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Intertidal investigations of early Holocene archaeological deposits from the Ńúláẃitx̌v tribal area, British Columbia, Canada

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ABSTRACT

In 2016, 2017 an intertidal excavation program was conducted at the outer coastal archaeological site EkTb-9 in the Ńúláẃitx̌v Tribal Area of Haíɫzaqv (Heiltsuk) territory, British Columbia, Canada. Haíɫzaqv oral history marks this area as a place of origin and longstanding ancestral histories (núyṃ) have been derived from Ńúláẃitx̌v. The sea level curve for this area shows that the shoreline was between two and 4 m lower than today from 14,000 to 10,500 years ago. Intertidal subsurface testing was conducted at EkTb-9 with the hope of discovering archaeological deposits of this age. This resulted in the collection of a varied assemblage of lithics from secondary deposits, representing the products of ancestral labour for the Haíɫzaqv community. The assemblage consists of simple flake and core tools, bifaces, and flakes and cores that generally resemble other early Holocene lithic assemblages from coastal sites in British Columbia. Minimum radiocarbon ages were obtained by dating barnacles found on artifacts, dating this area of the site to at least 9535 ± 25 B.P. (10,199–9714 cal B.P.), and demonstrating that intertidal lithic scatters can be assigned minimum ages. Critical to our understanding of the intertidal secondary deposits is a detailed knowledge of site formation processes and how these were affected by sea level change, erosion, and beach deposition. The results of this work provide a framework for approaching methodological challenges associated with excavating, dating, and interpreting intertidal archaeological sites.

1. Introduction

From 2011 to 2017 a comprehensive program of archaeological investigations was conducted focusing on late-Glacial (~19,000 to ~11,650 cal B.P.) to early Holocene (~11,650 to ~8000 cal B.P.) human history on the Central Coast of British Columbia (BC), Canada. Under this program, field work was conducted at an archaeological site assigned a provincial Borden number of EkTb-9, situated on the eastern side of Triquet Island. Triquet Island is located within the Ńúláẃitx̌v Tribal Area, in the territory of the Haíɫzaqv (Heiltsuk) First Nation, specifically the Ńúláẃitx̌v sub-tribe who later amalgamated with the ‘Wúyalitx̌v sub-tribe (“people from the seaward side”) following European contact (Olson, 1955; Boas, 1923; White, 2006). The Ńúláẃitx̌v Tribal Area is located on the outer Central Coast of BC, Canada, broadly encompassing the Hakai Passage and south Hunter Island regions (see Fig. 1). The work at EkTb-9 was carried out with the involvement and support of the Haíɫzaqv Cultural Education Centre (HCEC), Central Coast Archaeology, and the Haíɫzaqv Integrated Resource Management Department (HIRMD).

The Ńúláẃitx̌v Tribal Area is of special interest for the late-Glacial to the early Holocene time periods as the local sea level history shows that paleoshorelines dating between 14,000–10,500 years cal B.P. were between two and 4 m below modern levels (see Fig. 2) and, thus, available for investigation within the modern intertidal zone (McLaren et al., 2014). In addition, this region is known by the Haíɫzaqv community to be a place

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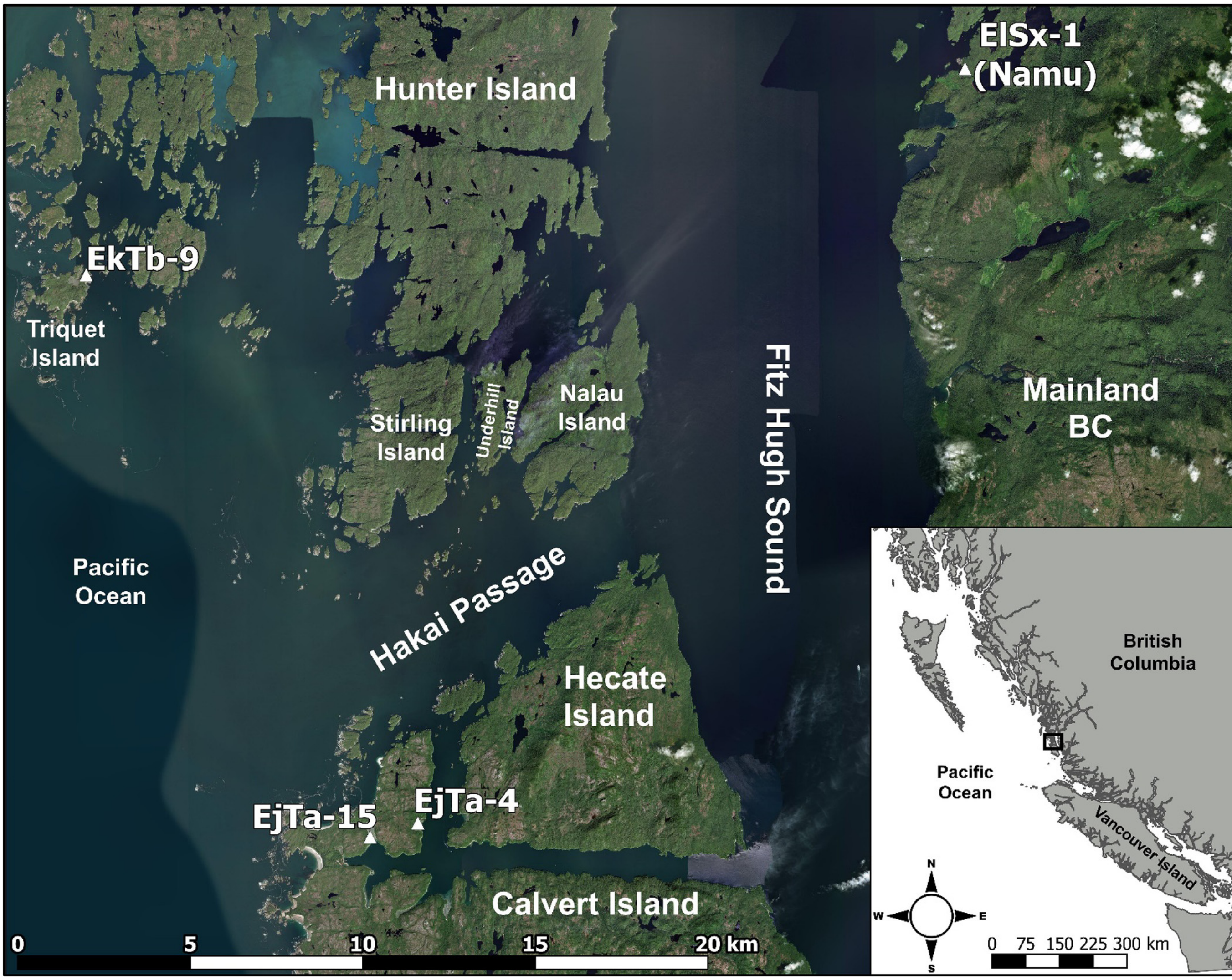

Fig. 1. Map showing the Hakai Passage and south Hunter Island regions with EkTb-9 and three nearby sites exhibiting a pattern of long-term occupation dating to the late-Glacial and/or early Holocene eras. The inset shows the position of the Hakai Passage and south Hunter Island regions along the BC coast.

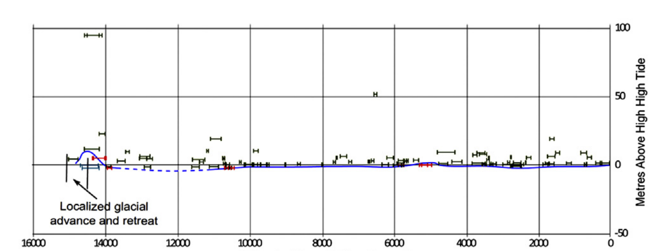

Fig. 2. Sea level curve for the West Hakai region (McLaren et al., 2014), which encompasses the study area. This curve shows the time period in calendar years before present (cal B.P.) and associated sea level in relation to the modern high tide level. It indicates a lower than modern sea level between 14,000 and 10,500 years cal B.P. Figure used with permission.

of great antiquity: the word Ńúláẃitx̌v means “first born”, and/or “people of the eldest” (HIRMD Correspondence, October 26, 2017). Work at EkTb-9 included both terrestrial and intertidal components. This paper focuses on the results of the intertidal investigations conducted in 2016 and 2017. Intertidal archaeological sites can present a number of methodological challenges associated with excavating in the intertidal zone, including difficulties finding datable materials, interpreting site formation processes, and situating out-of-context artifact assemblages. This paper presents a number of approaches that help to address these challenges.

1.1. Regional setting

Triquet Island is a small island located within the Hakai Lúxvbálís Conservancy, a marine protected area spanning 120,000 ha of ocean and land (BC Parks, 2018). It is situated at the southern end of an archipelago, at the edge of the open Pacific Ocean and in close proximity to sea lion haul-out rocks. Peat bog deposits are present on some parts of Triquet Island, but otherwise it is heavily forested by conifer trees. It is located within the Coastal Western Hemlock biogeoclimatic zone and the area has been sub-classified as Very Wet Hypermaritime, with an average yearly precipitation that ranges from 240 to 330 cm (Meidinger and Pojar, 1991).

1.2. Background

EkTb-9 was first recorded in 2008 during a field project conducted on behalf of BC Parks in collaboration with HCEC, when Jim Stafford, John Maxwell, Elroy White, and field assistant Danny Windsor identified large anthropogenic midden[1] terraces and scattered lithics in the intertidal zone (Stafford, 2009). Additional work was initiated in 2011 through a separate archaeological program under Duncan McLaren and Elroy White with a crew of two Haíłzaqv field assistants and Jim Stafford. Excavations followed from 2012 to 2017. The excavation work focused on an area of the site 70 m inland from the modern shoreline. It involved a number of Hakai Institute, independent, and University of Victoria archaeologists and Haíłzaqv field assistants (McLaren, 2013; McLaren et al., 2014, 2015; Gauvreau, 2016; Gauvreau and Dyck, 2018). The territorial and intergenerational knowledge shared by the Haíłzaqv community and crew members helped guide the broader themes of this project. Their involvement was invaluable in the day-to-day work, as they provided cultural context and helped to identify archaeological sites, areas of archaeological potential, and individual artifacts.

There are several archaeological sites and surficial features on Triquet Island. Site types include shell accumulations, house platforms, lithic scatters, petroforms (including fish traps), and culturally modified trees. Most of these are situated on the protected side of the island in association with sandy embayments. The occurrence of multiple sites on this small outer coastal island attests to extensive use and occupancy (see Dyck et al., 2018). EkTb-9 is a multi-component site, consisting of a deep, stratified shell accumulation, a wet-site deposit, at least one house platform, culturally modified trees, and intertidal lithics (Stafford, 2009; McLaren, 2013; Gauvreau, 2016; Gauvreau and Dyck, 2018).

The Ṅúláẃitx̌v Tribal Area, and Triquet Island specifically, are important cultural and marine landscapes for members of the Haíłzaqv community today. The community continues to have a deep, embodied connection to Ṅúláẃitx̌v; it is a place from which families of the Killer Whale clan have derived their *núym̓*, or ancestral story from which they derive their rights, songs, dances, ceremonies, and connections to particular territories (Haíłzaqv Tribal Council, 2018; White, 2006). Triquet Island is still regularly accessed for food and resource gathering and it is located within an active, family-owned trapline (BC Parks, 2018; see also Stafford, 2009). White, as a member of the Haíłzaqv community, has personally observed that the Ṅúláẃitx̌v Tribal Area is very productive; it is often the first place visited during times of harvest. The continued use of Triquet Island and neighbouring outer coastal islands for subsistence purposes and the extensive cultural connections to the area help to illustrate how deeply-rooted and persistent Haíłzaqv ties are to this region.

More broadly, the human history of the Central Coast extends to at least 14,000–13,000 years ago. Subsurface terrestrial deposits at EkTb-9 have recently been dated to ca. 14,500-13,400 cal B.P. with repeated occupations that continue up until ca. 500 cal B.P. (Gauvreau et al., forthcoming; Gauvreau and Dyck, 2018). The presence of culturally modified trees (CMTs) indicates use of the site post-500 cal B.P. Three other sites, located within a 30 km radius of EkTb-9, demonstrate a similar pattern of long term, repeated occupation with recent use indicated by the presence of CMTs: EjTa-4, EjTa-15 and ElSx-1 (Fig. 1). Beneath the intertidal beach at EjTa-4 is an intact late Pleistocene deposit containing footprints and lithics dating to ca. 13,000 cal B.P. Continuous subsurface occupation deposits are also present inland from the beach, dating from ca. 6100 cal B.P. and continuing to ca. 350 cal B.P. (McLaren et al. 2015, 2018). Occupation layers at EjTa-15 are situated in close proximity to the high tide line, and date from ca. 10,300 cal B.P. with repeated occupations continuing to modern times (McLaren et al., 2015; McLaren, 2014). The third site, Namu (ElSx-1), has its own first-generation story (see White, 2006) and exhibits a continuous occupation ranging from ca. 10,700 cal B.P. until contact (Carlson, 1996; Dyck et al., 2015; Rahemtulla, 2006). EkTb-9 is the most outer-coastal site, with its location at the edge of the open Pacific Ocean.

Extensive work conducted since the late 1960s shows that intertidal lithic sites are relatively common on the Central Coast and indicates that they are often lag deposits of sites associated with ancient (pre 10,500 years ago) shorelines at or below the elevation of the modern shore, rather than simply by-products of eroding terrestrial sites. (Apland, 1977; Carlson, 1972; Hester and Nelson, 1978; Hobler, 1982; Pomeroy, 1980). Initial intertidal surveys on Triquet Island identified several lithic scatters, some of which are quite extensive (Dyck et al., 2018; Stafford, 2009). The intertidal lithic scatter observed on the beach in front of the shell deposits at EkTb-9 is partially associated with a terrace-like landform approximately 3.5 m below the higher high tide (bhht) mark (Fig. 3). This landform was targeted for subsurface testing. The goal of this work was to find buried archaeological deposits that would have been in a terrestrial context between 14,000 and 10,500 years ago.

1.3. Paleogeography

The history of relative sea level change along the BC coast is complex due to the interplay between global sea levels (eustasy), the effects of local and regional glacial advances and regressions (isostacy) and tectonics. Ancient shorelines dating to 14,000 years ago are 200 m or more above modern shorelines in parts of the inner coast and, at the same time, as much as 150 m below modern shorelines on the outer coast (Clague et al., 1982; Mackie et al., 2018; Shugar et al., 2014). The Hakai Passage region (the broader region the Ṅúláẃitx̌v Tribal Area falls within) is in a hinge-like area wherein relative sea level has shifted less than 5 m over that last 14,000 years as a result of the local rate of post-glacial isostatic uplift having closely matched global eustatic sea level rise through that time (McLaren et al., 2014).

On Triquet Island, evidence for an early lowered relative sea level includes a paleosol recovered from 2.2 m bhht during coring work on a beach on the far west side of the island, ~1.2 km SW of EkTb-9. This paleosol included fresh water diatoms indicating that no marine inundation of terrestrial sediments was occurring at the time (Walker and McLaren, 2013). Terrestrial organics sampled from the paleosol were dated and resulted in ages of 10,666–10,583 cal B.P. and 10,566–10,499 cal B.P. (UCIAMS 102764, 102763; see Fig. 4; see Table 1). This suggests that relative sea level was at least 2.2 m below modern at that time (Walker and McLaren, 2013). Sometime after 10,500 cal B.P. the sea level began to rise to within 2 m of the modern high tide level, with a small transgression of 1–2 m ahht between 6000 and 5000 cal B.P (McLaren et al., 2014).

An understanding of glaciation, environmental change due to deglaciation, and changing sea levels is reflected in Haíłzaqv oral histories (McLaren et al., 2015). A Ṅúláẃitx̌v origin story tells of a time when “there was nothing but water and ice and a narrow strip

[1] The term ‘midden’ is used here for familiarity. The controversial nature of this term is acknowledged and respected and shell accumulation will be used here-to forth. See Grier et al. (2017) for a discussion regarding the monumentality and complex, deep meaning of so-called “midden” sites, a meaning that goes far beyond the refuse deposits implied by the word.

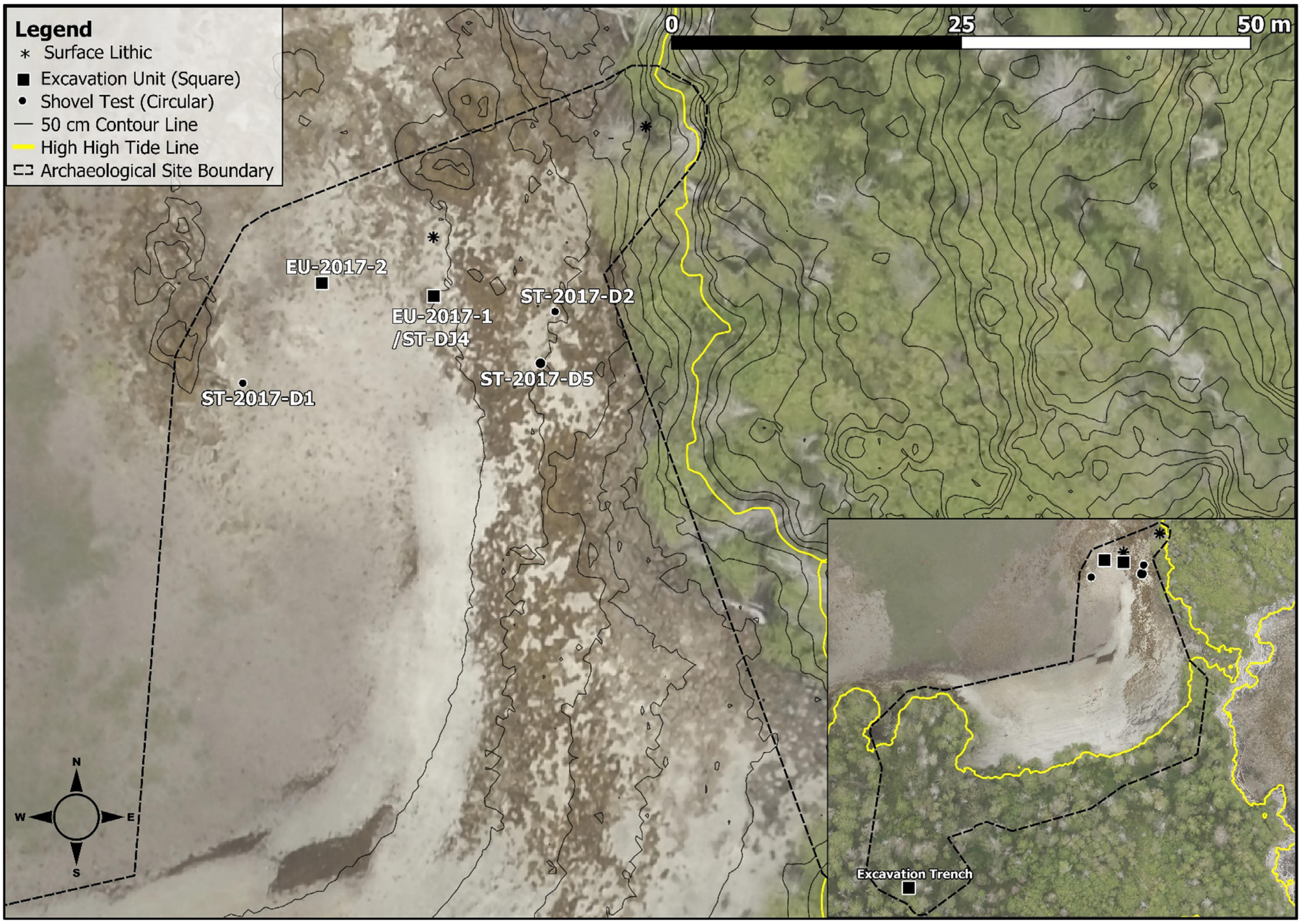

Fig. 3. Map of EkTb-9 showing the location of the surface lithics and the positive intertidal subsurface tests. The inset illustrates the distance to the excavation trench dug inland.

of shore-line" (Farrand, 1916), while another origin story from the northern Haíłzaqv village of Qvúqvaýáitxvx̌ (Kokway) tells the story of a man witnessing the environment change from barren to vegetated and rich with people and resources (Storie and Gould, 1973). A number of stories are placed in environments with both lower and higher sea levels (Boas, 1932; McLaren et al., 2015). People from the Haíłzaqv Nation know themselves to be from a community with social, political, and cultural practices that have been established over millennia in one place (Black, 1997). Due to this long-term connection to place, many Haíłzaqv community and crew members were interested in the sea-level history for the area and either supported or were actively involved in the search for evidence. The project's research strategy utilized both locally-held and scientific data to inform survey for early post-Glacial to early Holocene archaeological sites in the region (Dyck et al., 2015; McLaren, 2013, 2014; McLaren et al. 2015, 2018).

2. Methods

Archaeology in intertidal zones has unique challenges that must be accommodated with specials methods. These challenges include tidal cycles restricting access to the lower intertidal zone to two to 3 h, slumping of unconsolidated sediment, and strong water flow from groundwater during ebb tide, as well as from ocean water during flood tide. A number of solutions were employed to overcome or lessen these challenges, enabling more productive and controlled excavation work. Sandbag berms were placed around the excavation units to slightly extend the tidal window (see Fig. 5). To mitigate sediment slump a 60 cm diameter circular plastic caisson was used to shore the walls of shovel tests and a 120 × 120 cm square timber-and-plywood caisson was used to shore the walls of excavation units. Water drainage was facilitated by establishing a sump in one quadrat of the larger excavation units and running an electric dewatering (trash) pump to keep water levels low while excavating (Fig. 5). The pump was also used to slowly pre-fill units with seawater before the tidewater came in to help support the unit's walls and to minimize slumping that would have occurred due to the rapid influx of water.

More specifically, methods employed during subsurface testing included digging in ca. 10 cm arbitrary levels in shovel tests and in 5–10 cm arbitrary levels for larger excavation units. Due to slumping walls and seeping water, levels were difficult to keep consistent and they varied. All recovered sediment was wet screened through 3 mm mesh screens. Two 1.2 × 1.2 m square excavation units (EU-2017-1, EU-2017-2) and four shovel tests (ST-DJ4, ST-2017-D1, ST-2017-D2, and ST-2017-D5) ranging in size from 50 × 50 cm square (ST-DJ4), 60 cm in diameter (circular) and 1 m in diameter (circular) were conducted in the mid-intertidal area (see Fig. 3). Circular shovel tests were excavated to accommodate shoring.

Lithic analysis consisted of recording artifact metrics, providing a descriptive identification using a typology established by Porter

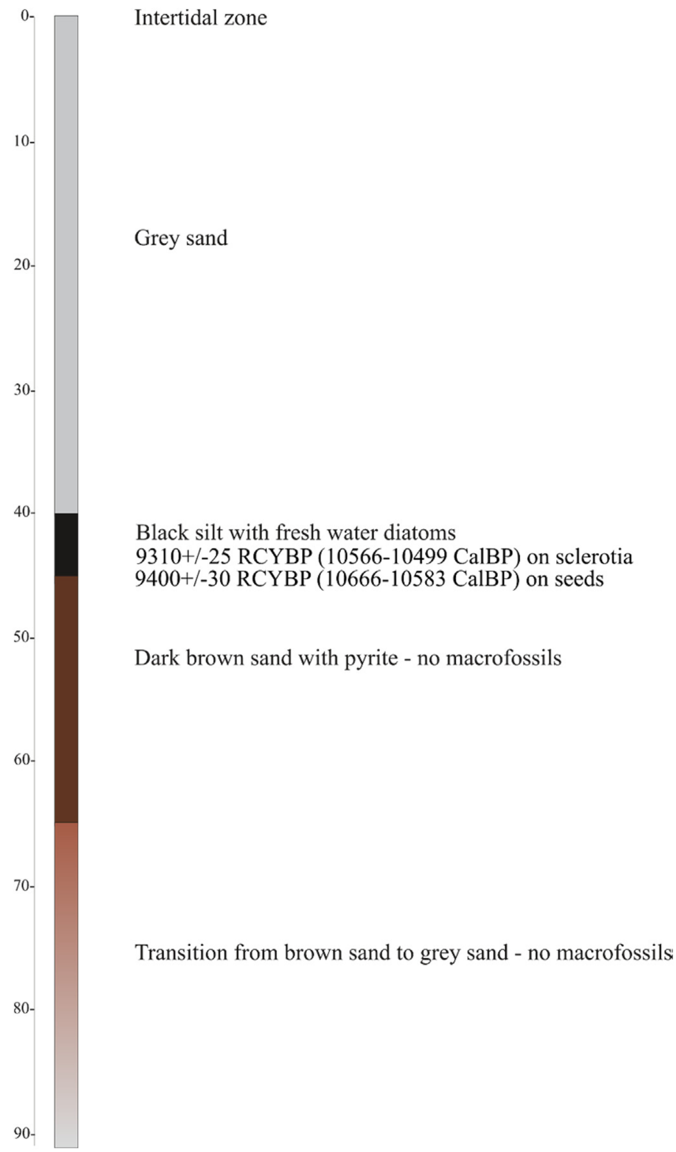

Fig. 4. Stratigraphic profile from an ESP core taken from a beach on the western side of Triquet Island showing organic soil (shaded in black) beneath beach sands. The top of the core is approximately 1.75 m below higher high tide. Used with permission (Walker and McLaren, 2013).

and McLaren (Porter, 2013, Table 20), and assigning material type designations based on visual assessment. All lithics are housed at the Haíɫzaqv Cultural Education Centre repository (Bella Bella, BC).

Material suitable for radiocarbon dating can be sparse in intertidal archaeological sites, particularly in sites with secondary deposits where the context cannot be reliably secured for any organic materials that are found. Although some charcoal was recovered and dated for comparative purposes, this challenge was primarily overcome by focusing on dating barnacles adhered to rocks and artifacts. This provides some level of context, as barnacles cannot survive in subsurface environments, and thus the resulting ages must be related to a time at which the artifact or rock was sitting on the surface of the beach. The dates obtained from the barnacles can then be used as a minimum age for artifact assemblages either directly via the barnacles situated on artifacts or relatively, through positional association of artifacts to dated rock barnacles. Radiocarbon dating was conducted by the Keck Carbon Cycle AMS Facility at the University of California Irvine. Radiocarbon samples were calibrated using the Calib 7.10 MARINE13 and Intcal 13 datasets (Stuiver et al., 2019). Marine samples were assigned a 331 $\pm$ 80 Delta R correction (McNeely et al., 2006). All radiocarbon dates obtained from the intertidal work at EkTb-9 have been calibrated with a two sigma error range.

3. Results

Artifacts were recovered from the two excavation units and all four shovel tests conducted in the mid-intertidal zone in 2016 and 2017 (see Table 2). No intact terrestrial deposits were encountered in the excavations, despite reaching depths as far as 1.3 m and 2 m below the surface in the excavation units. All strata appear to be made up of old beach sediments. The artifacts that were found are from secondary depositional contexts, as revealed by the presence of barnacles and some water-wearing on the artifacts. A moderately sized, but varied assemblage of 414 lithics (see Table 3) was collected. Thirteen minimum radiocarbon ages for the secondary deposition of the strata were obtained, ranging from 10,659 cal B.P. at the oldest to 7940 cal B.P. at the youngest (Table 1). No bone artifacts were recovered. A small quantity of fauna was retrieved, although a definite cultural origin for the fauna cannot be ascertained as it is all fish bone (and one sea mammal fragment) found in an intertidal context (Duffield, 2018). All artifacts are chipped stone with the exception of two ochre pigment stones and a graphite nodule exhibiting striae (Table 3). Basal deposits were not reached in any of the subsurface tests because of the extensive depth of the strata combined with tidal and coarse sediment issues. It is likely that additional cultural deposits lie below the depths achieved. It is further possible that preserved terrestrial strata exist at a greater depth, or in a less exposed intertidal location outside of the tested area.

The stratigraphy of the site is based upon the two larger excavation units (see Table 4). A total of six strata were identified. The topmost stratum is dominated by beach sands and shell hash and is active with live shellfish. The underlying strata are dominated by sand and silty sand with gravels and finer shell-hash. Cobbles and boulders are increasingly present as depth increases. All strata have the appearance of being marine-deposited beach sediments, with the possible exception of boulder-sized clasts. Transitions between strata were often gradual, being differentiated via colour, texture, and/or clast size and shape changes.

Of the 414 artifacts collected (Table 2), only two are from the surface of the beach (Fig. 3), although many more surface scattered artifacts were noted but not collected. The remaining artifacts reported here are from subsurface contexts. Debitage makes up a majority of the assemblage ($n = 275$, 66%), followed by cores ($n = 83$, 20%). The remaining 14% of the assemblage consists of tools ($n = 29$), Levallois-like flakes ($n = 9$), hammerstones ($n = 5$), utilized flakes ($n = 3$), biface preforms ($n = 3$), projectile points ($n = 3$), one microblade, two ochre pigment stones, and one graphite nodule (see Figs. 6, 7). Material types are mostly volcanic, visually assessed as basalt, andesite and dacite, in addition to a smaller quantity of quartzite and metasedimentary rock. Most materials are medium to coarse grained, with a smaller quantity of fine-grained material. Patination and water-rounding made identification of a number of material types difficult, although a small proportion of these appeared fine-grained. Three obsidian artifacts were recovered.

Thirteen radiocarbon dates were obtained from the intertidal excavations, spanning approximately 2500 years (Table 1). Dates obtained for shovel test DJ4 are 10,199–9714 cal B.P. (UCIAMS 175373) on barnacles from a unidirectional core and 9662-

Table 1
Radiocarbon dates obtained from the two excavation units and ST-DJ4 (around which EU-2017-1 was placed) in 2016 and 2017. Dates have been calibrated with a 2 sigma error, with the exception of UCIAMS 102764 and 102763, which were previously reported and have been kept as 1 sigma error calibrations for continuity. Empty cells indicate no value was assigned by the lab. Dates have been organized by test, material dated, and depth. A Delta ± R correction of 331 ± 80 (McNeely et al., 2006) was applied to all marine samples. Depth below higher high tide was determined by identifying the highest tide of 2017 and using this as a zero point from which unit elevations and sample depths were subtracted.

Lab Code	Sample Code	$d^{13}C$ %	±	14c Age	±	Older Cal Range BP	Younger Cal Range BP	Median Probability	Material	Depth Below Higher High Tide
UCIAMS 191449	EkTb-9 EU-2017-1 67–71 cm Barnacle	1.2	0.1	7975	25	8293	7940	8104	Barnacle on artifact	4.17–4.21 m
UCIAMS 175373	13-EkTb9-dj4-74 barnacle			9535	25	10,199	9714	9992	Barnacle on artifact	4.24 m
UCIAMS 191450	EkTb-9 EU-2017-1 80–90 cm Barnacle	1.6	0.1	9755	30	10,515	10,102	10,281	Barnacle on rock	4.30–4.40 m
UCIAMS 179733	EkTb9 ST DJ4 100-105	−25.9	0.1	8650	20	9662	9542	9581	Charcoal	4.50–4.55 m
UCIAMS 191444	EkTb-9 EU-2017-2 74 cm Barnacle	1.2	0.1	8340	25	8680	8305	8472	Barnacle on artifact	4.24 m
UCIAMS 191445	EkTb-9 EU-2017-2 86 cm Barnacle	1.7	0.1	8520	30	8964	8482	8703	Barnacle on artifact	4.36 m
UCIAMS 191446	EkTb-9 EU-2017-2125 cm Barnacle .21 mgC	1.0	0.1	8600	70	9088	8516	8803	Barnacle on artifact	4.75 m
UCIAMS 191447	EkTb-9 EU-2017-2137 cm Barnacle	1.9	0.1	8845	25	9385	8961	9147	Barnacle on artifact	4.87 m
UCIAMS 191448	EkTb-9 EU-2017-2180 cm Barnacle	1.5	0.1	8365	25	8718	8325	8496	Barnacle on rock	5.30 m
UCIAMS 191435	EkTb-9 EU-2017-2 95–105 cm Char.			7830	25	8644	8549	8605	Charcoal	4.45–4.55 m
UCIAMS 191436	EkTb-9 EU-2017-2135–145 cm Char.			9355	25	10,659	10,506	10,573	Charcoal	4.85–4.95
UCIAMS 191437	EkTb-9 EU-2017-2160 cm Char.			8190	25	9255	9030	9129	Charcoal	5.10 m
UCIAMS 191455	EkTb-9 EU2017-2185–190 cm fishbone .13 mgC		0.1	8280	120	8837	8094	8422	Fish bone	5.35–5.40 m
UCIAMS 102764	WTB 44-46			9310	25	10,566	10,499	10,525	Sclerotia	2.2 m
UCIAMS 102763	WTB 44-46			9400	30	10,666	10,583	10,631	Seeds	2.2 m

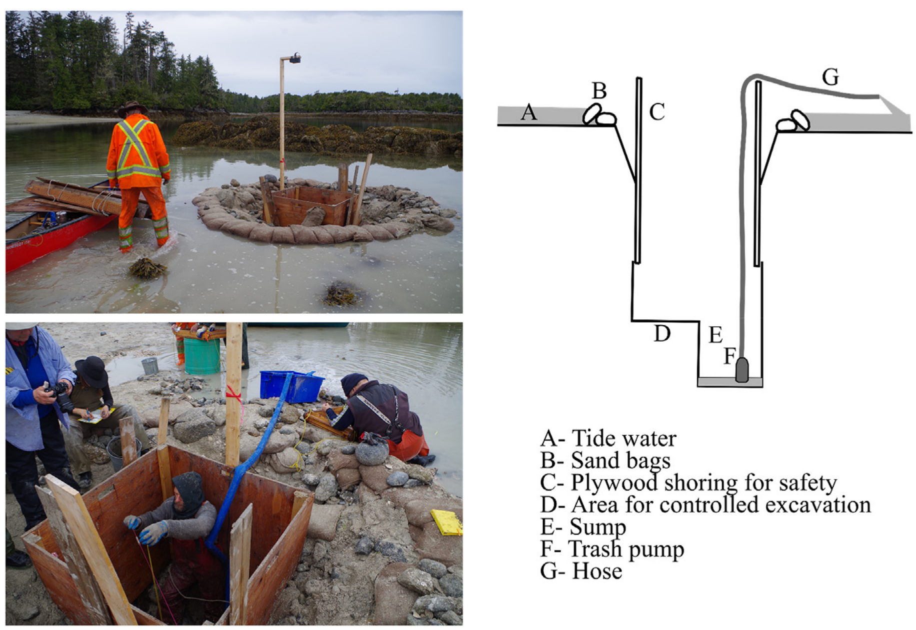

Fig. 5. Images and illustrated schematic of the set-up created for the excavation units in the intertidal zone to help manage the waterlogged conditions and influx of the tide.

9542 cal B.P. (UCIAMS 179733) from detrital charcoal (see Fig. 8). The charcoal date is out of sequence, which is likely the result of bioturbation or past-tidal action disturbing the sample. Dates for Excavation Unit 2017–1 include 8293-7940 cal B.P. (UCIAMS 191449) from barnacles adhering to an in-situ unidirectional core and 10,515–10,102 cal B.P. (UCIAMS 191450) from barnacles adhering to a rock (Fig. 8). Nine dates were obtained from barnacles, charcoal, and fish bone collected in Excavation Unit 2017–2 (see Fig. 9). These include ranges from 8964 cal B.P. (oldest date) to 8483 cal B.P. (youngest date) in sediment Layers 2–3 and 10,659 cal B.P. (oldest date) to 8094 cal. B.P. (youngest date) for sediment Layers 5–6. The oldest date of 10,659–10,506 cal B.P. (UCIAMS 191436) is out of sequence in Layer 5. It was obtained from a charcoal sample and likely represents redeposited material that eroded from an older component and/or is the result of bioturbation or past-tidal disturbance. Similarly, Layer 6 contains three out of sequence dates ranging from 9255 cal B.P. (oldest date) to 8094 cal B.P (youngest date). These dates may represent materials that have either slumped in or have been redeposited from higher up, something that is particularly likely for the lightweight charcoal and fish bone samples. It is unsurprising that all of the radiocarbon ages do not consistently appear in orderly stratigraphic sequence, as the unit strata all appear to be re-deposited beach sediments and subsequent tidal action and bioturbation has further mixed the deposits.

Table 2
Volume of sediment excavated and number of artifacts recovered from each positive subsurface test conducted in the intertidal zone at EkTb-9.

Test	Size	Volume Excavated (m^3)	Artifact Count
EU-2017-1	1.2 × 1.2 m	1.87	98
EU-2017-2	1.2 × 1.2 m	2.88	141
ST-DJ4	50 × 50 cm	0.3	42
ST-2017-D1	60 cm diameter	0.25	38
ST-2017-D2	60 cm diameter	0.27	28
ST-2017-D5	1 m diameter	0.94	65

4. Discussion

4.1. Dating and site formation processes

Hypothesizing site formation processes for intertidal assemblages in secondary deposits is notoriously difficult as the original depositional context is no longer present to provide essential contextual information. This hurdle can be partially overcome by obtaining radiocarbon dates that are connected to a known context, even if it is not necessarily the original depositional context. Interestingly, in the intertidal excavation units radiocarbon ages obtained from barnacles on either rocks or artifacts are stratigraphically consistent within each unit, with the exception of the lowest barnacle rock sample from Excavation Unit 2017–2 (UCIAMS 191447). This sample was collected as the caisson started to give way and may have slumped in from above. The sea level curve for the area suggests that high tide regressed to 3.5 m bhht between ca. 13,000 and 11,000 years ago. It rose to 2.2 m bhht between 10,666 and 10,499 cal B.P., as revealed by a terrestrial soil on the west side of Triquet Island (McLaren et al., 2014, Fig. 4). The relatively consistent barnacle dates and apparent lack of terrestrial deposits suggests that these barnacles grew on artifacts resulting from intertidal beach activities and/or paleoshoreline deposits that were sequentially redeposited as sea level rose between approximately 11,000 and 8000 years ago (see Fig. 10). Early dates from inland units confirm that the island was occupied within those time

Table 3
Description of the EkTb-9 intertidal lithic assemblage arranged by artifact type and subsurface test.

Type	ST-DJ4	EU-2017-1	EU-2017-2	ST-2017-D1	ST-2017-D2	ST-2017-D5	Surface	Total
Unifacial/Unimarginal tool	3	2	3	2	1	2	–	**13**
Bifacial tool	–	–	1	–	1	–	–	**2**
Endscraper	1	–	1	–	–	–	–	**2**
Scraperplane	1	1	–	–	–	–	–	**2**
Graver	–	2	–	–	–	2	–	**4**
Scraper/graver	–	1	–	–	–	–	–	**1**
Graver/notch	–	–	–	–	–	1	–	**1**
Burinated flake tool	–	–	1	–	–	–	–	**1**
Utilized flakes	1	–	–	–	1	1	–	**3**
Backed knife	–	–	–	–	–	2	–	**2**
Levallois-like flake tool	1	–	–	–	–	–	–	**1**
Microblade	–	–	1	–	–	–	–	**1**
Microblade core	–	–	–	–	–	1	–	**1**
Unidirectional core	2	7	5	3	2	2	–	**21**
Multidirectional core	2	5	5	1	1	2	–	**16**
Discoidal core	–	1	–	–	–	–	1	**2**
Bipolar core	4	4	10	6	1	2	–	**27**
Core (General)[a]	1	5	8	2	–	–	–	**16**
Debitage	20	64	102	22	19	48	–	**275**
Levallois-like flake	1	4	2	–	–	1	1	**9**
Pigment stone	–	–	1	1	1	–	–	**3**
Projectile Point	3	–	–	–	–	–	–	**3**
Biface preform	1	1	–	1	–	–	–	**3**
Hammerstone	1	1	1	–	1	1	–	**5**
Total	**42**	**98**	**141**	**38**	**28**	**65**	**2**	**414**

[a] Core (General) refers to tested nodules, core fragments, and heavily weathered cores.

Table 4
Stratigraphic descriptions for each excavation unit with depth below surface (db) and depth below higher high tide (bhht) indicated on the left of each layer description. Note that layer designations are unit specific. Artifacts were found in all layers except Layer 1 in EU-2017-2.

EU-2017-1		EU-2017-2	
0–50 cm dbs **3.50–4.00 m bhht**	Layer 1: Active beach/shell hash	**0–45 cm db** **3.50–3.95 m bhht**	Layer 1: Active beach/shell hash with rounded cobbles.
50–57 cm db **4.00–4.07 m bhht**	Layer 2: Fine shell hash with brown silt and dark silt lenses	**45–80 cm db** **3.95–4.30 m bhht**	Layer 2: Shell hash with rounded cobbles and pebbles.
55–80 cm db **4.07–4.30 m bhht**	Layer 3: Dark grey silty sand lenses in shell hash, compact with pebbles	**75–105 cm db** **4.25–4.55 m bhht**	Layer 3: Finer sandy shell hash with rounded gravels and less cobbles
70–100 cm db **4.20–4.50 m bhht**	Layer 4: Fine, silty sand with very fine shell, rounded clasts and a few angular clasts	**100–120 cm db** **4.50–4.70 m bhht**	Layer 4: Darker grey sand and shell hash with more cobbles and pebbles.
90–130 cm db **4.40–4.80 m bhht**	Layer 5: Fine-medium grained shell has with fine sand and mostly angular clasts. Some rounded clasts and some clay content. **Bottomed out on a large boulder.**	**120–158 cm db** **4.70–5.08 m bhht**	Layer 5: Rounded cobbles with some fine grey-brown sand and shell.
		158–200 cm db **5.08–5.50 m bhht**	Layer 6: Medium-fine grey sand with sub-rounded cobbles, pebbles and small boulders. **Bottomed out on cobbles and boulders.**

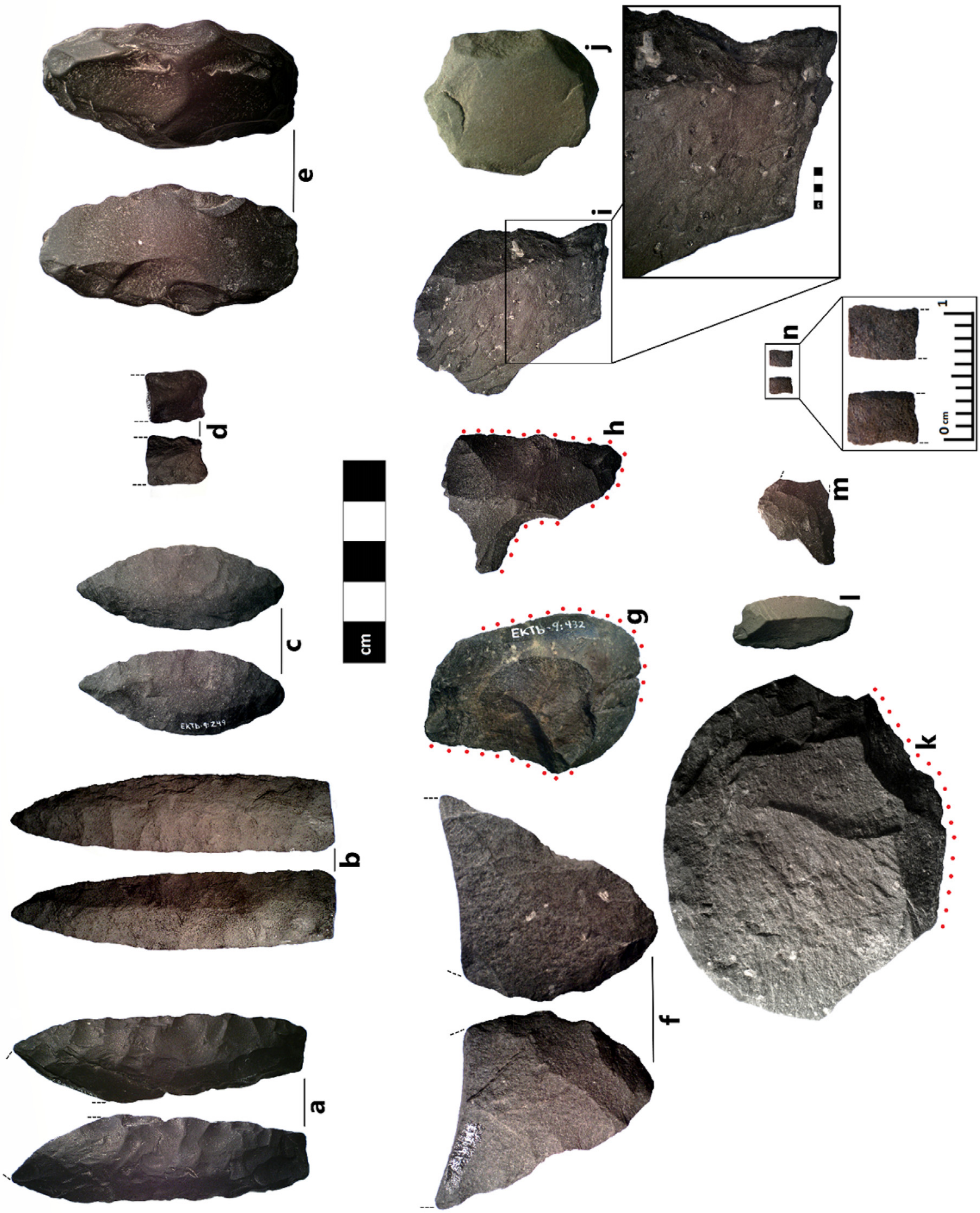

Fig. 6. Selection of tools from the EkTb-9 intertidal assemblage and one projectile point example from EjTa-15. Red dots indicate areas of heavy utilization. a: lanceolate projectile point (EkTb-9:287); b: lanceolate projectile point (EjTa-15:93) reminiscent of 'a', found on the surface of the beach at EjTa-15; c: foliate projectile point with incipient stem (EkTb-9:249).; d: waterworn preform projectile point base (EkTb-9:284); e: biface preform with a more recent flake removal from one face (EkTb-9:213); f: biface preform fragment (EkTb-9:133); g: unimarginally retouched flake tool (EkTb-9:432); h: utilized biface reduction flake (EkTb-9:407); i: graver/notch flake tool (EkTb-9:442); j: scraperplane with one large flake removal creating a concavity (EkTb-9:129); k: utilized backed knife (EkTb-9:433); l: unimarginally retouched flake tool (EkTb-9:473); m: fragmented biface reduction flake (EkTb-9:131); n: proximal microblade fragment (EkTb-9:288). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

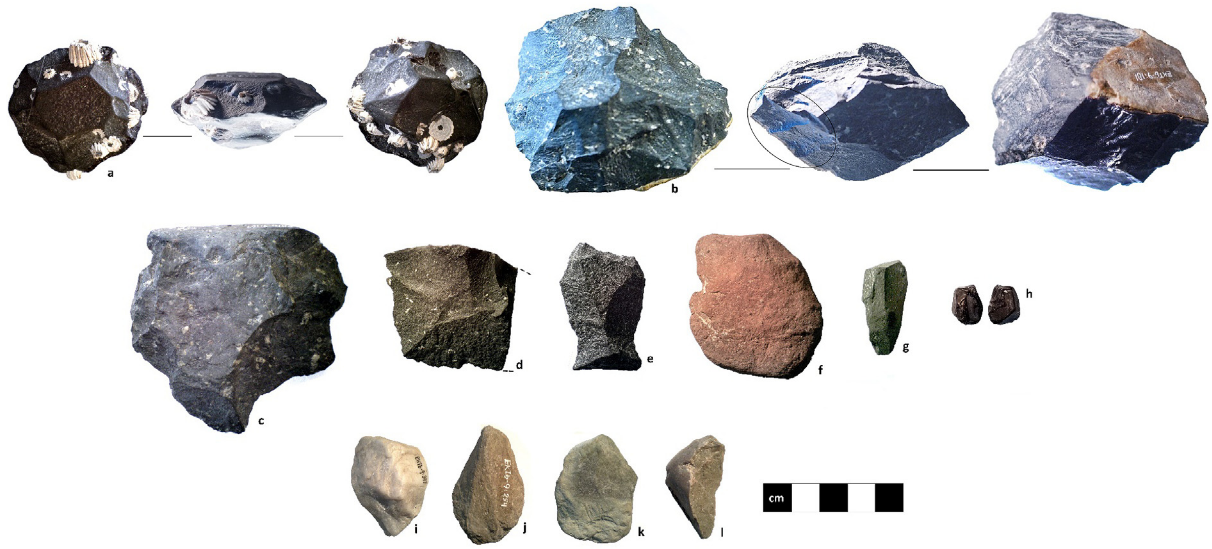

Fig. 7. Selection of cores, flakes, and pigment stones from the EkTb-9 intertidal assemblage. a: discoidal core found on the surface of the beach (EkTb-9:477); b: discoidal core with unidirectional blade like flake removals circled (EkTb-9:181); c–e: Levallois-like flakes (EkTb-9:169, 175, 285); f: ochre pigment stone (EkTb-9:320); g: graphite nodule (EkTb-9:241); h: obsidian debitage (EkTb-9:406); i–k: bipolar cores of various materials (EkTb-9:391, 254, 250); l: bipolar flake (EkTb-9:94).

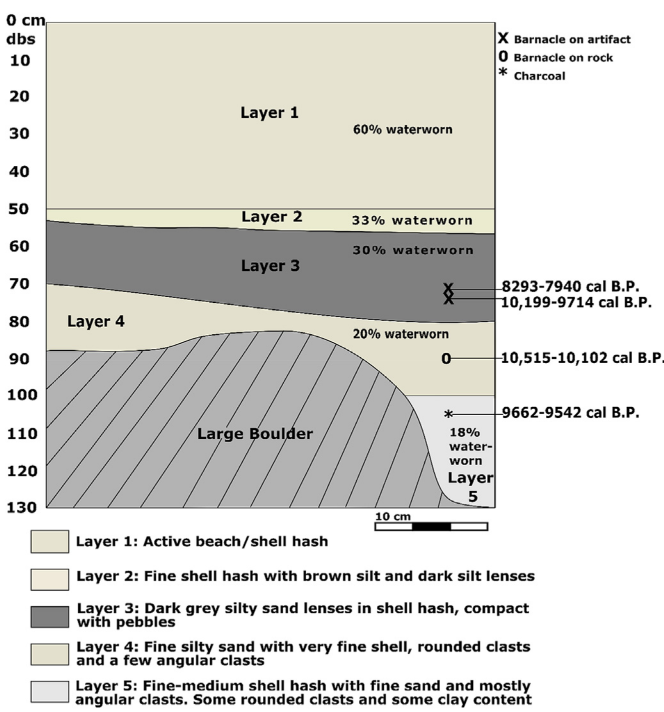

Fig. 8. Schematic stratigraphic profile of the south wall of Excavation Unit 2017-1 with dates from both ST-DJ4 and Excavation Unit 2017-1 displayed. Drawn based on detailed notes taken in the field. This test bottomed out on a large boulder, not dissimilar to those found on the nearby shore. Radiocarbon ages and percentage of waterworn lithics are indicated on the right.

frames (McLaren, 2013; Gauvreau, 2016; Gauvreau and Dyck, 2018). A lower sea level would have extended the shoreline, allowing Indigenous inhabitants to utilize vegetated space that is now in the intertidal zone. As is common practice today, it is likely past inhabitants utilized both the vegetated area and upper intertidal areas of the shoreline (Fig. 10, panel B). As sea level began to rise after 11,000 cal B.P., erosional and depositional processes would erode paleoshoreline archaeological deposits, while simultaneously depositing sediment and forming a new beach surface. This would cause some buried archaeological deposits to erode onto the new beach surface, while capping other deposits in a now-buried former beach surface (Fig. 10, panel C). Continued intertidal use by inhabitants during sea level rise is likely to have caused additional artifacts to be dropped onto the beach surface, resulting in the exposure of a mix of contemporaneous and older artifacts and rocks. As sea level continued to rise, new beach surfaces would be formed and continued erosional and depositional processes, would cause some previously capped artifacts to become exposed on the new beach surface, and thus open for barnacle colonization until subsequent depositional processes buried them again (Fig. 10, panel D, E). Inhabitants would continue to utilize the area by following the subsequent shorelines (Fig. 10, panels C–E). Artifacts from a series of former beach surfaces would have been redeposited in upper layers and/or re-exposed with continued erosional and depositional action and any corresponding bioturbation of the new beach surface. This means that although we can identify a time in which artifacts were colonized by barnacles while sitting on the surface of a beach, these dates are not necessarily representative of the age of the artifacts themselves. Most radiocarbon dates are likely substantially younger than the artifacts would be, with only intertidal dropped artifacts potentially representing a somewhat contemporaneous age in relation to use.

Calibration modelling of the barnacle ages shows a minimum of four separate periods of exposure, where artifacts and rocks would have been sitting on the surface of a beach and available for barnacle attachment. Exposure periods include the following ranges: 10,199-10,102 cal B.P., 9088-8961 cal B.P., 8680-8516 cal B.P., and 8293-7940 cal B.P. Three of the exposure periods are indicated by overlapping radiocarbon dates, while one is represented by a single date (see Fig. 11). Areas of overlap between the radiocarbon dates help to provide a narrowed period of exposure, tightening the potential time periods for which artifacts and rocks were exposed on the surface of the beach (see Table 5). For example, the two oldest ages obtained from barnacles have ranges of 10,515–10,102 (UCIAMS 191450) and 10,199–9714 cal B.P (UCAIMS 175373). A period of overlap between these two dates occurs between

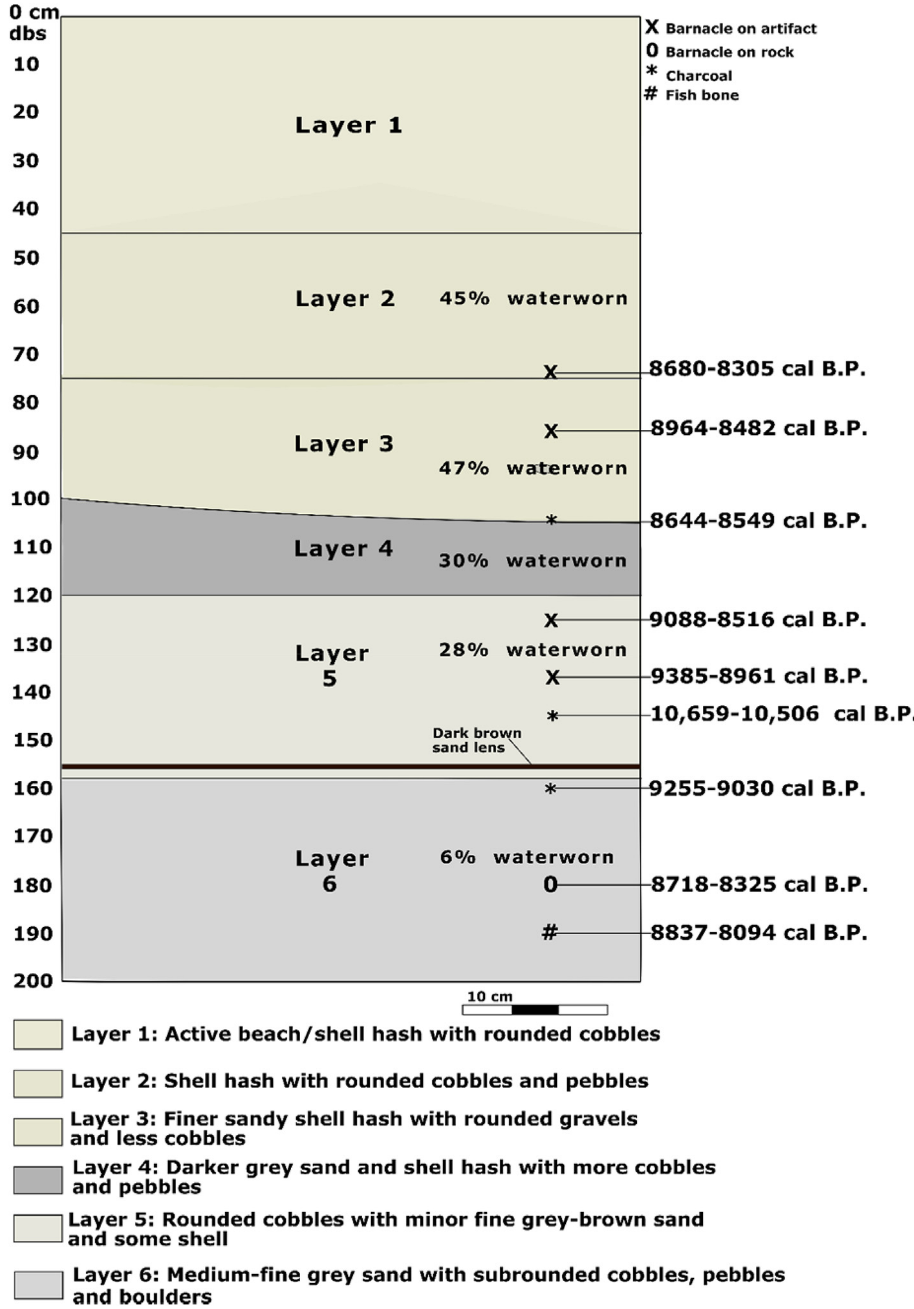

Fig. 9. Schematic stratigraphic profile of the north wall of EU-2017-2. Drawn based on detailed notes taken in the field. Radiocarbon dates retrieved from barnacles on artifacts and percentage of waterworn lithics are indicated on the right.

10,199–10,102 cal B.P., potentially indicating that the period of exposure for the dated rock and artifact falls within this narrower time-frame of 197 years, rather than the 801 year time span represented by both of the dates. One of the dates, 9088-8516 cal B.P. (UCIAMS 191446), overlaps in two separate places in its curve, providing two time frames in which this artifact may have been exposed on the beach. Despite this, the two time frames still provide a tighter overall range than that provided by the singular calibrated date (Table 5). Finally, one date stands alone, and thus while it still indicates a period of exposure, its range is not narrowed and remains the same. Whether general erosional/depositional processes due to relative sea level rise or singular events caused these exposure periods is difficult to tell. It is possible exposure periods were caused by storm events during relative sea level rise that resulted in the deposition of entire stratigraphic layers into the intertidal zone, but additional data is required to hypothesize further regarding potential causes. It is important to note that the exposure periods discussed above are limited by the quantity of dates that were obtained and are not meant to be a final interpretation. It is likely additional radiocarbon dating would discover more exposure periods, or may result in a more gradual spread of dates.

The waterworn condition of many of the artifacts is a further indication of their secondary context, as artifacts in intact subsurface deposits do not show water-wearing. Interestingly, as depth increases, the percentage of waterworn artifacts decreases (Figs. 8

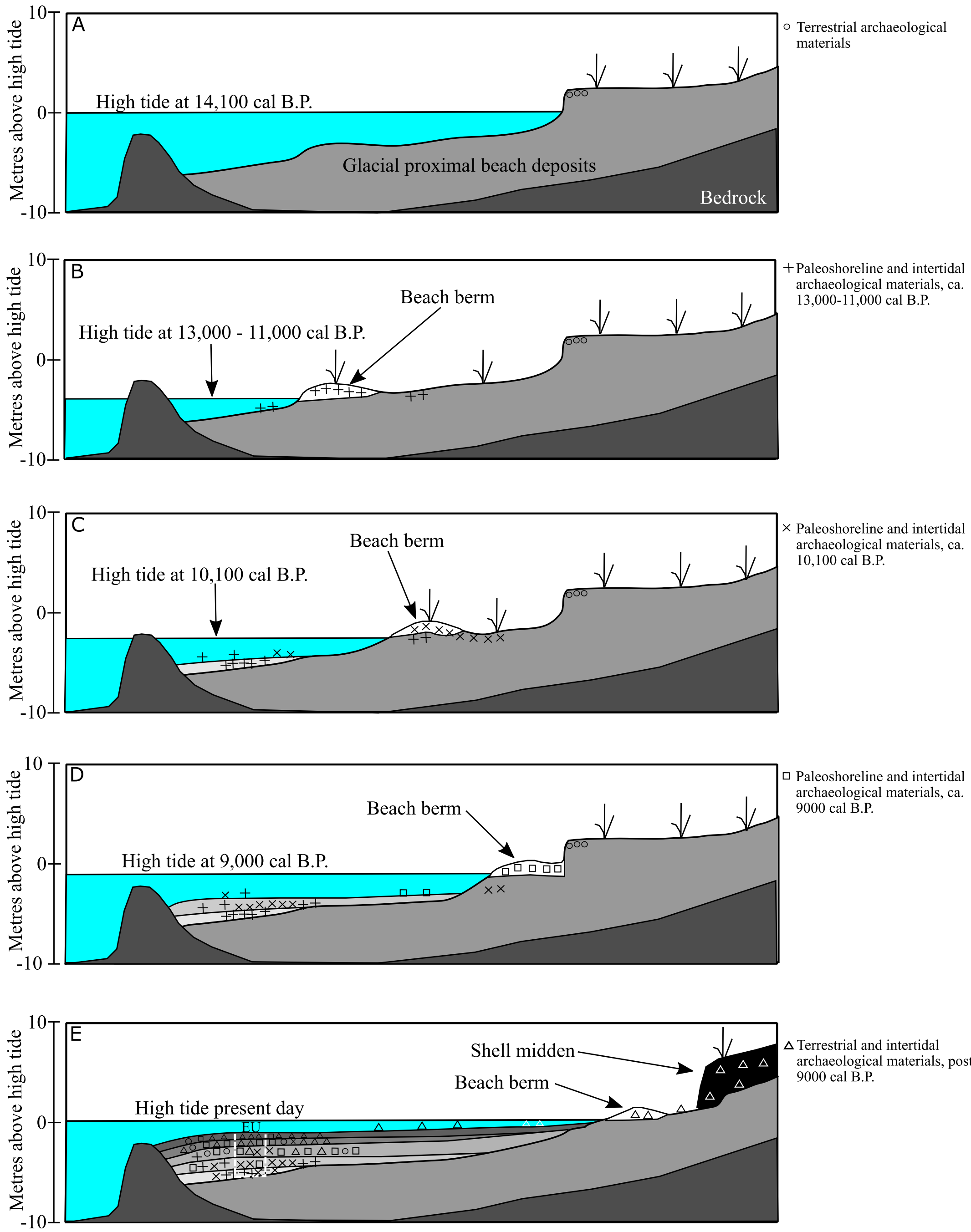

Fig. 10. Schematic drawing showing a broad interpretation of site formation processes that led to the intertidal deposits excavated in the intertidal zone of EkTb-9 in 2016 and 2017.

and 9). This may be the result of former beach surfaces with eroded or dropped artifacts being capped relatively quickly, providing less time for artifacts to become waterworn. The artifacts would then subsequently become less prone to additional re-exposure and/or bioturbation as increased deposition built-up deposits. This said, each potential beach surface would have been affected by bioturbation and possibly clam harvesting by inhabitants at the time, indicating that despite the reduction in water-wearing, deposits are likely to be somewhat mixed throughout. An alternate explanation may be that intact deposits from an unidentified terrestrial occupation are located below the depths achieved in 2017. Intertidal sites at Collison Bay and Kilgii Gwaii on Haida Gwaii both exhibited areas that contained mixed deposits on top of intact or partially-intact terrestrial and/or supratidal deposits (Fedje et al., 2005a, b; Fedje and Smith, 2009), supporting the possibility that intact deposits could still be found at lower depths or nearby the excavated units.

4.2. Lithic technology

Regionally and culturally situating artifact assemblages obtained from secondary intertidal deposits can be difficult as they lack the context that is often used to do this. Generally, in-situ dates and in-context deposition are minimally required to assign meaning to archaeological deposits. As secondary intertidal deposits often lack these components, it can be easy to disregard them as too

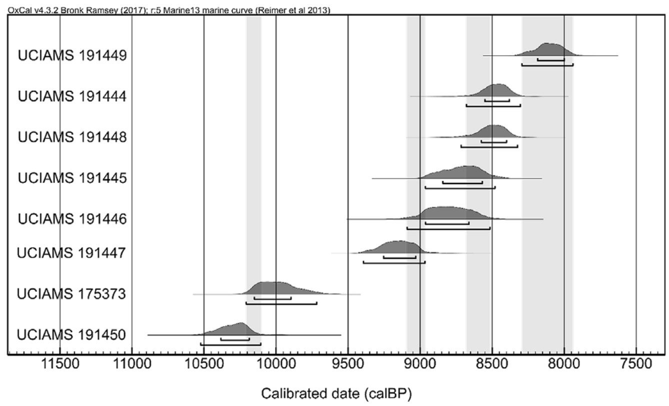

Fig. 11. Calibration model showing periods of overlap (highlighted with a grey bar) between calibrated radiocarbon dates. The shorter bar under each calibration curve represents a 1 sigma calibration range and the longer bar represents a 2 sigma calibration range.

difficult to assign meaning to. The above results show, however, that minimum ages for intertidal assemblages can be obtained through dating barnacles. This allows for intertidal lithic assemblages to be qualitatively compared to other similarly-aged assemblages in the region, allowing for deeper analyses that can consider similarities and/or differences and any cultural significance these may hold. It also allows for comparisons to be made to local Indigenous oral histories that connect temporally to the age of the assemblages, deepening cultural connections and enhancing the meaning these assemblages hold to living communities today.

The intertidal lithic assemblage from EkTb-9 is similar to the early lithic assemblages from Period 1 A to 1 B at Namu, the Kingii Complex and the Early Moresby assemblages from Haida Gwaii, and from the nearby sites of EjTa-15 and EjTa-4 on Calvert Island (Carlson, 1996; Dyck, 2018; Fedje and Mackie, 2005; Fedje et al., 2011; Fedje et al., 2005b, McLaren, 2014; McLaren et al. 2015, 2018; Rahemtulla, 2006). The flakes are generally simple and relatively large in size with very few small, lightweight flakes recovered. This paucity of small flakes is also seen in the in-situ recovered assemblages from Kilgii Gwaay and may reflect the hard hammer expedient flake production seen at these early sites along the coast, often associated with blade-like flake and Levallois-like flake technology (Fedje et al., 2005a; Fedje et al., 2011). The flake tools tend to have limited unimarginal and/or unifacial retouch that often takes advantage of natural features on the flake (see Fedje et al., 2005a; Fedje et al., 2011; Rahemtulla, 2006; Storey, 2008). A small number of the retouched flake tools appear to have more than one function (Table 3), a characteristic seen in the Kinggi Complex and Early Moresby assemblages at Richardson Island (Storey, 2008). The projectile points are similar to the foliate forms present at Namu, Haida Gwaii, and one surface collected point from EjTa-15 (Fedje et al., 2005a, 2008, 2011; McLaren and Smith, 2008; Porter, 2013; Rahemtulla, 2006). Levallois-like cores are a notable artifact type found in Haida Gwaii assemblages (see Fedje et al., 2011) and were also identified in this collection (Table 3). One of the EkTb-9 Levallois-like cores displays both unidirectional blade-like flake scars and the centripetal flake removals typical of these cores (Fig. 7). This is consistent with the hypothesis that Levallois-like cores and blade-like flake cores exist on a continuum (Fedje et al., 2011). Additionally, nine Levallois-like flakes, a distinctive flake type associated with Levallois-like core technology, were identified. These flakes are also present in early assemblages from Namu, Haida Gwaii, and EjTa-15 (Carlson, 1996; Hobler, 1978; Porter, 2015). The sampled late Pleistocene deposits found in association with footprints at EjTa-4 do not contain bifaces, microblades or Levallois-like technology, but the simple pebble and flake tools from the site are reminiscent of those in the EkTb-9 intertidal assemblage (Dyck, 2018; McLaren et al., 2018).

The quantity of microblades and microblade cores present in the EkTb-9 intertidal assemblage is significantly less than what is seen at Namu and in the assemblages from Haida Gwaii. It is worth noting, however, that the analysis of lithics from inland unit EU-2016-1 has resulted in the recovery of three obsidian microblades from early Holocene deposits (see Gauvreau and McLaren, 2017; Gauvreau and Dyck, 2018). Despite the presence of additional microblades in the terrestrial component of the site, the overall number is still lower than comparable sites. It is possible that microblade technology was not adopted at EkTb-9 to the same degree as is seen at Namu and on Haida Gwaii (Carlson, 1996; Hutchings, 1996; Rahemtulla, 2006), or that the age of the EkTb-9 intertidal assemblage (which is based on minimum radiocarbon dates) is earlier than the widespread adoption of microblade technology on the coast which occurred circa 9800-9600 cal B.P. (McLaren and Smith, 2008). However, it is also possible that there is additional evidence of a more developed microblade industry, and that what we are seeing in this assemblage is the result of sampling bias resulting from the placement of the tests and/or differential redeposition causing lighter and smaller artifacts to wash away. This may also be an alternative explanation for the relative lack of small, lightweight flakes in the assemblage.

Archaeological site EjTa-15 on Calvert Island provides an interesting nearby analogue to EkTb-9 as it also contains early intertidal and terrestrial deposits (Dyck et al., 2016; McLaren, 2014; McLaren et al., 2015). The intertidal deposits at this site have been interpreted as the remains of an intertidal beach activity area dating to ca. 8000 cal B.P., supported by the presence of a preserved stratum with many animal bones, including those of sea mammal, mammal, bird and fish, some of which exhibit burning (Dyck et al., 2016). EjTa-15 also contains a mix of microblades with simple flake tools and Levallois-like flakes dating to ca. 10,300 (oldest date) to ca. 7600 cal B.P (youngest date), although no Levallois-like cores were

Table 5
Radiocarbon ages obtained from barnacles and the exposure period range each calibrated date falls into. Each exposure period range represents a likely time-frame in which the dated artifacts and associated rocks were exposed on a beach surface and open to barnacle colonization.

Lab Code	Barnacle Date Range (cal B.P.)	Exposure Period Number	Exposure Period Range (cal B.P.)
191449	8293–7940	1	8293–7940
191444	8680–8305	2	8680–8516
191448	8718–8325	2	8680–8516
191445	8964–8482	2	8680–8516
191446	9088–8516	2/3	8680–8516 9088–8961
191447	9385–8961	3	9088–8961
175373	10,199-9714	4	10,199–10,102
191450	10,515–10,102	4	10,199–10,102

recovered (McLaren et al., 2015). One complete collaterally flaked lanceolate point was found from a surface context, and although it cannot be dated, its form is very similar to other early lanceolate point forms (see Fig. 6; Carlson and Magne, 2008; Porter, 2013). One retouched flake tool made from a Levallois-like flake has an associated date of ca. 9000 cal B.P. (McLaren, 2014; Porter, 2014). Most of the microblades do not have any closely associated ages, excepting one microblade found inland that is associated with a ca. 9000-8000 cal B.P. date range (McLaren et al., 2015; Porter, 2015). All of these dates are fairly consistent with the minimum ages from intertidal deposits at EkTb-9, making EjTa-15 a remarkably similar site occupied during a broadly contemporaneous or slightly later time period.

Broadly, many of the lithic types recovered from the intertidal tests (e.g. the lanceolate and foliate points, Levallois-like flakes, and flake-based tools) resemble those found in Western Stemmed Tradition sites (see Beck and Jones, 2010, 2012; Bryan, 1980; Davis et al., 2012; Davis et al., 2014; Davis and Willis, 2018; Erlandson and Braje, 2011; Haynes, 1996; Jenkins et al., 2012). The projectile points found at EkTb-9 tend to be more foliate in shape than stemmed, with the exception of the lanceolate point.

One notably different aspect of the EkTb-9 intertidal assemblage from nearby sites is the relatively high frequency of bipolar technology. Bipolar cores are the most common type of core collected (n = 27, 33%) and bipolar flakes make up 20% (n = 55) of the debitage, indicating this was a relatively important reduction strategy for inhabitants. Bipolar technology is rarely mentioned in the Haida Gwaii lithic analyses, with only two bipolar flakes recovered from Collison Bay (Fedje et al., 2011; Fedje and Mathewes, 2005; Fedje and Smith, 2009). At Namu, bipolar reduction is largely practiced on small obsidian nodules, indicating its use as a terminal reduction strategy employed to maximize output from a valuable material (Carlson, 1996; Hutchings, 1996; Rahemtulla, 2006). Some bipolar flakes and cores were collected at EjTa-15 and EjTa-4, but in much smaller quantities (Porter 2013, 2015; Dyck et al. 2016, 2018). This difference may be explained, in part, by the material types present in the EkTb-9 assemblage, which are generally medium to coarse grained volcanic rock. A small amount of fine-grained siliceous rock types are also present, but are in the minority. A basic visual assessment suggests that much of the material present in the EkTb-9 intertidal assemblage could have been locally obtained, as similar materials to those seen in the collection are present on the surrounding beaches.[2] Rahemtulla (2006, 311) notes that many of the materials present in the Namu assemblage are also not “qualitatively desirable”. He argues that the accessibility of the material, however, would have been advantageous, and people would have devised strategies that worked well with limitations caused by the coarser properties of many of the rock types (Rahemtulla, 2006). Fedje et al. (2011) also suggest that assemblage differences at coastal sites likely partially relate to locally available material types. The abundance of medium to coarse grained cobbles and pebbles in close proximity to EkTb-9 would have made bipolar reduction an ideal strategy as it allows for an efficient use of irregular-shaped nodules and material types with unpredictable fracture mechanics. It would also allow for maximum production of available finer-grained materials through shifting to bipolar reduction when prepared cores become too small to maintain. This strategy would be especially useful if the task at hand was expedient in nature and/or did not require a specialized edge. Past toolmakers would have assessed specific task requirements in relation to locally available materials and transport considerations when devising lithic reduction strategies. It is likely the common use of bipolar reduction evidenced in this assemblage arose from these types of considerations, resulting in an assemblage with slightly different components than those recovered from nearby sites.

Although it appears likely that at least some of the material types in the EkTb-9 intertidal assemblage are local, obsidian is present and has been sourced to the Bes But'a (Anahim Peak) (n = 2) and Kingcome (n = 1) flows (Reimer, 2018, Fig. 12). These sources are located, respectively, approximately 208 km NW and 142 km SW of Triquet Island, as the crow flies. Interestingly, the Kingcome sourced obsidian may be the oldest known occurrence from this source (Carlson, 1994; Stafford et al., 2013). The presence of obsidian in this assemblage demonstrates that inhabitants would have had relationships with other communities, and that travel over significant distances would be required to obtain the obsidian, either through trading or territory access. Obsidian sourced to Bes But'a was also found just south of the Haíɫzaqv community Waglisla (New Bella Bella) on Campbell Island, ~24 km NNE of Triquet Island (Marr, 2017) and several other coastal sites including Namu (Carlson, 1994). This shows a continuity of material use and access to trade routes and/or relationships throughout Haíɫzaqv territory. The difficulty of obtaining obsidian generally makes it a much more valuable material. The scarcity and small size of the obsidian artifacts in the assemblage confirms this value, suggesting this material was utilized to the end of its functional life. The presence of a small angular graphite nodule in the intertidal deposits similarly supports the occurrence of trade and/or travel to secure non-local materials. Other than a small source of disseminated graphite flakes near Rivers Inlet, ~70 km away, the closest known graphite source is a large lump vein located near Bella Coola, ~110 km away (Marchildon et al., 1993; Reese, 1992; Simandl et al., 2016). Despite these distances, boat travel would have allowed for relatively easy transport of raw materials, and as coastal First Nations are highly maritime adapted, this likely was a common strategy. Ultimately, it is likely that the materials represented in the assemblage were both locally obtained and transported in from elsewhere.

The EkTb-9 intertidal assemblage has connections beyond its similarities (or differences) to surrounding archaeological sites. As White (2006) observed, Haíɫzaqv people relate to these artifacts (and other archaeological remains) as products of their ancestor's labour. The late Qáqútilayu (Hoffman Harris), a Haíɫzaqv elder, illustrated this intimate relationship when he shared that stone tools are gifts “… of the one who first made man. They are created for those born first in this area” (HIRMD Correspondence, October 26, 2017). Genealogy is recorded by the Haíɫzaqv people through their ancestral narratives, complex social and cultural practices, connection to land, and political histories and it often has no decipherable start or end point (White, 2006). From the Haíɫzaqv perspective, the early age of this lithic assemblage represents not only the remains of Haíɫzaqv culture, but gifts given from their Creator to the ancestors who first settled in this area. They are physical manifestations of the adaptive strategies and lifeways of Haíɫzaqv ancestors, whose stories are indelibly marked on the land and seascape investigated by archaeologists. It is in these ways that the Haíɫzaqv connect to their ancestors and the stories artifacts tell through this lithic assemblage.

5. Conclusion

The intertidal exploration program completed in 2016 and 2017 at EkTb-9 was conducted under the umbrella of a program that worked with Haiɫzaqv field assistants, archaeologists, Central

[2] An in-depth assessment of materials (i.e. chemical analysis) was not conducted on either the beach samples or the lithic assemblage. Thus, no concrete conclusions can be made regarding material sourcing for non-obsidian artifacts (see Smith, 1997 and Abbott, 2018 for discussions on this).

Fig. 12. Map showing the distance of the Kingcome and Bes But'a (Anahim Peak) obsidian sources identified at the site in relation to the location of EkTb-9.

Coast Archaeology, the Haíłzaqv Integrated Resource Management Department, and the Haíłzaqv Cultural Education Centre to target and identify archaeological sites in the area. This was done through incorporating scientific data and traditional and local knowledge. More specifically, the goal for the intertidal work at EkTb-9 was to find intact, buried terrestrial strata representing the remains of an archaeological site occupied at a time when sea levels were lower. In-situ terrestrial deposits were not located, although the beach did contain abundant artifacts from archaeological deposits re-worked by rising sea levels. This paper has illustrated that with the right methodological approaches, not only can intertidal archaeological sites be excavated in a somewhat controlled manner, they can be rich with information, both scientifically and culturally. The ability to provide minimum age-ranges from barnacles on artifacts and associated rocks has provided temporal contexts that have allowed for the interpretation of site formation processes, a broader regional situation for the lithic assemblage, the identification of the potential cultural significance of assemblage differences, and the ability to identify deeper cultural meanings the assemblage still holds today.

The site formation processes resulting in the intertidal deposits excavated at the site appear to represent the remains of paleo-shoreline occupations with concurrent intertidal use that were redeposited due to a rising sea level. The barnacle dates obtained from the intertidal deposits show a minimum of four exposure periods, wherein artifacts sat exposed in the intertidal zone. The earliest age obtained from an artifact is 9535 ± 25 (10,199–9714 cal B.P.), with a corresponding exposure period of 10,199–10,102 cal B.P., indicating that, at a minimum, this area of EkTb-9 was utilized sometime prior to this time. Since sterile strata were not reached, there remains the possibility that intact terrestrial deposits are present beneath or close to the excavated deposits. Additional work with better caissons and additional water control would be needed to assess this and to further refine the age span of this area of EkTb-9.

A varied assemblage of 414 artifacts was collected from five subsurface tests and two surface contexts. The assemblage aligns fairly well with other local assemblages. Including those from the Kingii Complex and Early Moresby Tradition in Haida Gwaii, periods 1 A and 1 B at Namu, and the early assemblages at EjTa-15 and EjTa-4, revealing a cobble reduction industry supplemented with microblade technology and variably including the presence of bifaces, Levallois-like cores, and/or Levallois-like flakes (Carlson, 1996; Fedje et al., 2011; Fedje and Christensen, 1999; Fedje et al., 2005a, b; Porter, 2014; Rahemtulla, 2006). The substantial presence of bipolar technology in the EkTb-9 intertidal assemblage is a notable difference from the above sites. The prevalence of bipolar technology at EkTb-9 is likely related to the interactive relationship between the availability of local raw materials, mobility considerations, task requirements, and the innovative strategies toolmakers devised to respond to these constraints. Overall, the contents of this assemblage support the technological trends that have been identified at other sites on the Northwest Coast of BC, while providing additional insight about early human interactions with outer coastal island environments during the early Holocene era.

The antiquity of the intertidal component of EkTb-9 is congruent with the Haíłzaqv Nation's deep-rooted relationship with the Ńúláẃitx̌v Tribal Area. The Haíłzaqv description of the land and seascape at the time of their arrival coincides with the known late-Glacial paleogeography of the region. The history of Ńúláẃitx̌v is shared through family stories that tell of how the Haíłzaqv people first arrived or came to be at specific places in this tribal area. Family núym̓ help to pass these stories on from generation to generation through oral histories and ceremonies. The meaning of the EkTb-9 intertidal archaeological remains extends beyond scientific knowledge of the early Holocene period; to the Haíłzaqv Nation this site represents the products of their ancestor's labour (White, 2006), and it provides a physical manifestation of a timeless connection to their culture, land, and history.

Data availability

Datasets related to this article can be found at the BC Archaeology Branch, Victoria, British Columbia.

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CRediT authorship contribution statement

Angela Dyck: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data curation, Writing - original draft, Writing - review & editing, Visualization. **Daryl Fedje:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Writing - original draft, Writing - review & editing. **Alisha Gauvreau:** Investigation, Writing - original draft, Writing - review & editing. **Jim Stafford:** Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing. **Q̌íx̌itasu Yím̌ázalas (Elroy White):** Methodology, Investigation, Writing - original draft, Writing - review & editing. **Quentin Mackie:** Investigation, Writing - original draft, Writing - review & editing. **Duncan McLaren:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization, Supervision, Project administration, Funding acquisition.

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.

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