/scanning electron microscopy (EPMA/SEM; under the direction of Antonio Garcia-Casco, University of Granada) and state-of-the-art minimally invasive laser ablation sampling for trace element and isotope analyses (under the direction of Davies). Results from these studies will be presented separately.

Of the 162 complete celts (Fig. 12),118 were provenanced to a specific island, with 32 provenanced only to The Bahamas and 12 only to TCI (Table 1). Celts were divided by location in two ways. Firstly, following an environmental gradient in the archipelago from southeast to northwest, they were divided into south, central and north island groups (Fig. 1; cf. Schulting et al., 2021). The islands' flora differs substantially from south to north, which might have resulted in different demands on hard stone tools (e.g., with larger stands of softer pines in the north, compared to more tropical hardwoods in the central islands; e.g., Fall et al., 2021; Sealey, 2006). In addition, the north group is generally at a greater distance from the nearest large island, Cuba, and lacks the 'stepping stone' chains of cays that lead into the central islands, while the southern group as a whole is comparatively close to northern Hispaniola. Secondly, as this gradient more or less parallels the north coasts of Hispaniola and Cuba, they were also divided into in- and out-groups, with the former comprising those islands closest to the Greater Antilles, and the latter those more distant. Membership of this out-group is limited to Mayaguana, Rum Cay, San Salvador, Cat Island, Eleuthera, the Abacos and Grand Bahama (Fig. 1). Celts that could only be attributed to the 'Turks and Caicos Islands' were placed into the south and in-groups (see below), while those attributed only to 'The Bahamas' were excluded from the spatial analysis, but included in the comparison of celt size by raw material.

3. Distribution by number, size and material

Of the celts provenanced to island, the majority derive from the

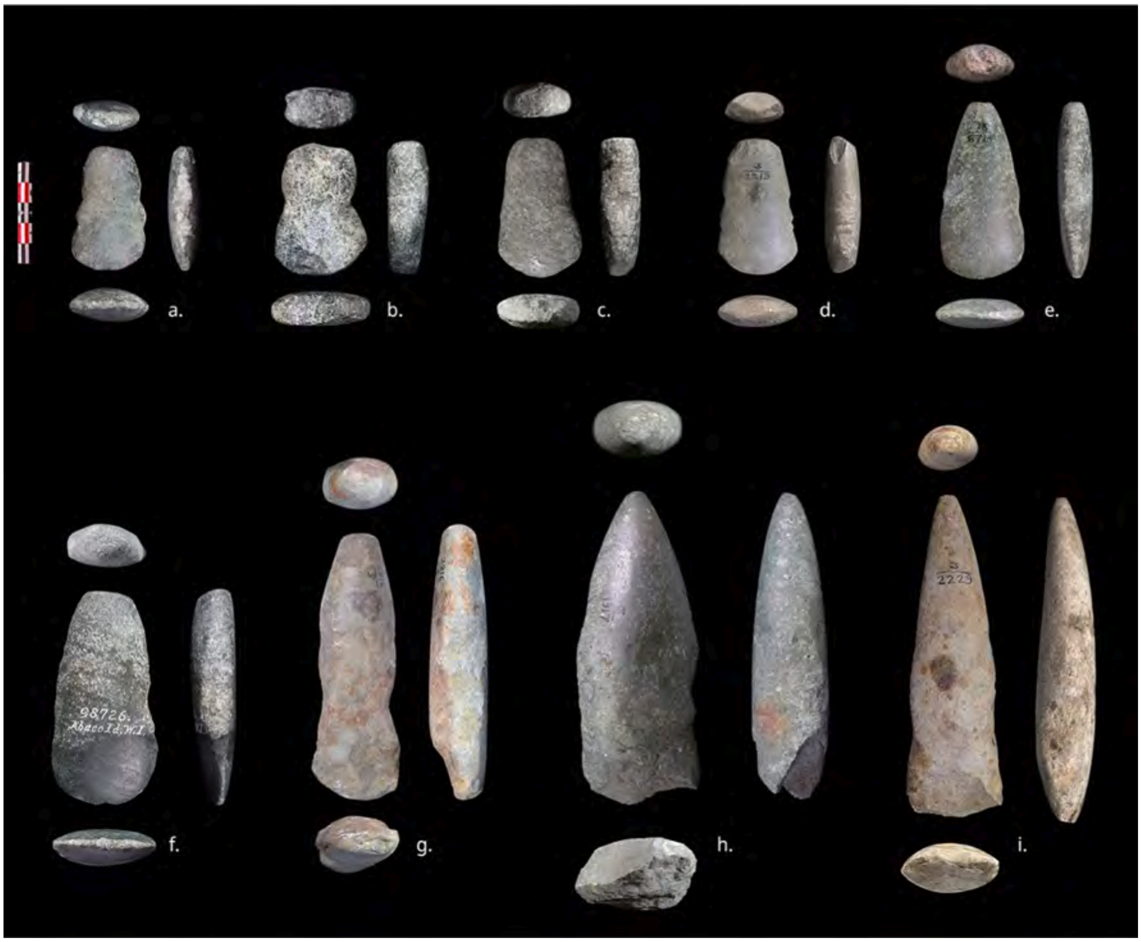

Fig. 10. 'Waisted' celts showing modification for re-hafting. a. Pink Wall, New Providence, AMMC NP-12–181-13 (NP1); b. Minnis-Ward, San Salvador, AMMC SS3/09–5 (SS3); c. North Storrs, San Salvador, AMMC 198/2000 (SS1); d. Smith's, North Caicos, NMAI 032219 (NC6); e. Bottle Creek, North Caicos, NMAI 186714A (NC11); f. Abaco, NMNH A98726 (Ab6); h. Flamingo Hill, East Caicos, NMAI 031917 (EC1); i. TCI, NMAI 059182 (TCI4). Photos: Ostapkowicz, courtesy of the National Museum of The Bahamas, Antiquities, Monuments and Museums Corporation (AMMC); National Museum of the American Indian (NMAI); National Museum of Natural History, Department of Anthropology, Smithsonian Institution (NMNH). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

south group (n = 88; note that this includes TCI), followed by the central (n = 58) and north (n = 43) groups. Compared to the total land area (km^2) of the island groups, the relatively low number from the north is clear, with a density of 0.005 celts/km^2 compared to 0.030 celts/km^2 for the south and central groups (Table 1). This is at least partly due to the fact that the large islands of the north group have seen less research, though it may also relate to their relatively low coastline-to-land-mass ratio, relevant because of the coastal focus of the Lucayan economy. This makes such differences in numbers difficult to interpret. Noteworthy is the high number of celts from TCI, particularly North Caicos (24). This is especially striking since several archaeological surveys on North Caicos since the 1970s (e.g., Sullivan, 1981) have found only one small pre-Columbian site (Carlson, 2006), in contrast to the rich legacy collections comprising at least eight open-air and two cave sites.

Table 2 presents summary statistics for the different spatial groups. No significant differences are seen between the south, central and north island groups in length (Kruskal-Wallis, $H = 4.776$, $p = 0.092$), width ($H = 2.012$, $p = 0.366$), or thickness ($H = 1.539$, $p = 0.463$) (Fig. 13a, b). While there is no difference in length between the in-group and out-group (Mann-Whitney, $Z = 0.501$, $p = 0.616$), they do differ significantly in both width and depth, with the out-group being wider and thicker than the in-group (width: $Z = 1.994$, $p = 0.046$, effect size $Z\sqrt{(n_1 + n_2)} = 0.17$; depth: $Z = 2.588$; $p = 0.010$, effect size = 0.23) (Fig. 13c, d). The effect size, however, is small. There are no significant differences in length/width ratios between the three island groups (Kruskal-Wallis, $H = 5.322$, $p = 0.070$) or between in-group and out-group (Mann-Whitney, $Z = 1.453$, $p = 0.146$). Non-jade celts are on average slightly longer (Mann-Whitney, $Z = 2.698$, $p = 0.007$) and thicker ($Z = 2.661$, $p = 0.008$) than those made of jades (Fig. 13e, f), though again the difference is small and so possibly not meaningful (effect size for both = 0.21). They are not significantly wider ($Z = 0.754$, $p = 0.451$).

It is also noteworthy that the proportion of complete celts is similar for jades (70.8 %) and other materials (76.2 %). While there is no doubt a bias in early museum collections for complete specimens, there is no evidence that this favours jades. Stone celts of whatever material have long been recogised as exotic to the Lucayan archipelago and were sought by collectors.

4. Discussion

The distribution of hard stone celts across the islands of the archipelago demonstrates that most, if not all, islands participated in the exchange network that brought and circulated them. This simple point is worth emphasising, since earlier accounts (Daggett, 1980; Sears and Sullivan, 1978) suggested that no celts had been found in the northern islands – Abaco, New Providence, Andros and Grand Bahama – despite the finds made by several early archaeologists, from de Booy's (1913) Abaco celts to Goggin's (1937 ms) celt purchases on Andros, and

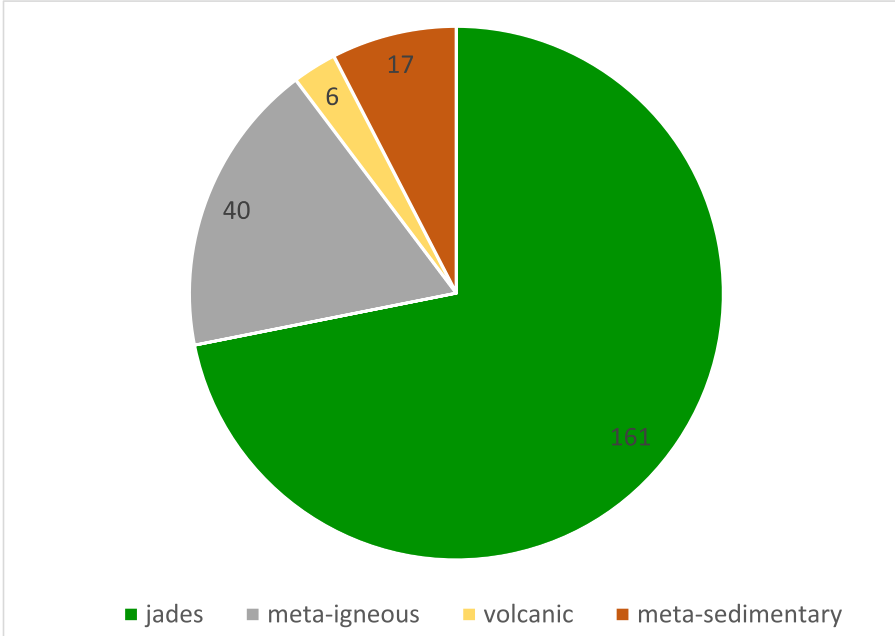

Fig. 11. Broad geological characterization of raw materials used for Bahamian/TCI celts (n = 224).

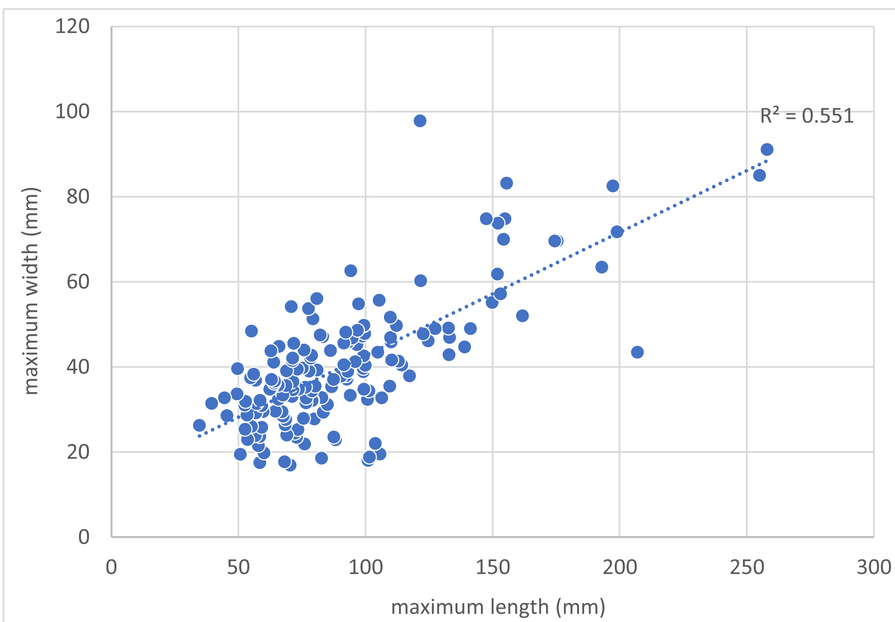

Fig. 12. Scatterplot of length–width measurements for complete celts (n = 162).

Rainey's (1934 ms) on northernmost Grand Bahama. Sears and Sullivan proposed that celts found in the north resulted from the historic practice of placing a thunderstone below the mast of a boat for good luck: "boat purchasers have descended upon… [boat] construction locales [Man of War Cay, Abaco and Mangrove Cay, Andros] with celts of diverse origins in hand, since the last century" (Sears and Sullivan, 1978:7-9). Daggett (1980:149) also argued that non-local material culture, including celts, was "heavily weighted towards the southern Bahamas", becoming far less frequent in the central Bahamas, and totally absent in the north. Such conclusions were not only based on the relatively limited archaeological work done in the region at the time, but notably, reflect a wider tendency in the Caribbean (as elsewhere) to downplay the relevance of legacy museum collections, though these were known (cf. Granberry, 1955). Subsequent excavations have confirmed the presence of stone celts in the northern islands, for example, at the sites of Clifton Point (NP-014) and Pink Wall (NP-012), New Providence (Saunders and Bohon, 2000; Wilkie and Farnsworth, 1999); other sites, such as Rico's Hill North (AB-021) and South (AB-020) on Abaco, have also yielded imported ceramics and ornaments, etc. (e.g., Aarons et al., 1992; for wider discussion of imported ceramics, particularly into the central islands, see Keegan et al., 2022). The proportion of jade celts, however, is significantly lower in the north group of islands (55.8 %) than in the central (79.3 %) and south groups (79.5 %) (χ^2 = 9.666, p = 0.008; Fig. 1), suggesting that jades may have been preferentially retained by communities on those islands. Far fewer imported pottery vessels also appear to have made their way to the northern islands (Keegan et al., 2022).

Our analysis found no significant differences in celt length between

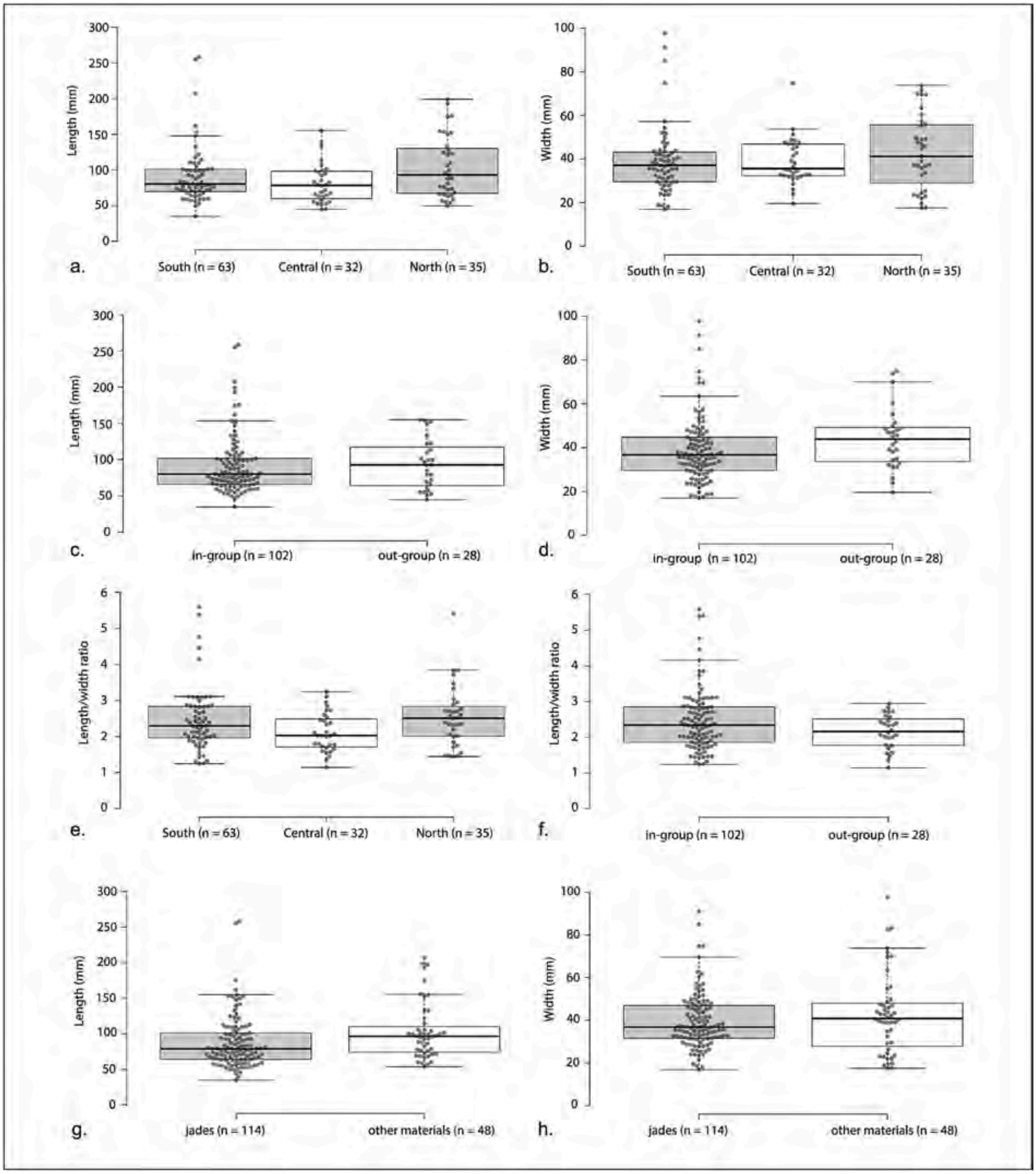

Fig. 13. Boxplots comparing: a) length by island group; b) width by island group; c) length by in/out-group; d) width by in/out group; e) length/width ratio by island group; f) length/width ratio by in/out-group; g) length by material; h) width by material.

the islands, no matter how they were grouped. Nevertheless, it is worth noting that celts in the north and out-groups had median lengths greater than 10 mm greater than the other groups (Table 2); indeed, the largest celt (33 cm) documented from the region – known only from an archival reference to a Nassau collection – is attributed to San Salvador (Goggin, 1952 ms). This is the opposite of what would be expected had supply been a problem such that these celts saw greater use. While celts of the out-group were on average slightly wider and thicker, they did not differ in their length/width ratios, so that this is likely not the result of more extensive resharpening, which would be expected to lead to "stubbier" celts (cf. Shott, 1989). It is clear that many celts saw use, as evidenced by use-wear on the blades, breakages and re-working. Others, however, appear to have been highly curated, polished to a high gloss that exceeded functional requirements. From this we can infer that celts served both prestige and/or ceremonial roles, as well as functional roles. The particular biographies of axes may have determined their treatment. Some, for example, may have been part of formal exchange between elites or "big men" (Berman et al., 2013), while others may have been exchanged more informally. The "status" of celts may have also changed following their initial exchange between the primary actors (and their descendants?), sometimes increasing as time passed and they achieved the status of ancestral heirlooms (cf. Pétrequin and Pétrequin, 2006:254, 299–302), but in other cases diminishing and perhaps entering the utilitarian sphere.

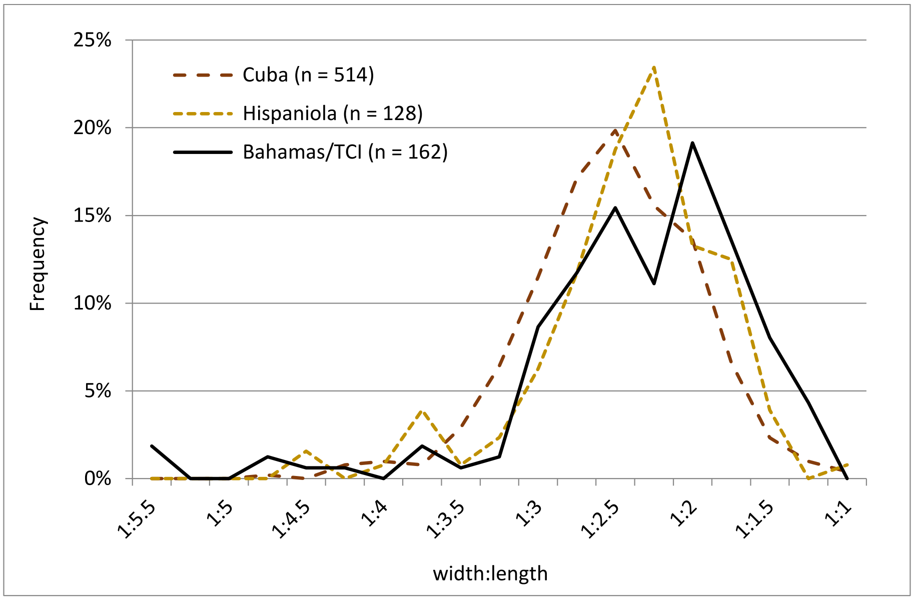

Fig. 14. Frequency distribution of stone celt width:length indices from Cuba, Hispaniola and The Bahamas/TCI (Cuban and Hispaniolan data from Herrera Fritot 1964:100).

Studies of celts in regions where they are still used are very informative. In Papua New Guinea, for example, Pétrequin and Pétrequin found that while *all* axes were used for woodworking, the larger and more ornate ones also had ceremonial roles. But they note that even "the biggest axes are not necessarily the most prized; the rock, the type of crystallization, the quality of polishing and coating are taken into account, as well as the age of the axe and its personal history. The most famous historical axes can be recognised by many, by details of the crystals, in the same way that a maker will long remember his production" (Pétrequin and Pétrequin, 2006:301-2; translation by authors). Some axes are kept for generations, particularly the very large, 'old' axes (over 35 cm in length) which are passed down within families, and come to symbolise a clan's power. Important celts are safeguarded and only exchanged with great ceremony during critical political negotiations with outside communities. It would be dangerous for those who are not ritually prepared or have no intermarriage relationships with the holding clan to possess these blades. While distant in time, space and cultural context to our subject area, such cases allow us to consider the nuances of meaning that may have been associated with celts and their varied roles.

The closest and most appropriate comparanda for the Lucayan celts are from Hispaniola and Cuba. The largest published corpus from these islands of which we are aware is that of Herrera Fritot (1964). Raw measurements are not provided, but the celts are placed into width: length ("petaloid index") categories that allow comparison with our dataset. The distributions of all three regions are quite similar (Fig. 14), which is no doubt partly a simple reflection of functional requirements, but also of the putative Greater Antillean origins of the Bahamian/TCI celts. The main difference in their distributions lies in The Bahamas/TCI having a higher proportion in the 'standard wide' and 'very wide' categories (Table 3). This is consistent with a greater degree of reworking of celts in the archipelago – the difference is statistically significant for comparisons between the combined Greater Antillean islands and The Bahamas/TCI (Kolmogorov–Smirnov D = 0.198, critical D = 0.120), and for Cuba and The Bahamas/TCI (D = 0.211, critical D = 0.123; Table S2). However, it is not marked, which implies that access to hard stone was reasonably constant and secure across the archipelago. The lack of any clear size diminution in the islands furthest from Cuba and Hispaniola provides further support for this. Even if, as some studies have suggested (Harlow et al., 2006; 2019; Knaf et al., 2021; 2022; Rose, 1987), sources of stone were even more distant (i.e., Guatemala), the lack of other material evidence for direct contact implies that they would have most likely reached the archipelago through Cuba.

The minimal evidence for any difference in use-lives between jade and non-jade celts (as inferred from size when removed from circulation and proportion of complete vs incomplete celts) implies that no particular preference was attached to jade as a material (though possibly countering this is the higher proportion of jade celts in the south and central islands). In fact, non-jade celts are on average slightly larger than their jade counterparts, though this may simply reflect the greater availability of larger nodules of non-jade rock, given the tendency of jade outcrops to be much smaller (Harlow and Sorensen, 2005). It may be that the lack of hard stone on the islands made any stone celt equally valuable. Moreover, as most celts were exchanged to the islands as finished objects, the Lucayans presumably had limited knowledge of the initial stages of quarrying and manufacture, where differences in the properties of the materials would be more evident. In addition, the range of colours and textures in jades and non-jades may have blurred visual distinctions between them (Figs. 2 and 3; cf. Ostapkowicz et al., 2022: Fig. 8). More to the point, Indigenous Caribbean understandings of stone – as with other materials – may have rendered modern Western taxonomies irrelevant. Rodríguez Ramos (2010:35) has used the term 'social jade' to refer to other materials in the wider Caribbean, such as serpentinite, quartz and agate, that seem to have been perceived and used in ways that were indistinguishable from jades. It may be that, for the Bahamian archipelago, this idea could be extended to any exotic hard stone.

That said, it can still be noted that jades are the predominant material used for celts across the Lucayan archipelago, apparently even more so than in the neighbouring Greater Antilles. A visual examination of comparative collections in the Smithsonian's National Museum of the American Indian undertaken by project SIBA identified 54.8 % of celts and adzes from Cuba as jades (n = 146, mainly from Guantánamo province), compared to 27.3 % from Hispaniola (n = 44) and only 11.2 % from Puerto Rico (n = 313) (Tables S3-S5). The Hispaniolan collection is heavily biased to Île de la Gonâve, Haiti, and so may not be representative of the island as a whole. Yet, even at Playa Grande, which is situated near a jade source in the Dominican Republic, jades only account for ca. 36 % of woodworking tools (Schertl et al., 2019); surprisingly, some of these have been attributed geochemically to

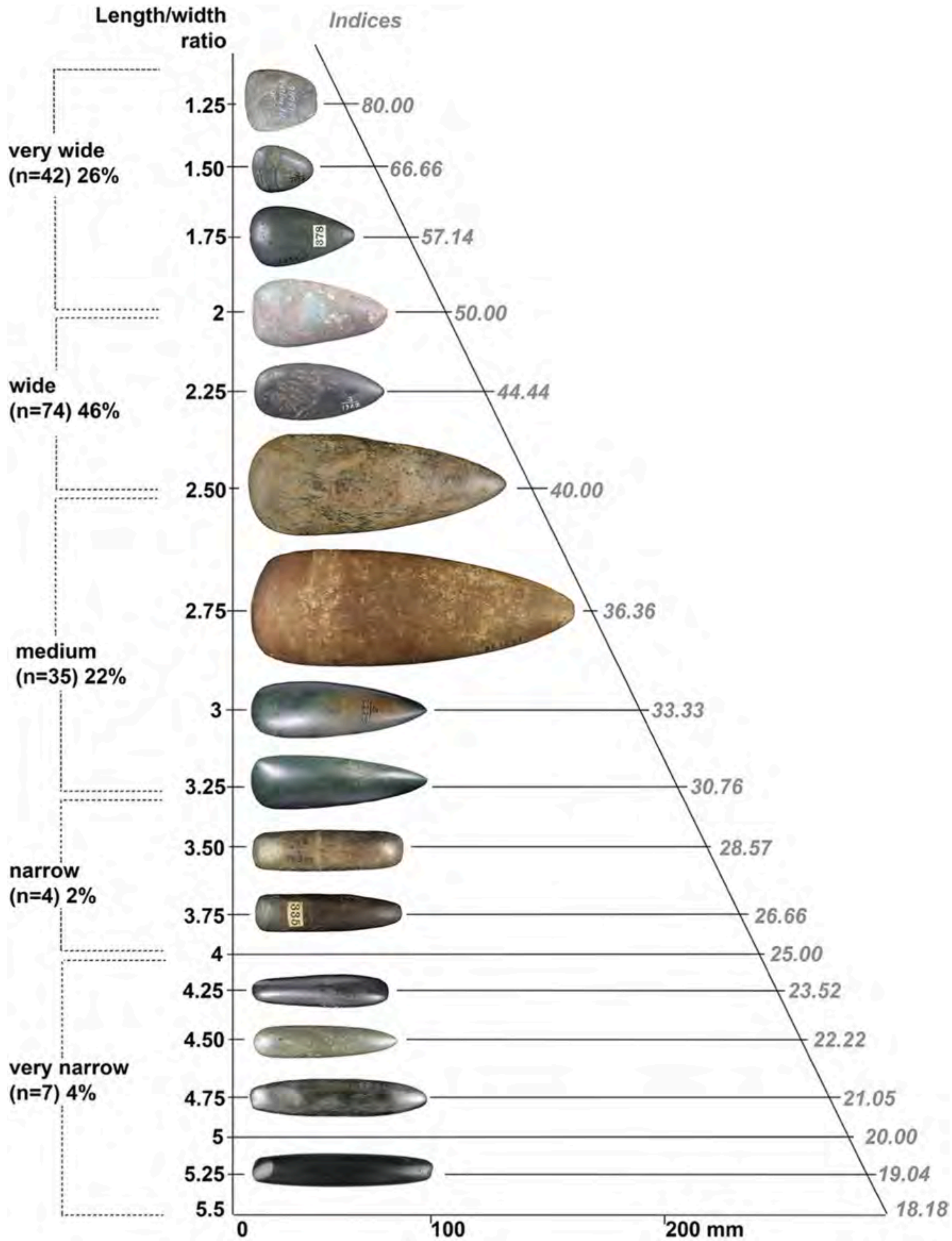

Fig. 15. Celts from the Lucayan archipelago aligned to Herrera Fritot's scale (Herrera Fritot 1964: 95). From top to bottom: 1.25: NMNH A098731 (SS12); 1.50: NMAI 031920 (EC3); 1.75: PMNH ANT.137380 (B16); 2: TCNM/Donna Cay (Pr6); 2.25: NMAI 031922B (EC4); 2:50: PMNH ANT.137371 (An11); 2.75: PMNH ANT.137369 (NP6); 3: NMAI 032229C (M3); 3.25: NMNH 554668 (LI16); 3.50: PMNH ANT.058330 (An12); 3.75: PMNH ANT137378 (NP8); 4.25: NMAI 031921 (NC2); 4.50: PMNH ANT.028854 (In6); 4.75: PMNH ANT.137396 (B25); 5.25: PMNH ANT.137656 (An/NP1). Photos: Ostapkowicz, courtesy of the National Museum of the American Indian (NMAI), National Museum of Natural History, Department of Anthropology, Smithsonian Institution (NMNH), Peabody Museum of Natural History (PMNH) and Turks and Caicos National Museum (TCNM).

Guatemala (Knaf et al., 2022). The low proportion of jades from Puerto Rico does appear to be a real phenomenon (Jeff Walker, 2023, pers. comm.; Rodríguez Ramos, 2011), suggesting limited participation of that island in whatever exchange networks circulated this material in the Greater Antilles. The proportion of jade celts becomes lower still in the Lesser Antilles (Rodríguez Ramos, 2011:153): at Golden Rock, St. Eustatius, only ca. 8 % of axes recovered were identified as jadeitites (Garcia-Casco et al., 2013).

It should be noted that the Greater and Lesser Antillean sites represent a much longer timespan than those of the Lucayan archipelago. This

Table 1
Summary of island provenance divided into jades and other materials.

Island	jades	other stone	total	% jade	area km²	celt/ km²
South group						
East & South Caicos	9	4	13	69 %	91	0.143
Grand Turk/Salt Cay	2	0	2	100 %	18	0.111
Middle Caicos	6	4	10	60 %	144	0.069
North Caicos	22	2	24	92 %	116	0.207
Providenciales	6	1	7	86 %	98	0.071
TCI (unspecified)	10	4	14	71 %	–	–
Acklins	1	0	1	100 %	389	0.003
Long Cay/ Fortune Island	1	1	2	50 %	8	0.250
Crooked Island	3	0	3	100 %	148	0.020
Great Inagua	5	2	7	71 %	1679	0.004
Mayaguana	5	0	5	100 %	280	0.018
South total	**70**	**18**	**88**	**80 %**	**2971**	**0.030**
Central group						
Cat Island	1	1	2	50 %	389	0.005
Eleuthera	9	1	10	90 %	457	0.022
Exumas	1	0	1	100 %	250	0.004
Long Island	15	4	19	79 %	596	0.032
Ragged Island	1	0	1	100 %	23	0.043
Rum Cay	2	0	2	100 %	78	0.026
San Salvador	17	6	23	74 %	163	0.141
Central total	**46**	**12**	**58**	**79 %**	**1956**	**0.030**
North group						
Abaco	6	3	9	67 %	2009	0.004
Andros	8	5	13	62 %	5957	0.002
Grand Bahama	1	1	2	50 %	1373	0.001
New Providence	5	8	13	38 %	207	0.063
New Providence/ Andros	4	2	6	67 %	–	–
North total	**24**	**19**	**43**	**56 %**	**9546**	**0.005**
Bahamas (unspecified)	21	14	35	60 %	–	–
TCI total	**55**	**15**	**70**	**79 %**	**467**	**0.150**
Bahamas total	**106**	**48**	**154**	**69 %**	**14,006**	**0.011**
Grand total	**161**	**63**	**224**	**72 %**	**14,473**	**0.015**

is relevant as the use of jade for celt production may have intensified after AD 500/700 within the Greater and Lesser Antilles (and after CE 1000 for eastern Cuba, associated with "Taíno" contexts) (Rodríguez Ramos, 2011). This coincides with the expansion of Lucayan settlement, and so a higher percentage of jades seems in line with expectations, though 71.9 % remains exceptionally high in comparison to the rest of the Caribbean. Thus, despite the absence of evidence for any clear difference in treatment (e.g., higher levels of curation), it may still be that jade celts were seen as more desirable than other stone in the archipelago, as is also suggested by their apparent preferential retention in the southern and central islands. Given the absence of any hard stone on the Lucayan archipelago, it is unlikely that their dominance is related to a collector bias in favour of jades, especially as the range of colours and textures do not make their identification immediately obvious.

5. Conclusions

We document a corpus of 224 hard stone celts from the Lucayan archipelago now in public collections, though archival research indicates that this is only a fraction of the number that have been recovered from the islands, but subsequently lost or passed into private ownership. Typologically, many take the classic petaloid form, though a range of other types – including adzes and chisels – are also present. A small number of very distinctive ridged forms potentially suggest direct connections with Cuba, though this needs further investigation with a larger comparative sample. Celts occur throughout the archipelago, including the northern islands where they were previously thought absent or rare. There is no clear evidence for any dimunition in size with distance from proximate sources, here taken to be Hispaniola and Cuba. This suggests that exchange systems were adequate in meeting demands over the 600–800 year occupation of the archipelago. Jades are by far the most common materials for celts, though whether this reflects a preference or availability is unclear. There is no evidence that jade celts were treated differently than those made of other materials, with examples of both being finely shaped and highly polished, but also experiencing similar use-damage. We argue that the biographies of celts were varied and complex, permitting no simple classification into "prestige" and "utilitarian".

Our study focused on historic legacy collections, supplemented by a relatively small proportion of more recent finds from archaeological excavations. Watters and Brown (1999:292) note that the "primary research value" of old museum collections, lacking provenience (i.e., stratigraphic context), "is at the level of artefact typology." While to some extent this may be a valid point, project SIBA diverges from such restricted views of museum collections. Artefacts held in museum repositories, with or without context, are not mute, superficial records of the past: their embodied histories have the potential to inform on a much wider discourse that encompasses agency, belief systems, social

Table 3
Celt shape categories according to Herrera Fritot's 'bi-axial index' (DR, Dominican Republic; TCI, Turks and Caicos Islands) For Bahamas/TCI examples see Fig. 15.

Forms	width/length ratio	Frequency Cuba/DR n = 646	Frequency Bahamas/TCI N = 156
Very wide	<1:2	10 % rare	26 % (n = 40)
Wide	1:2 to 1:2.50	48 % predominant	45 % (n = 69)
Medium	1:2.75 to 1:3.25	35 % frequent	22 % (n = 33)
Narrow	1:3.50 to 1:4	5 % rare	3 % (n = 4)
Very Narrow	greater than 1:4	1 % exceptional	4 % (n = 6)

Table 2
Summary statistics for complete celts by island group and material (SD, standard deviation; med, median).

Group	*length (mm)*			*width (mm)*			*depth (mm)*			*lenth/width ratio*			*n*
	mean	*SD*	*med*	*mean*	*SD*	*med*	*mean*	*SD*	*med*	*mean*	*SD*	*med*	
south	92.5	41.8	80.2	39.1	15.6	37.1	20.4	7.6	18.5	2.5	0.9	2.3	63
central	81.0	27.6	78.2	38.9	10.7	35.6	20.8	5.5	20.7	2.1	0.5	2.0	32
north	104.0	43.2	93.0	43.0	17.0	41.2	22.0	7.7	19.3	2.5	0.8	2.5	35
in-group	92.5	41.3	80.0	39.1	15.1	36.6	20.3	7.3	18.4	2.5	0.9	2.3	102
out-group	93.6	34.2	92.7	43.9	14.0	43.8	23.2	6.1	23.4	2.2	0.5	2.2	28
all (includes 'Bahamas')	92.4	38.4	81.5	40.5	15.0	37.9	21.0	7.0	19.3	2.4	0.8	2.3	162
jades	88.2	37.2	78.8	39.6	13.0	36.8	20.0	6.3	18.8	2.3	0.7	2.3	114
other stone	102.4	39.9	95.3	42.8	18.8	41.7	23.3	8.2	21.7	2.6	1.0	2.3	48

connections, politics and economics. While we have only scratched the surface in the overview provided here, the potential of this material is already apparent. These aspects will be explored in greater detail in forthcoming publications.

CRediT authorship contribution statement

Joanna Ostapkowicz: Writing – original draft, Writing – review & editing, Methodology, Conceptualization, Funding acquisition, Investigation, Visualization. **Rick J. Schulting:** Writing – original draft, Writing – review & editing, Conceptualization, Investigation, Methodology, Visualization. **Gareth R. Davies:** Funding acquisition, Investigation, Methodology, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

Work towards this paper was supported by a grant from the UK's Arts and Humanities Research Council for the project *SIBA: Stone Interchanges in the Bahamian Archipelago* (AH/N007476/1). This study would not have been possible without the support of the many project partner museums and institutions holding Bahamian/TCI collections, including: National Museum of The Bahamas, Antiquities, Monuments and Museum Corporation, Nassau; Lowe Museum, Abaco; Turks and Caicos National Museum, Cockburn Town; American Museum of Natural History, New York; National Museum of the American Indian, and National Museum of Natural History, Smithsonian Institution, Washington; Peabody Museum of Natural History, New Haven; Peabody Museum of Archaeology and Ethnology, Cambridge, MA; Maxwell Museum, Albuquerque; Field Museum, Chicago; Department of Anthropology, Florida Atlantic University, Boca Raton; University of Florida Museum of Natural History, Gainesville; and the British Museum, London. Archives have also been particularly helpful in establishing collection histories, including the National Anthropology Archives, Smithsonian Institution, Suitland; Special Collections and Archives, Cline Library, Northern Arizona University, Flagstaff; George A. Smathers Libraries, University of Florida, Gainesville. Alice Knaf, Quinty Boosten, Chloe Buytendijk, Hester Dijkstra, Eva Kelderman, Tijmen Opsomer and Fons Vermeulen assisted with visual material identifications. Many thanks to Jeff Walker, Reniel Rodríguez Ramos and to two anonymous reviewers for their useful comments, which have greatly improved the paper.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jaa.2023.101504.

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