Chapter 15

Analysis of Chipped Stone Artifacts from Ops. 51, 57, 58, 59, 61, and 62 at Crawford Bank*

including Appendix A: Crawford Bank STP Series 035 and Surface Collection

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Introduction

This report summarizes the results of the analysis of the chipped stone tools excavated from operations (Ops.) 51, 57, 58, 59, 61, and 62 at Crawford Bank, Crooked Tree, Belize, by the Belize River East Archaeology (BREA) Project between January 2020 and Summer 2022. A total of 1,615 stone artifacts were analyzed in terms of raw material, metrics, and technology. Additionally, use-wear analysis was conducted on a portion of the 1,083 chipped stone artifacts from Op. 51. The lithic artifacts were recovered from aceramic contexts. Three radiocarbon dates from strata located 62-65 cmbd in Op. 57 yielded historic to modern dates (200 +/- 30 BP or 1720-1780 cal CE; see Brouwer Burg 2023:128), underscoring the extreme amount of sediment mixing that has occurred along the Crooked Tree lagoon shoreline. However, the artifacts described below are considered to be preceramic based on the absence of pottery in the units from which they were recovered and the presence of some tool types similar to those recovered from other preceramic contexts in Belize (see below).

Raw Materials

The lithic assemblage from the six operations at Crawford Bank consists of 1,603 (99.3%) cryptocrystalline silicates (chert or chalcedony) and 12 (0.7%) limestone artifacts (**Figure 15.1**). Of the cryptocrystalline silicate chipped stone artifacts, 561(35.0%) were identified as chert from the Northern Belize Chert-bearing Zone (NBCZ) based on their fine texture and characteristic banding and/or mottling and colors ranging from yellow/gold, honey brown, grayish brown, tan, to gray (Hester and Shafer 1984:164; Mitchum 1994:54; Shafer and Hester 1983:521; see McAnany 1989:334). This high-quality chert is distributed throughout Northern Belize in what were once called the 'flint bearing soils' (Wright et al. 1959) of central Northern Belize but is typically referred to now as the 'chert-bearing zone' (Shafer and Hester 1983; Hester and Shafer1984:158-159; also see Cornec 1985) that contains Colha and other lithic workshops nearby (e.g., Chicawate, Kunahmul, Maskall, and Sand Hill). In addition to Colha and neighboring workshops, NBCZ chert has been found at many Maya sites throughout mainland Northern Belize, as well as on Ambergris Caye, in the form of finished tools and debitage (e.g., Dockall and Shafer 1993; Hult and Hester 1995; Lewenstein 1987; McAnany 1989; McSwain 1991; Mitchum 1991; Mock 1997; Shafer 1983; Speal 2006, 2009; Stemp 2001, 2004; Stemp and Graham 2006). A number of preceramic bifaces and constricted unifaces have also been made from NBCZ chert, in addition to cores and flakes at preceramic sites (see Iceland 1997; Lohse 2010; Rosenswig et al. 2014; Stemp et al. 2016, 2018; Stemp and Harrison-Buck 2019; Stemp and Rosenswig 2022).

In addition to NBCZ chert, 80 (5.0%) chipped stone artifacts were made from medium-fine- to coarse-grained cherts that were primarily brown and gray in color, some of which were semi-translucent. A few have banding. They tended to have variable amounts of microvoids and small inclusions. It is not known where these cherts originate, but minimally they can be differentiated from the better quality NBCZ material. It is suspected that these are local cherts from the Crooked Tree area. It is possible that some may have come from further afield. Some of the coarser-grained cherts may be from around Northern River Lagoon (Mock 1997), Rocky Point (Kelly 1982), Midwinter Lagoon (Stemp 2001), Saktunha/Cabbage Ridge (Speal 2006, 2009), or near Laguna de On (Masson 1993, 1997; Oland 1999; see Paris 2012: 114-115, Fig. 1 for the "Cryptocrystalline Pebble Zone")

There were 24 (1.5%) chalcedony artifacts recovered. The chalcedony artifacts possessed a whitish-gray, porous cortex and the stone itself had a fibrous texture and was variably translucent brown/honey and yellow in color. The chalcedony recovered from these sites may have come from the limestone facies north of the NBCZ, across the Freshwater Creek and New River faults (Hester and Shafer 1984:158), near Orange Walk Town (Hester and Shafer 1984:160), or around Laguna de On (Oland 1999:105, Table 1; see Paris 2012: 114-115, Fig. 1 for the "Cryptocrystalline Pebble Zone")

Most of the chipped chert or chalcedony artifacts (938 or 58.5%) were classified as "indeterminate" in terms of chert type due to the significant burning and/or patination of the raw material. Burning changed both the internal and external structures and the colors of the stone with pink, gray, red, white, and black variously occurring (based on the intensity and/or degree of burning). Burnt chert was also recognized based on one or more structural changes of the raw material, including fracture into angular chunks, potlids, crazing, calcination, and a change in luster to a greasy/shiny 'gloss' (Luedtke 1992: 97, 106; Mandeville 1973: 183; see Clemente-Conte 1997; Purdy 1974). The patinas that developed on the tools included 'black' patination/oxidation, glossy patination, and white patination based on the specifics of the chemical interactions with the environments in which they were found (Cackler et al. 1999; Glauberman and Thorson 2012: Howard 2002; Hult and Hester 1995; Lévi-Sala 1986: 230, 240, 1993; Luedtke 1992: 99-100; Plisson and Mauger 1988; Purdy and Clark 1987: 232; Rottländer 1975; Stapert 1976: 12; Stemp 2001: 28-29; Thiry et al. 2014). Patinas altered the surface color and/or surface textures of the artifacts. Artifacts with white patinas possessed variably porous microsurfaces and yellowish-white to white coloration. Those with 'black' patinas tended to range from glossy to matte and smooth in surface textures. Glossy patinas created very smooth and lustrous surfaces, but did not, in and of themselves, alter the surface coloration of the cherts. Artifacts with glossy patinas do not seem to develop white or 'black' patinas.

The 12 limestone artifacts were dolomitic and likely came from areas in or around Crawford Bank. In some cases, the limestone was very similar to coarse-grained chert. Like the cherts, the limestone tended to be badly burnt.

The raw materials from the STP series 035 test pits and the surface of Crawford Bank are similar to those reported above. Notably, there were no limestone artifacts documented and the percentage of stone tools and debitage that could be identified as NBCZ chert was higher than that for the operations (**Appendix A: Figure A1**). Specifically, 151 (59.4%) chipped stone artifacts were made from NBCZ chert, 9 (3.5%) were made from other chert, 7 (2.8%) were produced from chalcedony, and the rest 87 (34.3%) of the chert or chalcedony artifacts were considered 'indeterminate' in terms of raw material type.

Tool Types and Production Technology

Of the 1,615 chipped artifacts excavated from Ops. 51, 57, 58, 59, 61, and 62 at Crawford Bank, 22 (1.4%) were classified as 'formal' tools (**Table 15.1**). The 'formal' tools consist of 4 thin biface fragments (**Figure 15.2**), 2 thick biface fragments, either a poorly made thick biface or a biface preform (**Figure 15.3**), 7 edge fragments from small bifaces/celts (**Figure 15.4**), 1 macroblade fragment, 2 unifacially retouched macroblade fragments (**Figures 15.5 and 15.6**), 3 pointed unifaces (the distal ends of retouched macroblades) (**Figure 15.7**), 1 whole blade (**Figure 15.8**), and 1 blade fragment. Most of these tools (12 or 54.5%) were made from NBCZ chert, 2 (9.1%) were produced from other chert and the remining 8 (36.4%) were indeterminate chert (some of which are also likely NBCZ chert) or chalcedony that cannot be identified visually due to post-depositional alteration). Many of the tool types in this report are similar to those described for the Archaic period in Belize (Iceland 1997; Lohse et al. 2006: 222, Fig. 8; Stemp et al. 2021: 418-420) and are similar to some of those recovered from excavations at Crawford Bank in 2017 (Stemp and Harrison-Buck 2019). Based on the debitage recovered, specifically the bifacial thinning flakes and the lack macroflake or macroblade cores, it seems unlikely that bifaces and microblade tools were produced at Crawford Bank (see below). At least some blades may have been locally produced given the recovery of a single NBCZ chert blade core with multiple unidirectional blade scars originating from the striking platform and perhaps some crude bifaces (see below).

Table 15.1 Formal tools by raw material types from Ops. 51, 57, 58, 59, 61, and 62, Crawford Bank.

Tool type	NBCZ chert	Other chert	Chalcedony	Indeterminate chert	Limestone
Thin bifaces	1	1[a]	-	2	-
Thick bifaces/celts	1	-	-	1	-
Thick biface/celt preforms	-	1	-	-	-
Biface edges	3	-	-	4	-
Macroblades	1	-	-	-	-
Retouched macroblades and pointed unifaces (unifacial)	4	-	-	1	-
Blades	2	-	-	-	-
Total	**12**	**2**	**0**	**8**	**0**

[a]Serrated thin biface; partial beveling from pressure flaking/retouch.

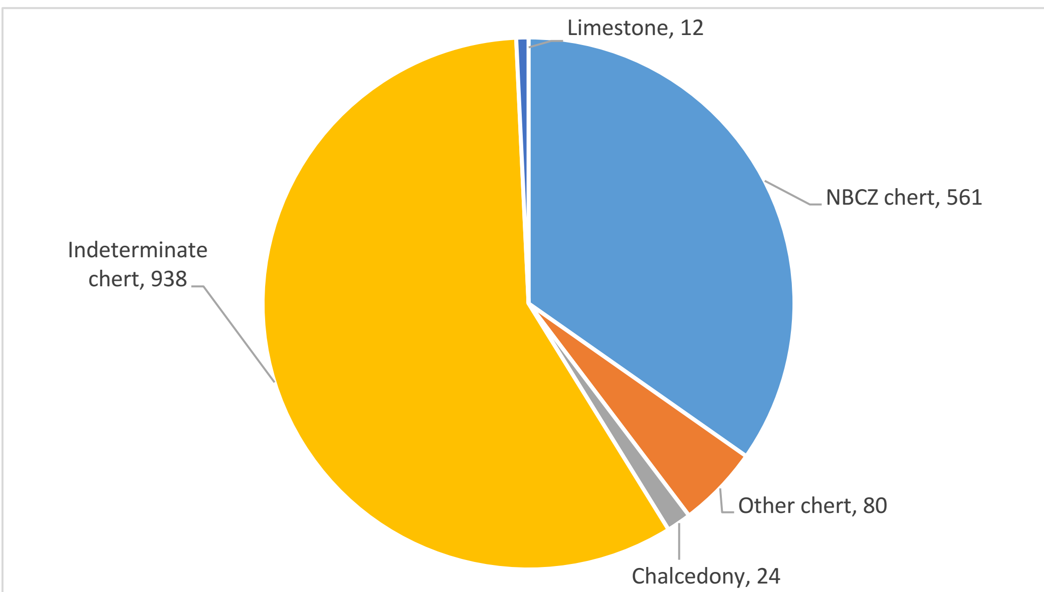

Figure 15.1 Number of lithic artifacts by raw material type from Ops. 51, 57, 58, 59, 61, and 62 at Crawford Bank (image by W. J. Stemp).

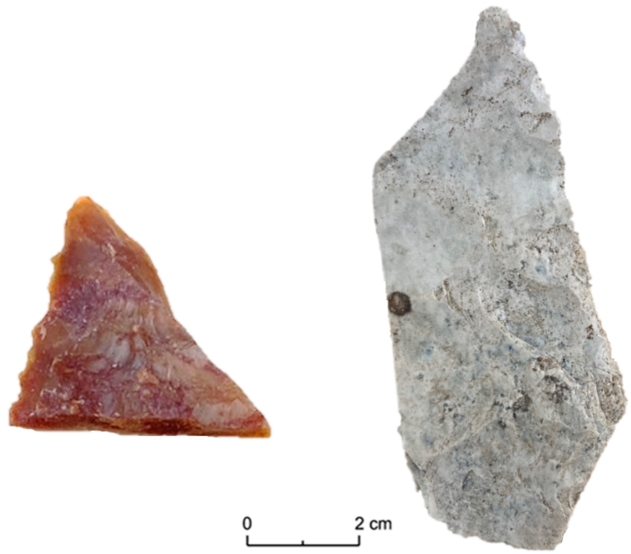

Figure 15.2 A serrated thin biface fragment from Op. 51 (left) and a thin biface fragment from Op. 57 (right; photos by W. J. Stemp).

Figure 15.3 A crude thick biface fragment from Op. 58 (photo by W. J. Stemp).

Figure 15.4 Two biface edge flakes from Op. 51. Note: The biface edge flake on the right is burnt (photos by W. J. Stemp).

Figure 15.5 A nearly complete retouched macroblade [four fragments] from Op. 61 (photo by W. J. Stemp).

Figure 15.6 A retouched proximal macroblade fragment STP 035-F4. Note: The white patina on the microblade fragment (photo by W. J. Stemp).

Figure 15.7 A distal retouched macroblade fragment [pointed uniface] from Op. 62 (left) and a refit medial retouched macroblade fragment [pointed uniface] from STP 035-D19 (right). Note: The fragments both have ‘black’ patination (photos by W. J. Stemp).

Figure 15.8 A whole blade with a hinge termination from Op. 51. Note: The blade has some 'black' patination from manganese oxidation (photo by W. J. Stemp).

Of particular note is the medial thin biface fragment recovered in Square M, Zone 20 of Op. 51 (LCB 11085-7; **Figure 15.2**, left). The biface fragment is made from medium/fine-grained brown, semi-translucent chert. The chert has a 'fibrous' texture reminiscent of chalcedony. Red portions of what appear to be slightly coarser material are the product of texture and color changes due to exposure to fire, although this is not thought to be deliberate heat-treatment of the raw material. The raw material most likely comes from Northern Belize; however, it is not the typical fine-grained variety from the NBCZ proper. Technologically, the biface demonstrates flake scarring consistent with bifacial flaking using a 'softer'-hammer and the edge is partially serrated using pressure-flaking. This edge retouch is unifacial on the dorsal surface of the tool and creates a bevel on a portion (about half) of the biface's edge. Given the general size and production technology of this medial fragment, it is possible that it was part of a preceramic stemmed biface, such as a Lowe point. However, without additional diagnostic features, such as the Lowe point's wide stem with basal thinning, corner-notching, or a large barb, it is difficult to say for certain (Kelly 1993; Lohse et al. 2006; Stemp and Awe 2013; Stemp et al. 2016).

The rest of the assemblage from excavations in Ops. 51, 57, 58, 59, 61, and 62 at Crawford Bank consists of different types of debitage (1593 or 98.6%; **Table 15.2**). The majority of the pieces have not been modified into specific types of tools (see Iceland 1997 for lack of retouched tools in the preceramic of Northern Belize); however, there were 4 unifacially retouched non-cortical flakes (**Figure 15.9**), 1 unifacially retouched cortical flake, 1 unifacially retouched flake-blade, and 4 unifacially retouched blocky fragments recovered. These artifacts were all retouched on the dorsal surface using hard-hammer percussion. The edge angles of all the retouched flakes and flake-blade are generally acute (<45°); whereas 2 of the retouched blocky fragments' edges were acute (<45°) and 2 were about 50-55°. In addition to the retouched flakes, there were 910 (57.1% of all debitage) hard-hammer flakes, including flake-blades (**Figure 15.10**). Three macroflakes [2 cortical and 1 non-cortical] were also recovered (**Figure 15.11**).

Table 15.2 Informal tools/debitage by raw material types from Ops. 51, 57, 58, 59, 61, and 62.

Tool type	NBCZ chert	Other chert	Chalcedony	Indeterminate chert	Limestone
Flakes – 100% cortex	4	3	0	22	-
Flakes – >50% cortex	15	3	3	22	-
Flakes – <50% cortex	70	9	2	74[b]	2
Flakes – 0% cortex	235[a]	34	6	383[c]	4
Flake-blades – >50% cortex	1	-	-	-	-
Flake-blades – <50% cortex	4	1	-	1	-
Flake-blades – 0% cortex	7	1	1	3	-
Retouched flake-blades - >50% cortex	-	-	-	1	-
Bifacial thinning flakes – >50% cortex	-	-	1	1	-
Bifacial thinning flakes – <50% cortex	2	-	-	2	-
Bifacial thinning flakes – 0% cortex	30	-	-	21	-
Bifacial thinning pressure flakes – 0% cortex	1	-	-	1	-
Biface edge retouch/repair flakes – 0% cortex	2	-	-	11	-
Uniface edge retouch/repair flakes – <50% cortex	1	-	-	1	-
Uniface edge retouch/repair flakes – 0% cortex	1	-	-	8	-
Retouched flakes (unifacial) – >50% cortex	1	-	-	-	-
Retouched flakes (unifacial) – 0% cortex	3	-	-	1	-
Macroflakes - <50% cortex	1	1	-	-	-
Macroflakes - <0% cortex	-	1	-	-	-
Microdebitage (<3.0 mm x 3.0 mm)	88	4	1	30	-
Simple flake cores	18	4	2	15	-
Bifacial/discoidal flake cores	1	1	-	-	-
Blade cores	1	-	-	-	-
Simple flake cores/hammerstones	-	1	-	-	-
Blocky fragments	59	12	8	256	6
Retouched blocky fragments (unifacial)	2	1	-	1	-
Potlids and burnt fragments	2	1	-	76	-
Cobble	-	1	-	-	-
Total	**549**	**90**	**24**	**930**	**12**

[a]Two flakes are from bifaces/celts, but they are not bifacial thinning flakes.
[b]Two flakes could be refit.
[c]Two flakes are from bifaces/celts, but they are not bifacial thinning flakes.

Figure 15.9 A distal retouched flake fragment from Op. 51. Note: The white patina on the flake fragment (photo by W. J. Stemp).

Figure 15.10 Debitage from Op. 51. Note: 'Black' patination, white patination, and burning on some artifacts (photos by W. J. Stemp).

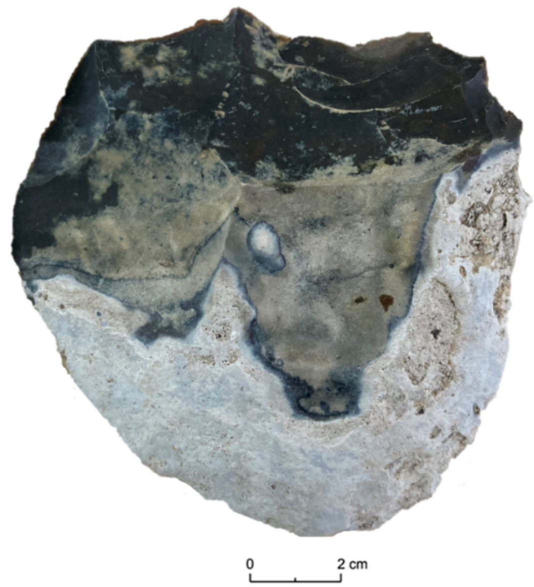

Figure 15.11 A macroflake from Op. 62. Note: 'Black' patination and white patination (photo by W. J. Stemp).

In all, the hard-hammer retouched and non-retouched flakes and flake-blades were mostly made from 'indeterminate' chert (507 or 55.3%). The rest were produced from 340 (37.1%) NBCZ chert, 51 (5.6%) other chert, 12 (1.3%) chalcedony flakes, and 6 (0.7%) limestone flakes. The numbers of cortical and non-cortical flakes varied by raw material type, but there is a full range of reduction debitage for the cherts and chalcedonies (**Figure 15.12**). There are no statistically significant differences in the numbers of cortical versus non-cortical NBCZ and 'indeterminate' chert flakes ($x^2 = 1.60552$, $p > 0.05$) suggesting that similar reduction processes are represented. The data tend to support the belief that a majority of the 'indeterminate' chert was, in fact, originally NBCZ material before patination and/or burning. The percentages of cortical-to-non-cortical flakes, as well as the presence of cores, core fragments, and blocky fragments (some cortical) indicate that *ad hoc*/expedient flake production occurred at Crawford Bank and is the main form of reduction there. The cores and/or cores fragments [including a bifacial core] of NBCZ chert, other chert, and chalcedony provide evidence for local reduction of these three types of raw material at the site (**Figure 15.13** and **15.14**). The sizes of the flakes indicate a fairly wide range, but at least some cores were quite large. Based on the flakes with cortex, specifically the primary (100% cortex) flakes, the NBCZ cores were likely brought to Crawford Bank at least partially decorticated. With the exception of some biface repair (see below), almost all of the reduction was the result of hard-hammer percussion. This is supported by the relatively few thinning flakes, the flat and cortical platforms observed on the whole flakes and proximal flake fragments (**Table 15.3**) and the high percentages of hinge terminations on the whole flakes and distal flake fragments (**Table 15.4**). Further evidence against local biface production is that there was a total of 974 flakes, including flake-blades and bifacial thinning flakes (see below), for all raw material types from Ops. 51, 57, 58, 59, 61, and 62 at Crawford

Bank. Based on experimental data for Classic Maya biface production, a single biface might produce somewhere between 748-884 flakes (Whittaker et al. 2009: 147, Fig. 9).

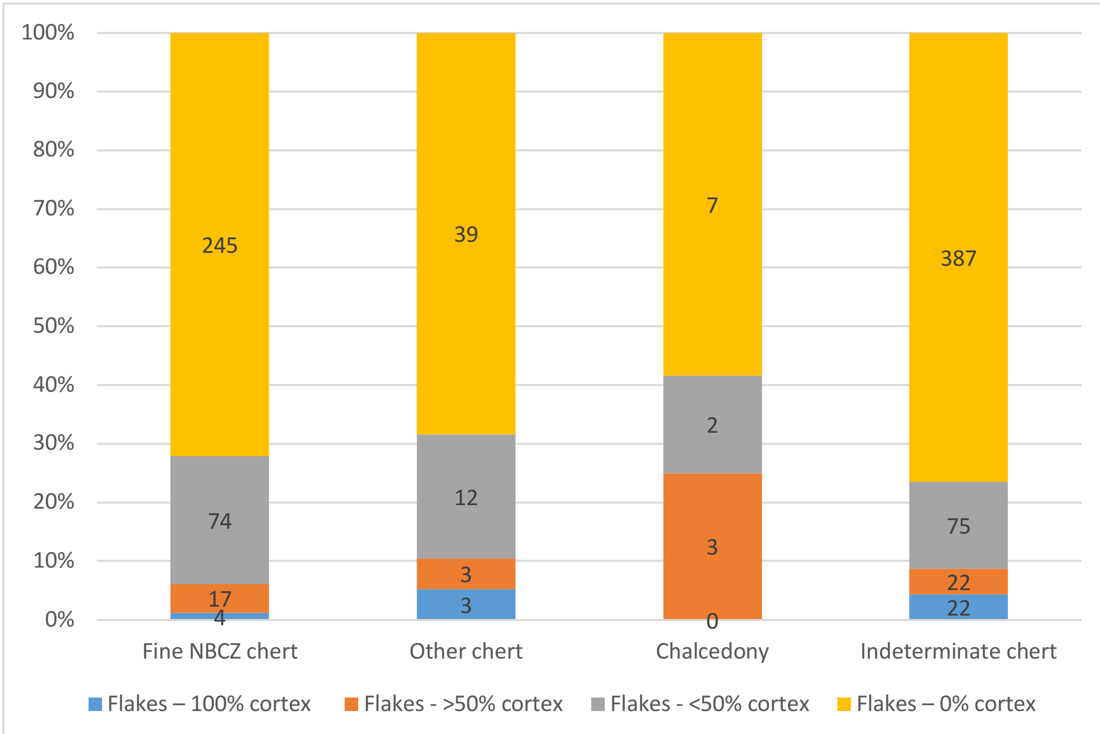

Figure 15.12 Percentages of cortical and non-cortical flakes by raw material type from Ops. 51, 57, 58, 59, 61, and 62 (image by W. J. Stemp).

Figure 15.13 Three chert flake cores from Op. 51. Note: One core (left) is burnt, and two cores (middle, right) have 'black' patination (photo by W. J. Stemp).

Figure 15.14 Large bifacial/discoidal chert flake core from Op. 51. Note: Slight burning on the core (photo by W. J. Stemp).

Table 15.3 Platforms for whole flakes and proximal flake fragments from Ops. 51, 57, 58, 59, 61, and 62.

	Cortical	Cortical/ flat	Flat	Flat/ lipped	Dihedral	Facetted	Facetted /lipped	Linear	Puncti- form	Crushed
NBCZ chert	12 (5.0%)	17 (7.1%)	170 (70.5%)	10 (4.1%)	12 (5.0%)	1 (0.4%)	3 (1.2%)	7 (2.9%)	2 (0.8%)	7 (2.9%)
Other chert/limestone	5 (13.9%)	4 (11.1%)	24 (66.7%)	1 (2.8%)	-	1 (2.8%)	-	-	-	1 (2.8%)
Chalcedony	-	1 (14.3%)	5 (71.4%)	-	-	-	-	-	-	1 (14.3%)
Indeterminate chert	14 (5.6%)	11 (4.4%)	177 (70.2%)	13 (5.2%)	6 (2.4%)	3 (1.2%)	1 (0.4%)	11 (4.4%)	4 (1.6%)	12 (4.8%)

Table 15.4 Flake termination types on whole flakes and distal flake fragments from Ops. 51, 57, 58, 59, 61, and 62.

	Feather	Hinge	Step
NBCZ chert	119 (55.9%)	88 (41.3%)	6 (2.8%)
Other chert/limestone	13 (59.1%)	9 (40.9%)	-
Chalcedony	5 (83.3%)	1 (16.7%)	-
Indeterminate chert	171 (62.6%)	92 (33.7%)	10 (3.7%)

Notably, the microdebitage (123) from the excavations supports some local reduction at Crawford Bank. However, the locations of highest concentrations of microdebitage (i.e., Op. 57) cannot be reliably interpreted as the specific areas for primary reduction due to post-depositional factors along the shoreline of the lagoon. It seems most likely that the small microdebitage accumulated in specific areas due to natural transformation processes that moved the artifacts into secondary contexts like the other lithic artifacts (see Stemp and Harrison-Buck 2019). Most microdebitage is NBCZ chert (88 or 71.5%), while the rest consists of other chert (4 or 3.3%), chalcedony (1 or 0.8%), and 'indeterminate' chert or chalcedony (30 or 24.4%).

The 70 bifacial thinning flakes and biface edge repair flakes from Ops. 51, 57, 58, 59, 61, and 62 at Crawford Bank constitute 4.4% of the debitage and are mostly non-cortical (64 or 91.4%), representing end stage flaking and biface repair (**Figure 15.15**). The few bifacial thinning flakes suggest that biface production was not occurring on-site (**Figure 15.16**). The majority of these flakes (56 or 98.2%) are NBCZ chert and 'indeterminate' chert [of which most is suspected to be NBCZ chert]. This is consistent with the assumption that the biface technology at Crawford Bank was primarily associated with NBCZ chert. Some of the bifacial thinning flakes are quite large. Notably, two bifaces made from other chert were recovered at Crawford Bank, but no bifacial thinning flakes of other chert were. Two different types of bifacial thinning flakes were identified at Crawford Bank based on thickness, morphology, and platform type. The first type includes 'harder'-hammer percussion flakes (Callaghan 1979; Hayden and Hutchings 1989:249) that usually have: 1) beveled or 2) lipped and beveled striking platforms. These flakes tend to have cone-like initiations and more pronounced bulbs of percussion. (Shafer and Hester 1983:524, Fig.6a, c-e; Shafer 1991:40). The second type of bifacial thinning flake typically has a lipped striking platform, a flatter and more diffuse bulb of percussion, and often tends to widen near the distal end (Callaghan 1979; Hayden and Hutchings 1989:246, Fig. 6, 247; Shafer and Hester 1983:531, Fig.6b, f). For both types of bifacial thinning flakes and biface edge flakes, many of the striking platforms are faceted to variable degrees (47 or 74.6%), and most are lipped (55 or 87.3%; **Table 15.5**). In all, 37 (52.8%) of the flakes are consistent with 'harder'-hammer percussion, while 7 (10%) are consistent with 'soft'-hammer percussion. For the remaining bifacial thinning flake fragments (26 or 37.1%), there is not enough production evidence to distinguish hammer type or there are combinations of traits from both hammer reduction types. Most (46 or 97.9%) whole bifacial thinning flakes and distal bifacial thinning flake fragments end in feather terminations (**Table 15.6**).

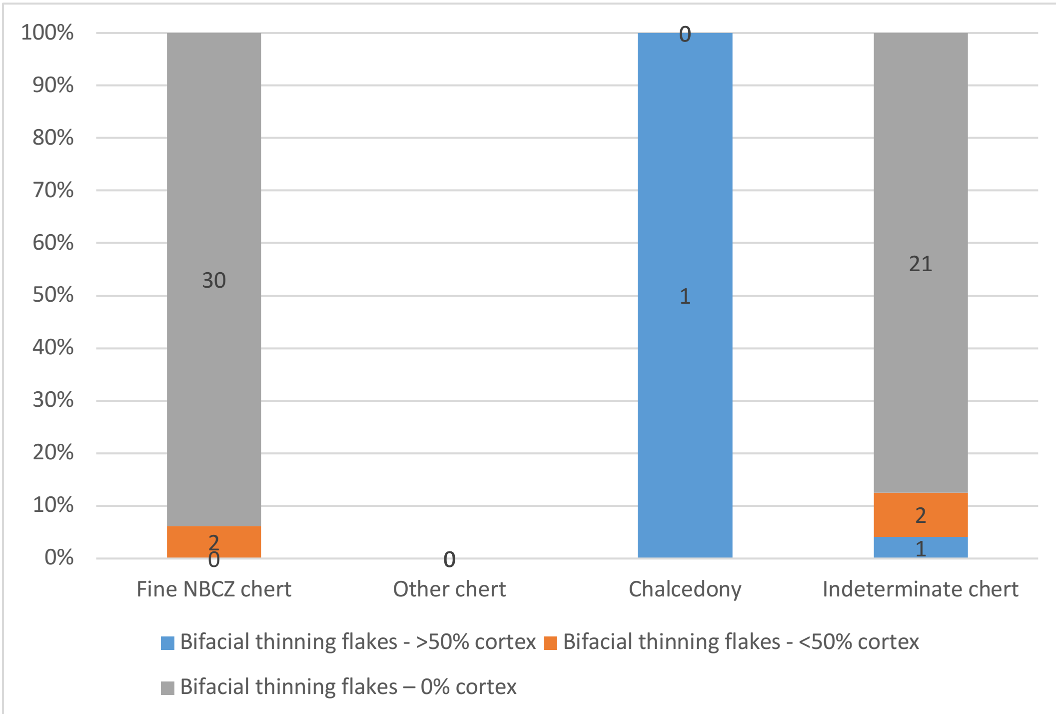

Figure 15.15 Percentages of cortical and non-cortical bifacial thinning flakes by raw material from Ops. 51, 57, 58, 59, 61, and 62. Note: There are no 'other' chert bifacial thinning flakes (image by W. J. Stemp).

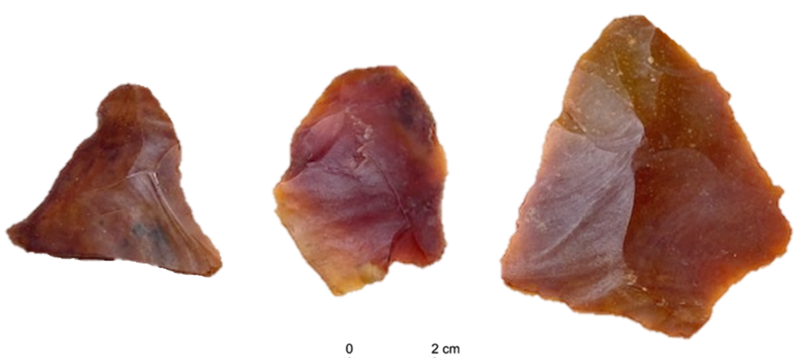

Figure 15.16 Bifacial thinning flakes from Op. 51. Note: All the flakes are burnt (photos by W. J. Stemp).

Table 15.5 Platforms for whole bifacial thinning flakes and proximal bifacial thinning flake fragments from Ops. 51, 57, 58, 59, 61, and 62.[a]

	Cortical	Cortical/flat	Flat	Flat/lipped	Dihedral	Facetted	Facetted/lipped	Linear/lipped	Crushed
NBCZ chert	-	-	2 (6.3%)	4 (12.5%)	-	2 (6.3%)	22 (68.8%)	-	2 (6.3%)
Other chert/ limestone	-	-	-	-	-	-	-	-	-
Chalcedony	-	-	-	-	-	-	-	-	-
Indeterminate chert	-	-	-	5 (16.1%)	-	-	23 (74.2%)	1 (3.2%)	2 (6.5%)

[a]Includes biface edge retouch/repair flakes

Table 15.6 Flake termination types on whole bifacial thinning flakes and distal bifacial thinning flake fragments from Ops. 51, 57, 58, 59, 61, and 62.[a]

	Feather	Hinge	Step
NBCZ chert	20 (100%)	-	-
Other chert/limestone	-	-	-
Chalcedony	-	-	-
Indeterminate chert	26 (96.3%)	1 (3.7%)	-

[a]includes biface edge retouch/repair flakes

The simple flake cores and core fragments (40) are mostly NBCZ (18 or 45.0%) and ‘indeterminate’ cherts (15 or 37.5%) although there were 5 core fragments of other chert and two of chalcedony. All show multiple striking platforms and somewhat random flake scar patterns. The bifacial or discoidal flake core fragments are made from NBCZ and other chert. Of most interest, is the NBCZ chert blade core fragment. It appears to be somewhat *ad hoc* in that it lacks a prepared striking platform (the platform is partially cortical). There are four unidirectional blade removal scars that all originate from the proximal (platform) end. One blade scar demonstrates a deep hinge termination. It appears the core fragment itself was struck from a larger core based on the ventral surface of the fragment. All the flaking associated with the blade core is hard-hammer.

The lithic raw material and technology data demonstrate a heavy reliance on NBCZ chert debitage as tools. The debitage was used without further modification with a few exceptions. Although some biface fragments, biface flakes, and some macroblade fragments were recovered at the site, these tool types do not appear to have been made at Crawford Bank. More likely, they were acquired as finished tools. With the exception of the two biface fragments, and some bifacial thinning flakes, all of the reduction is hard-hammer. With the exception of the edge resharpening of two thin biface fragments, retouch on the rest of the artifacts was accomplished using hard-hammer percussion. Overall, the assemblage points to people who primarily relied on chert debitage, usually unretouched, for most of their stone tool needs. This appears to be typical of the preceramic period in northern Belize (Stemp and Harrison-Buck 2019; Stemp and Rosenswig 2022).

More or less, the tool type and reduction data from the test pits and surface collection mirror those from the excavated operations. Formal tools constituted 11 of the 254 (4.3%) chipped stone artifacts recovered through test pitting and surface collection with the rest (243 or 95.7%) being debitage of various types (**Appendix A: Tables A1 and A2**). The formal tool types include fragments of thick bifaces/celts, some biface edges, and unifacially retouched macroblades, in particular two refit pointed uniface fragments. One new tool type – the tranchet-bit biface was recovered from the surface of Crawford Bank (see below).

Most reduction products in the test pits were the result of hard-hammer percussion and the general distribution of cortical and non-cortical flakes is similar to that from the operations.

The cortical and non-cortical flakes similarly suggest NBCZ chert cores were arriving at Crawford Bank (**Appendix A: Figure A2**). The expedient reduction of NBCZ chert, other, and chalcedony to produce usable flakes is further supported by the simple flake cores and core fragments from the test pits.

Limited evidence for biface reduction/repair is provided by the 7 NBCZ chert and 1 indeterminate chert bifacial thinning flakes, all of which were non-cortical, from the test pits (2.9% of all debitage). There were no bifacial thinning flakes of other chert or chalcedony found in the test pits (**Appendix A: Figure A3**).

Use-wear Analysis

Method and Equipment

The protocol for observing and recording the use-wear on the lithic artifacts is essentially the same as that previously used by Stemp et al. (2010, 2013, 2015, 2018; also see Stemp 2001; Stemp and Harrison-Buck 2019; Stemp and Rosenswig 2022) for chipped chert and chalcedony tools. However, the cleaning procedure was changed. Rather than using solutions of 15% hydrochloric acid (HCl) and 20% sodium hydroxide (NaOH) as done previously, the artifacts were first rinsed in cold water and laid out to air dry. The main reason for this cleaning procedure was to potentially preserve some residues on the stone tool surfaces (see Stemp and Rosenswig 2022: Online Supplement 1). During the use-wear analysis, some unidentified residues were noted on the artifacts. Whether they are simply sand/soil still adhering to the surfaces or contain some plant or animal materials remains to be seen.

A metallurgical microscope [Unitron MS-2BD] was used to locate and identify use-wear features at both low- (40×) and high-power (100×, 200×, 400×) magnification under angled and incident light. Photomicrographs of the tools' worn surfaces were taken using a Moticam X3 (4.0 MPX) digital microscope camera. The identification and interpretation of the use-wear on the chert and chalcedony artifacts was based on the previous experimental use-wear analysis programs conducted by Stemp (see Stemp 2001, 2004, Stemp et al., 2010 for full descriptions of experimental use-wear feature categories and damage criteria). The use-wear characteristics were also considered in terms of the experimental and archaeological work of other use-wear analysts, specifically Aoyama (1995, 1999, 2007, 2009), Aldenderfer et al. (1989), Keeley (1980), Lewenstein (1987), Odell (1977), Rots (2010); Sievert (1992), Tringham et al. (1974), van Gijn (1989), and Vaughan (1985). The analysis included observation and documentation of edge-damage (microflaking), striations, and surface polish on the artifacts. As in previous use-wear analyses, used areas on the stone tools were recorded using an independent use-zone (IUZ) method (Stemp et al. 2010, 2013, 2015, 2018; see Aoyama 2009; Vaughan 1985).

Problems due to Post-deposition

The use-wear analysis of the chipped stone tools from the 2020 BREA excavations at Crawford Bank was only possible for a proportion of the entire assemblage because the damage to the tools due to post-depositional forces was quite severe. A total of 299 (27.6%) of the 1083 chipped chert, chalcedony, and limestone artifacts were in good enough condition for use-related wear analysis.

There are many problems associated with post-depositional alteration of stone tool surfaces at Op. 51 at Crawford Bank. The most significant post-depositional changes to the lithic artifacts from the site was burning. Burnt cryptocrystalline silicates demonstrate changes, sometimes extreme, that include the following: color changes (from pinks, to reds, grays, blacks, and whites), potlid fractures and heat crazing, increased susceptibility to edge microflaking, increased surface smoothing or 'gloss', some edge rounding, and the possible addition of non-use-related residues. The alterations usually damaged tool surfaces to variable degrees and frequently made observation of use-wear on stone tools very difficult, if not impossible (see Luedtke 1992; Olausson 1983; Sievert 1992). In general, mildly to severely burnt artifacts were evenly distributed throughout the sub-assemblages in the excavation units of Op. 51 (**Table 15.7**).

Table 15.7 Number of burnt lithic artifacts by Square from Op. 51.

	Op. 51	Op. 57	Op. 58	Op. 59	Op. 61	Op. 62
Burnt	779/1082 (72.0%)	201/267 (75.3%)	68/117 (58.1%)	28/45 (62.2%)	35/67 (52.2%)	24/37 (64.9%)

Patination of different types also affected the conditions of the lithic artifacts. Although there were not many artifacts that developed a heavy white or yellowish-white patina, some did. Well-developed white patination creates a porous microsurface that destroys surface polishes and striations, which greatly hinders microscopic use-wear analysis (see Anderson-Gerfaud 1981; Glauberman and Thorson 2012; Keeley 1980; Luedtke 1992; Rottländer 1975). 'Black' patination/manganese oxidation not only changes the color of the stone tool surface but seems to reduce the brightness of polishes. Use-wear polishes and striations are still observable, for the most part, but more developed 'black' patinas make it more difficult to observe polishes microscopically under high magnification (>100×). Overall, the percentage of tools with significantly developed black patinas was low in Op. 51; however, it was proportionately higher in Squares L, M, and O (see Stemp 2022: Table 10). The percentages of tools with 'black' patination are generally higher the closer the operations are to the lagoon shoreline (Ops. 35, 59, 61, and 62; **Table 15.8**) (see Stemp and Harrison-Buck 2019: Online Supplement 1). It has been argued that the pattern of repeated exposure to air and salty/brackish water results in the development of a 'black' patina. Glossy patinas produce shiny or lustrous surfaces due to the dissolution and then re-precipitation of the silica on the artifacts' surfaces (Glauberman and

Thorson 2012; Howard 2002; see Lévi-Sala 1986; Luedtke 1992; Stapert 1976); however, 'glossy' stone tools surfaces (not associated with burning) were rare in the lithic assemblages from Crawford Bank.

Table 15.8 Number of 'black' patinated lithic artifacts by Square from Op. 51.

	Op. 51	Op. 57	Op. 58	Op. 59	Op. 61	Op. 62
'Black' patination	0/129 (0%)	0/108 (0%)	7/298 (2.3%)	7/167 (4.2%)	12/242 (5%)	11/139 (7.9%)

There were series of physical/mechanical forces that also altered the edges and surfaces of the chert and chalcedony artifacts from the operations at Crawford Bank. Mechanical damage can either obliterate existing use-wear on stone tools or introduce non-use-related wear (see Lévi-Sala 1996; Pevny 2012). Some of the artifacts were water-rolled, which caused the blunting of tool edges, the smoothing of flake scar arises, and the addition of non-use-related (typically multi-directional) striations (Burroni et al. 2002; Donahue and Burroni 2004; Lévi-Sala 1986; Shackley 1974). In many cases, distinguishing use-related edge chipping from post-depositional edge chipping was difficult because fracture scars along edges could mimic use-related edge flaking. Many artifacts from Crawford Bank have these microscars that indicate movement in the soil, trampling, or some other force application that was "perpendicular to the ventral surface plane" (Donahue and Burroni 2004: 145; see Tringham et al. 1974) of the flakes. This flaking occurs on either the ventral or dorsal surface of flakes and is typically unifacially, rather than bifacially, distributed, suggesting force application from one direction.

Microchipping along a tool edge could also be identified as the result of post-deposition because it had sharp margins and either intersected the surfaces with white or 'black' patinas or cut through polished regions of stone tool surfaces (see Donahue and Burroni 2004: 143, Fig. 15.2B). Edge damage, surface abrasion/mild particulate polishing, and striations may have also been caused by tool movement in the soil due to other actions, such as trampling (Asryan et al. 2014; Chu et al. 2015; Donahue and Burroni 2004; Driscoll et al. 2015; Eren et al. 2010; Keeley 1974, 1980; McBrearty et al. 1998; McPherron et al. 2014; Pargeter and Bradfield 2012; Pevny 2012; Pryor 1988; Schoville 2010, 2014; Shea and Klenck 1993; Tringham et al. 1974). The movement of lithic artifacts in the ground could also cause contact friction with stones or other chert artifacts creating 'bright spots' on some of the chipped stone tools from the Crawford Bank excavations. The bright spots are usually localized or spatially clustered and consist of a very reflective flat polish (see Lévi-Sala 1986: 231).

It should also be noted that many lithic artifacts were scratched by the aluminum 'context' tags that were included in the bags containing the stone tools. The metal tags left very bright silver-colored linear traces on the stone tools' surfaces. The metal residue is the product of adhesive wear (Donahue and Burroni 2004: 144). These linear traces are quite bright and distinctive; however, they can cover or alter possible use-related wear. Aluminum tags should be inserted into their own plastic bags before being placed in the bags with the lithic artifacts.

Use-wear Analysis Results

In the preceramic period of Belize, there are very few use-wear studies of chipped stone artifacts. Most have focused on two types of formal tools – constricted unifaces/adzes (Gibson 1991; Hudler and Lohse 1994; Iceland 1997: 227-228; Lohse 2007) or stemmed bifaces (Stemp et al. 2016). Two other studies have primarily focused on debitage (Stemp and Harrison-Buck 2019; Stemp and Rosenswig 2022). The main reason why there are so few use-wear analyses of chipped stone tools from the preceramic is likely due to the conditions of the artifacts; many of which are heavily damaged due to post-deposition (see above). In this analysis, 9 'formal' tools, and 290 pieces of debitage from Op. 51 were examined for microscopic traces of use.

In total, 95 of the 299 (31.8%) chipped chert and chalcedony artifacts possessed some use-related wear. The use-wear analysis was not performed on a true random sample. As such, it is possible that the percentage of used artifacts in the total assemblage excavated from Crawford Bank could be higher or lower. The artifacts with use-related wear were identified as NCBZ (41 or 43.2%) chert, other chert (8 or 8.4%), chalcedony (3 or 3.2%), and 'indeterminate' chert/chalcedony (43 or 45.3%) based on raw material type. None of the limestone artifacts had evidence of use. However, if the numbers of artifacts with use-wear are considered in terms of all of the chipped stone tools excavated in 2020, then the total percentage of used tools would only be 8.8%. By raw material type, 41 of the 285 (14.4%) NBCZ chert artifacts, 8 of the 64 (12.5%) other chert artifacts, 3 of the 18 (16.7%) chalcedony, and 43 of the 704 (6.1%) 'indeterminate' chert artifacts were used. Most of the used 'indeterminate' chert artifacts had some mild white patination and were either not burnt or minimally heat-modified. It is also possible that a fairly elevated amount of very small 'indeterminate' debitage is contributing to its lower percentage of used tools.

There was a total of 105 IUZs on the 95 stone tools with use-wear traces (**Table 15.9**). Most of the used stone tools only possessed one IUZ (89 or 93.7%); however, there were three (3.2%) that had two IUZs, and two (2.1%) that had three IUZs, and one (1.1%) that had possibly four IUZs. Only one of the tools with two IUZs was a bifacial thinning flake that had use-wear on its dorsal surface and/or near its proximal end/striking platform that was the product of use while it was still attached to a biface and use-wear that was associated with its use as an *ad hoc*/expedient tool after having been detached from the biface (see below). The other two tools with two IUZS were flakes. One of the tools with three IUZs was a flake and the other was a blocky fragment. The single tool with possibly four IUZs was a large flake.

Table 15.9 Number of IUZs on chipped stone tools from Op. 51.

IUZs	Thin bifaces	Retouched macro-blades	Pointed unifaces (macroblades)	Blades	Flakes[c]	Bifacial thinning flakes[e]	Blocky fragments

Bone/antler							
cut/slice	-	-	-	-	1 (1.0%)	-	-
saw	-	-	-	-	4 (3.8%)	-	-
Meat/skin/fresh hide							
cut/slice	-	-	-	-	5 (4.8%%)	-	-
Meat/skin/fresh hide and bone							
cut/slice	1[a] (1.0%)	-	-	-	2[d] (1.9%)	-	-
Plant							
cut/slice	-	-	-	1 (1.0 %)	6 (5.7%)	-	-
Soil							
dig/hoe	-	-	-	-	1 (1.0%)	1 (1.0%)	-
Wood							
adze/chop	-	-	-	-	-	5[f] (4.8%)	-
cut/slice	-	-	-	1 (1.0 %)	9 (8.6%)	-	-
saw	-	-		-	14 (13.3%)	-	1 (1.0%)
scrape/plane	-	-	-	-	5 (4.8%)	-	-
whittle	-	-	-	-	10 (9.5%)	-	-
Soft							
cut/slice	-	-	-	-	4 (3.8%)	-	-
Hard							
adze/chop	-	-	-	-	-	1 (1.0%)	-
cut/slice	-	-	-	-	3 (2.9%)	-	-
saw	-	-	-	-	11 (10.5%)	-	2 (1.9%)
scrape/plane	-	-	-	-	2 (1.9%)	-	-
whittle	-	-	-	-	3 (2.9%)	-	-
Indeterminate							
saw	-	-	-	-	3 (2.9%)	1 (1.0%)	1 (1.0%)
indeterminate	-	-	1[b] (1.0%)	-	3 (2.9%)		3 (2.9%)
Total	**1**	**0**	**1**	**2**	**86**	**8**	**7**

[a]May include other contact materials as well; burning of the tool renders identifying other contact materials difficult.
[b]Complex polish mostly restricted to the tool's edges; sometimes it looks like bone or wood, but it seems like there is a soft contact material involved as well.
[c]Includes retouched flakes.
[d]Traces of wood polish noted (bright, domed polish).

[e]Also includes biface edges.
[f]Two bifacial thinning flakes also have wear consistent with soil.

The use-wear on the chipped chert and chalcedony artifacts from the 2020 BREA excavations at Crawford Bank is mostly consistent with working wood (45 IUZs or 42.9%) (**Figure 15.17a**). Other tools were used on bone or antler (5 IUZs or 4.8%) (**Figure 15.17b**), meat/skin/fresh hide and bone (3 IUZ or 2.9%) (**Figure 15.17c**); plants (7 IUZ or 6.7%) (**Figure 15.17d**), unidentified soft materials (4 IUZs or 3.8%), unidentified hard materials (22 IUZs or 21.0%), meat/skin/fresh hide (5 IUZs or 4.8%) (**Figure 15.17e**), and indeterminate materials (12 IUZs or 11.4%). Some artifacts were used to dig in soil (2 IUZ or 1.9%; plus use-wear traces on one bifacial thinning flake used to adze/chop wood) (**Figure 15.17f**).

Based on the results of the use-wear analysis, the people at Crawford Bank clearly relied on wood as an important resource and worked it in a number of different ways. Cutting and sawing were the main motions associated with wood-working (21.9%), but scraping, planing, and whittling of wood was also quite common (14.3%). These motions likely represent tasks such as making handles for hafted tools and weapons, supports for perishable structures, making containers, forest clearance, or firewood. Because wooden artifacts were not found at Crawford Bank, the use-wear on the stone tools serves as important secondary evidence for a reliance on wood. There is good use-wear evidence for subsistence activities in terms animal hunting and butchery (12.4%) and plant cutting/slicing (6.7%). Other items used for non-dietary purposes may have been produced using animal or plant parts as well. Some of the unidentified soft and hard materials used by the Crawford Bank inhabitants were likely animal or plant parts of some kind.

Most of the motions on the tools recovered from the 2020 excavations at Crawford Bank were cutting, slicing, or sawing (71 IUZs or 67.6%). Far fewer tools were used with a scraping, planing, or whittling motion (20 IUZs or 19.0%), for adzing or chopping (6 IUZs or 5.7%) or digging in soil (2 IUZs or 1.9%). The fact that most of the flakes had fairly acute edge angles assists in understanding why evidence indicating longitudinal motions was most commonly found of the tools' surfaces. Few flakes had edge angles that exceeded ~ 45-50^{o}, which are typically associated with scraping, planning, or whittling activities.

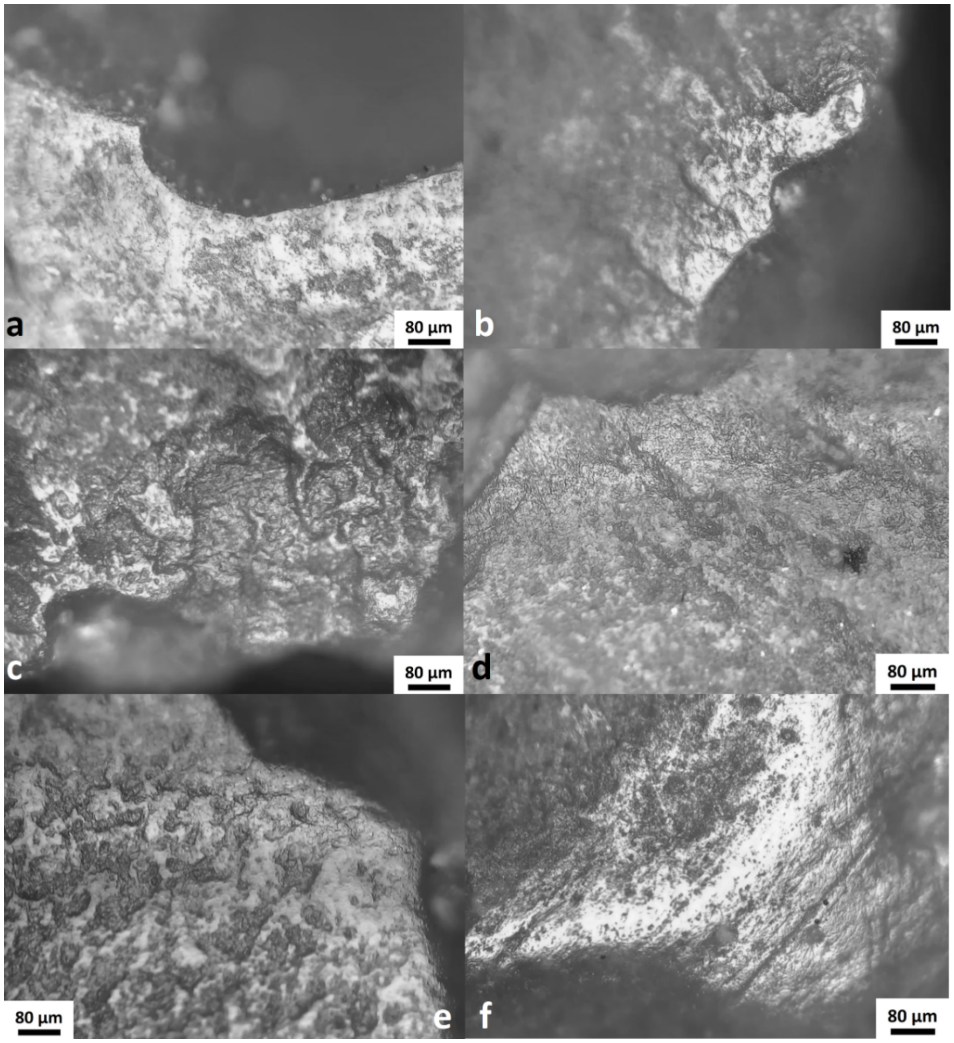

Figure 15.17 Photomicrographs of usewear (200x) – a) unretouched chert flake used to saw wood The polish is well-developed and is beginning to link up beyond the reticular stage of development. The flake is partially patinated; b) unretouched chert flake used to saw antler/bone. The polish is limited in distribution to the very edge of the flake]; c) thin chert biface used to cut/slice meat/skin/fresh hide and bone. The thin biface is burnt]; d) unretouched chert flake used to cut/slice non-woody plant; e) unifacially retouched chert flake used to scrape hide; f) unretouched chert bifacial thinning flake [dorsal surface] used to dig/hoe in soil and adze/chop wood (photos by W. J. Stemp).

The use-wear data also demonstrate that *ad hoc*/expedient flake technology was an important source of tools for the people of Crawford Bank, as noted in other debitage studies from preceramic sites in Belize (Stemp and Harrison-Buck 2019; Stemp and Rosenswig 2022). Although lithic debitage has been recovered at other preceramic sites in Belize, it has not undergone a detailed use-wear analysis (e.g., Brown et al. 2011; Griffith and Morehart 2001; Griffith et al. 2002; Hester et al. 1980, 1996; Lohse 2006; Lohse and Collins 2004; Pohl et al. 1996; Iceland 1997; Shafer et al. 1980).

Discussion and Conclusions

Based on the analysis of lithic raw material types for the artifacts recovered at Crawford Bank by BREA, the inhabitants relied on sources of chert and chalcedony from Northern Belize with most identifiable stone coming from the NBCZ and smaller amounts originating from locations in the ‘Pebble Zone’, within which Crawford Bank is located. The results of the lithic analysis from the excavations undertaken in 2017 at Crawford Bank (Op. 35) by BREA can be compared to those from Ops. 51, 57, 58, 59, 61, and 62). Although significant proportions of the chert artifacts were classified as ‘indeterminate’ in terms of raw material type in all operations and there are generally similar high percentages of burnt chert and chalcedony at all locations, far fewer lithic artifacts a ‘black’ patina overall. Based on the locations of the excavation units for all operations, it generally appears that proximity to the lagoon shoreline and related fluctuations in the water levels over time are responsible for this difference.

The 22 ‘formal’ stone tools from the excavations in Ops. 51, 57, 58, 59, 61, and 62 at Crawford Bank are similar to those reported from Op. 35 at this site, specifically the macroblades, blades, and thick bifaces/celts (Stemp and Harrison-Buck 2019: 189, Table 1). It is also worth noting that some tools are missing from all operations at Crawford Bank, specifically, there are no obvious constricted unifaces [although one trimmed microblade fragment was recovered from Op. 35], no Sawmill points, and no scraper forms. It is possible that the medial thin biface fragment with a serrated edge and partial beveling from Op. 51 was originally part of a preceramic stemmed biface (e.g., Lowe point), but this is difficult to know for certain. Most of the ‘formal’ tools with a recognizable raw material were made from NBCZ chert. In general, the raw materials from which the tools were made and the tool types (e.g., bifaces,/celts, macroblades, and blades) are similar to those recovered at various other preceramic sites in Northern Belize (see Hester et al. 1996; Iceland 1997; Kelly 1993; Lohse et al. 2006; Pohl et al. 1996; Rosenswig et al. 2014; Rosenswig 2015; Stemp et al. 2016).

Based on the types and quantities of debitage at all operations, in the STP 035 series, and on the surface at Crawford Bank, the absence of macroflake and macroblade cores, the few cortical bifacial thinning flakes, and the few biface preforms, most of the ‘formal’ tools were most likely not made at Crawford Bank (see Stemp and Harrison-Buck 2019). Specifically, macroblades are represented by interior versions and there are no examples of external or cortical [>50% or 100 dorsal cortex] ‘first’ or ‘second’ series macroblades (see Iceland 1997: 134 for Zone D, Op. 4046 [South] at Colha). Some of the bifacial thinning flakes have use-wear on their dorsal surfaces, which suggests biface repair/refurbishing rather than biface production. Aside from a few unifacially retouched flakes and blocky fragments, there were no other ‘intentional’ flake tools (e.g., burins, denticulates, scrapers, etc.) in the overall Crawford Bank assemblage. The inhabitants may have been making some bifaces based on the recovered preforms, as well as some blades locally based on the recovery of the blade core fragment at Op. 51. The people who made and used the preceramic Crawford Bank chipped stone artifacts had access to nodules of NBCZ chert, chalcedony, and other chert based on the cores, and core fragments, cortical flakes [specifically the flakes with 100% cortex and >50% cortex], and the striking platforms that are cortical or partially cortical. At least some cores appear to have been partially decorticated and reduced before arriving at the site based on the ratios of flakes to cores and core fragments and the high percentages of non-cortical flakes (see Tomka 1989: 138, Table 1). Based on flake types, platform types, and termination types, the NBCZ chert and other chert were similarly reduced using hard-hammer percussion. Chalcedony was also used to produce simple hard-hammer flakes, but with fewer non-cortical versus cortical flakes.

The use-wear on the lithics from Op. 51 at Crawford Bank indicates a reliance on expedient technology to complete tasks (also see Stemp and Harrison-Buck 2019; Stemp and Rosenswig 2022). Many tasks involve wood (see Acosta Ochoa 2010: 2; Pérez 2009; Stemp and Harrison-Buck 2019; Stemp and Rosenswig 2022), but tools were also used to a fairly high degree on animals (bone, meat/skin/fresh hide), and plants as well. There is little evidence for contact with soil, which seems to argue for minimal horticultural activity that may have involved stone tools at Op. 51. For the most part, the use-wear seems consistent with activities undertaken by hunter-gatherers. The residues on some tools, such as the serrated thin biface fragment, could be analyzed to get a better understanding of particular plants or animals exploited by the inhabitants of Crawford Bank.

Overall, the results of the analysis of stone tools from Ops. 51, 57, 58, 59, 61 and 62 are very similar to those from Op. 35 (Stemp and Harrison-Buck 2019). The lithic artifacts from these areas were mostly made using hard-hammer percussion of chert from Northern Belize, specifically the NBCZ. There were few formal tools recovered in any operation. Cores and core fragments of NBCZ chert, other chert, and chalcedony and flake ratios in all operations demonstrate a pattern of acquiring nodules that were partially decorticated and reduced before reaching Crawford Bank. Macroblade and macroflake cores are absent in the assemblages in all operations. Tool use-wear patterns are similar, with wood being the most common contact material and most tools being used for longitudinal motions. Proportionately, more tools were used on bone or antler, meat/skin/fresh hide, and plants at Op. 51; however, there is no evidence for contact with dry hide and fewer stone tools contacted soil than at Op. 35.

As at Op. 35 (Stemp and Harrison-Buck 2019), it is believed that some activities performed using stone tools are underrepresented by the use-wear evidence. At Op. 51, the use-wear overwhelmingly consists of contact with hard materials (wood, bone/antler, unidentified hard). Use-wear consistent with meat/skin/fresh hide, non-woody plants, and other ‘soft’ materials is much less frequent. As with Op. 35, there are two hypotheses for the use-wear pattern distribution observed at Op. 51. Either the activities involving animals (meat/skin/fresh hide) or plants (other than wood) were only being minimally performed with the stone tools recovered from Crawford Bank or the use-wear traces associated with contact with these materials were disproportionately altered or eliminated by post-deposition. Because much of the assemblage was burnt, it is noteworthy that some researchers (Clemente-Conte 1997: 533;

Rutkoski et al. 2020) observed that burning affects use-wear polishes differently. For example, bone and wood polishes seem to survive exposure to burning better than polishes associated with soft contact materials, such as meat, fat, and sinew. As well, Plisson and Mauger (1988) noted that use-related polishes resulting from contact with animal tissues (i.e., meat, hide) are less resistant to chemical alteration associated with white patination than polish produced by contact with harder materials, specifically wood. Given full consideration of the use-wear patterns and the significant post-depositional damage to the artifacts, the second hypothesis is believed to be more likely correct.

Post-depositional damage, specifically edge microchipping, surface abrasion, flake scar ridge rounding, and burning on the Op. 51, 57, 58, 59, 61, and 62 lithics, suggests that these tools accumulated in various locations along the shore as a result of secondary deposition of some kind. There was movement of these artifacts at some point in the past, possibly due to water action, along the shoreline. This has also been suggested for the stone tools from Op. 35 (Stemp and Harrison-Buck 2019).

In the entire area where excavations and test-pitting occurred around Crooked Tree Lodge in Crawford Bank, the only example of a tool that is clearly Maya based on the technology of production and cross-dating with Late Preclassic Colha workshop production is a tranchet bit biface made from NBCZ chert that was collected from the surface (LCB 16617) (**Figure 15.18**; see Shafer 1991:33).

Figure 15.18 A NBCZ chert tranchet-bit biface surface collected from Crawford Bank (photo by W. J. Stemp).

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Appendix A

Results of STP Series 035 and Surface Collection at Crawford Bank

W. J. Stemp

Table A1 Formal tools by raw material types from STP Series 035 and surface collection.

Tool type	NBCZ chert	Other chert	Chalcedony	Indeterminate chert	Limestone
Thin bifaces	-	-	-	-	-
Thick bifaces/celts	3	-	-	-	-
Thick biface/celt preforms	-	1	-	-	-
Tranchet bit adze	1	-	-	-	-
Biface edges	1	-	-	1	-
Macroblades	-	-	-	-	-
Retouched macroblades and pointed unifaces (unifacial)	3	-	-	1[a]	-
Blades	-	-	-	-	-
Total	**8**	**1**	**0**	**2**	**0**

[a]Two refit medial fragments.

Table A2 Informal tools/debitage by raw material types from STP Series 035 and surface collection.

Tool type	NBCZ chert	Other chert	Chalcedony	Indeterminate chert	Limestone
Flakes – 100% cortex	-	2	-	1	-
Flakes – >50% cortex	4	-	-	3	-
Flakes – <50% cortex	25	1	1	11	-
Flakes – 0% cortex	70	2	5	43	-
Flake-blades – >50% cortex	-	-	-	-	-
Flake-blades – <50% cortex	1	-	-	-	-
Flake-blades – 0% cortex	2	-	-	-	-
Retouched flake-blades - >50% cortex	-	-	-	-	-
Bifacial thinning flakes – >50% cortex	-	-	-	-	-
Bifacial thinning flakes – <50% cortex	-	-	-	-	-
Bifacial thinning flakes – 0% cortex	7	-	-	1	-
Bifacial thinning pressure flakes – 0% cortex	-	-	-	-	-
Biface edge retouch/repair flakes – 0% cortex	-	-	-	-	-
Uniface edge retouch/repair flakes – <50% cortex	-	-	-	-	-
Uniface edge retouch/repair flakes – 0% cortex	-	-	-	-	-
Retouched flakes (unifacial) – >50% cortex	-	-	-	-	-
Retouched flakes (unifacial) – 0% cortex	1	-	-	1	-
Macroflakes - <50% cortex	-	-	-	-	-
Macroflakes - <0% cortex	1	-	-	-	-
Microdebitage (<3.0 mm x 3.0 mm)	4	-	-	5	-
Simple flake cores	5	2	1	-	-
Bifacial/discoidal flake cores	1	-	-	-	-
Blade cores	-	-	-	-	-
Simple flake cores/hammerstones	-	-	-	-	-
Blocky fragments	22	1	-	19	-
Retouched blocky fragments (unifacial)	-	-	-	-	-

Potlids and burnt fragments	-	-	-	2	-
Cobble	-	-	-	-	-
Total	**143**	**8**	**7**	**85**	**0**

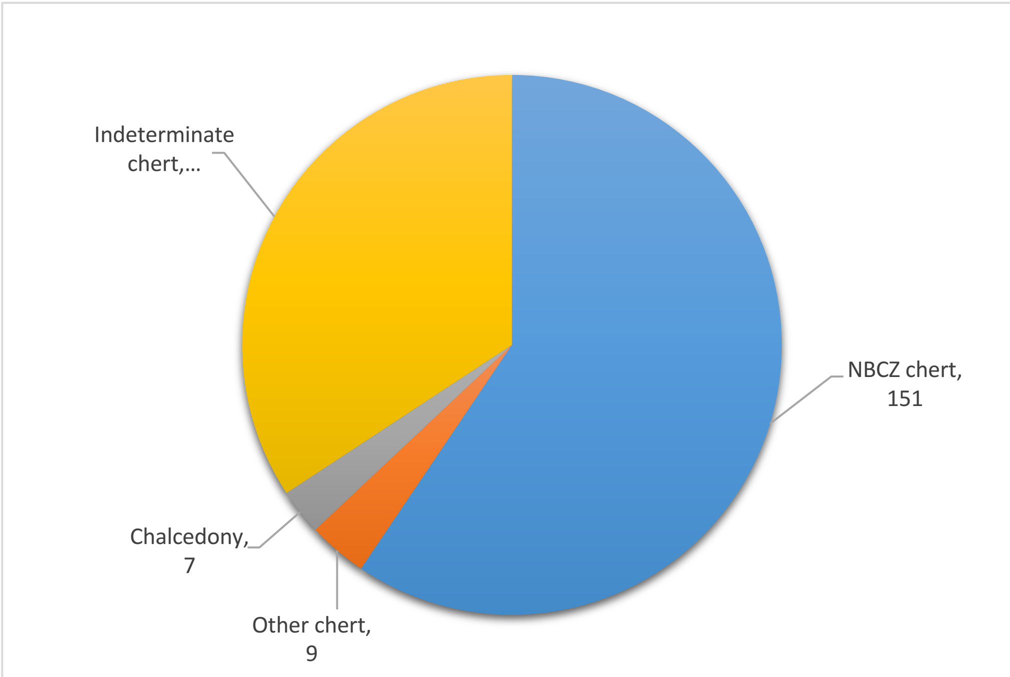

Figure A1 Number of lithic artifacts by raw material type from STP Series 035 and surface collection.

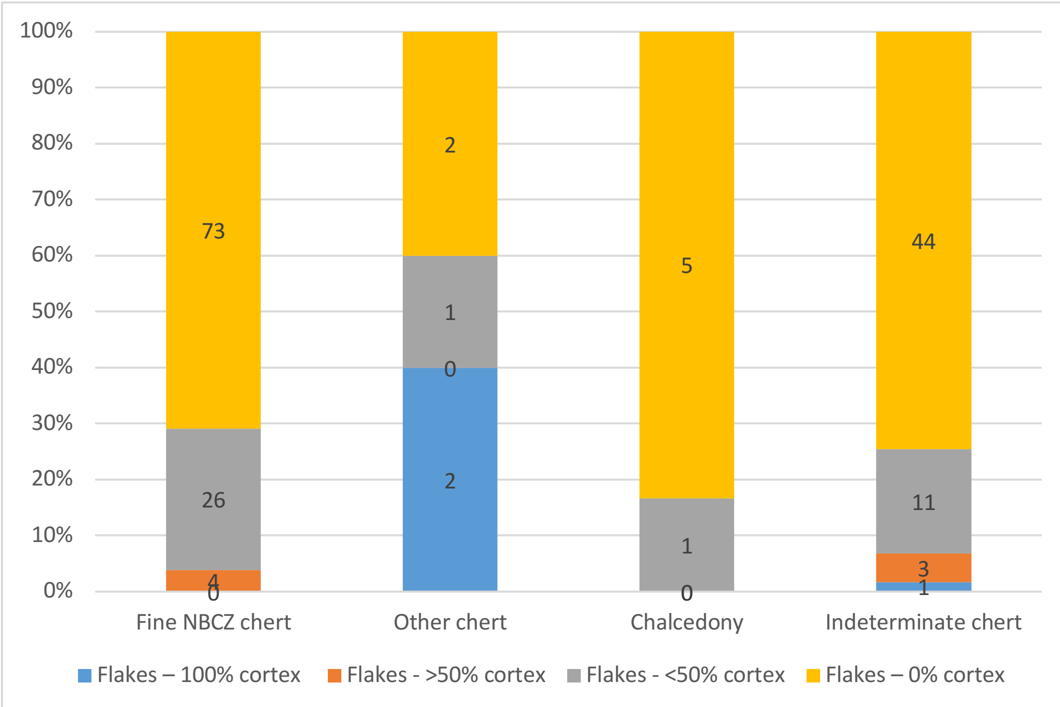

Figure A2 Percentages of cortical and non-cortical flakes by raw material type from STP Series 035 and surface collection.

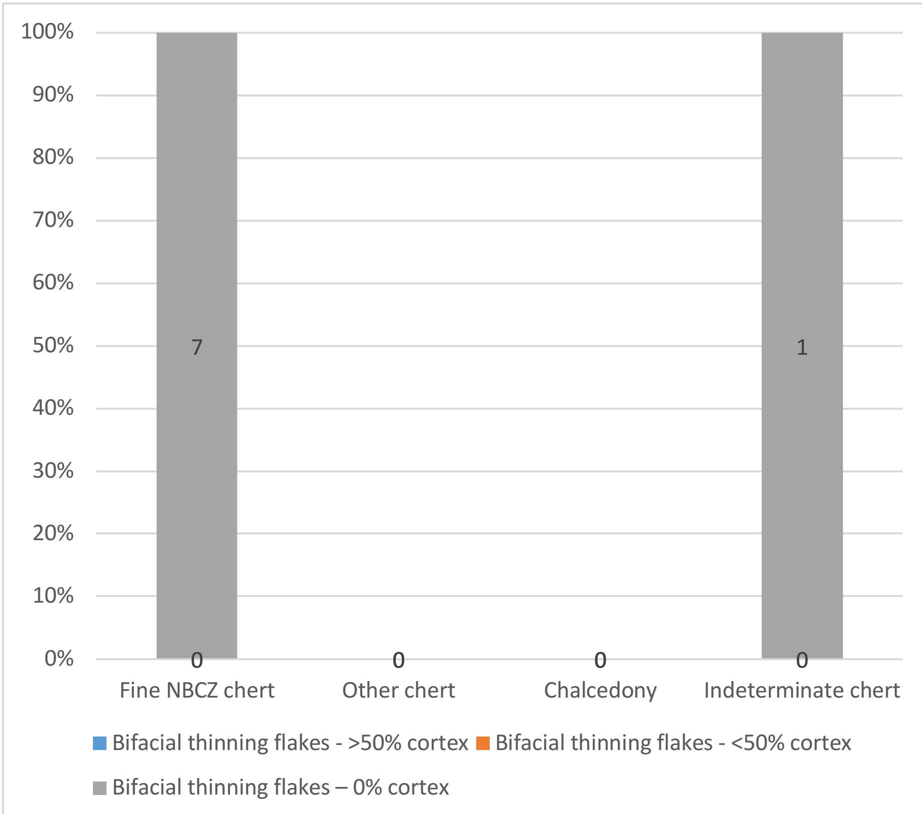

Figure A3 Percentages of cortical and non-cortical bifacial thinning flakes by raw material from STP Series 035 and surface collection. Note: There are no 'other' chert or chalcedony bifacial thinning flakes.