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Signalling and Mobility: Understanding Stylistic Diversity in the Rock Art of a Great Basin Cultural Landscape

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Abstract: This paper explores Great Basin arid-zone hunter–forager rock art as signalling behaviour. The rock art in Lincoln County, Nevada, is the focus, and this symbolic repertoire is analysed within its broader archaeological and ethnographic contexts. This paper mobilises an explicitly theoretical approach which integrates human behavioural ecology (HBE) and the precepts of information exchange theory (IET), generating assumptions about style and signalling behaviour based on hunter–forager mobility patterns. An archaeological approach is deployed to contextualise two characteristic regional motifs—the Pahranagat solid-bodied and patterned-bodied anthropomorphs. Contemporary Great Basin Native American communities see Great Basin rock writing through a shamanistic ritual explanatory framework, and these figures are understood to be a powerful spirit figure, the Water Baby, and their attendant shamans' helpers. This analysis proposes an integrated model to understand Great Basin symbolic behaviours through the Holocene: taking a dialogical approach to travel backward from the present to meet the archaeological past. The recursive nature of rock art imagery and its iterative activation by following generations allows for multiple interpretive frameworks to explain Great Basin hunter–forager and subsequent horticulturalist signalling behaviours over the past ca. 15,000 years.

Keywords: rock art; petroglyphs; Great Basin; signalling behaviour; information exchange theory; Pahranagat; symbolic behaviour

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1. Introduction

Early North American syntheses of rock art[1]—petroglyphs, pictographs, and geoglyphs—proposed an early Great Basin Abstract style that persisted over large areas of north America (e.g., Steward 1929; Heizer and Baumhoff 1962; Grant 1967), being replaced through time by numerous regional representational styles (Schaafsma 1980; Francis and Loendorf 2002; Whitley 2019). This early widespread geometric repertoire was interpreted as "an interrelated ideographic system transcending defined culture areas" (e.g., Schaafsma 1980, p. 79). A similar explanatory framework in Australia (Balme et al. 2009; Veth et al. 2011) sees the transformation of the earliest engraved open signalling repertoire into myriad Pleistocene regional style chronologies (e.g., Finch et al. 2021; Mulvaney 2009; McDonald 2017): a model now substantiated by regional genetic diversification in Australia by 25,000 cal BP (Malaspinas et al. 2016).

While there is still debate about when northern America and, more specifically, the Great Basin were settled (Coutouly and Holmes 2018; Dillehay et al. 2015; Goebel et al. 2008; Jenkins et al. 2012; Pellegrini et al. 2022; Rowe et al. 2022; Smith and Barker 2017; Waters 2019), there is no question that this was by fully modern humans, whose cultural repertoire included signalling behaviour (e.g., Wernecke and Collins 2012;

Purdy et al. 2011). The early 'Great Basin Abstract' is an open signalling style, likely deployed initially as a colonizing repertoire. Later, Paleoindian adaptations included rock art (e.g., the Great Basin Carved Abstract), distinctive textiles and point technologies, obsidian conveyances zones, and political circumscription (Barker 2019; Benson et al. 2013; Jones et al. 2003; Middleton et al. 2014).

Despite the long history of Great Basin research, there remains little consensus on Great Basin rock art/writing chronologies, stylistic variability, meaning, function, or age (cf. Whitley 1992, 1994, 2000, 2013). Invariably, however, the various Great Basin art sequences have been chronometrically pegged to contemporary paradigms for settlement chronology, founded on known and predicted culture blocs and archaeological evidence. Heizer and Baumhoff's (1962) sequence was seen as commencing with pit and groove art (around 6000 years ago), with the art becoming increasingly complex through to the recent past, with a "Pre-Numic" age being given to the art: a cultural disjunct was seen between the petroglyphs and the ethnographic present (cf. Numic scratching), and hunting-magic was the theorized purpose. Interpretations have included costly signalling theory, while others have suggested gendered and/or other subsistence-related functions with inferred meaning based on archaeological associations (Cannon and Woody 2007). Gilreath and Hildebrandt (2008) argued that the introduction of the bow and arrow increased hunting efficiency, contributing to the regional depletion of Bighorn sheep. This necessitated intensified ritual practice and increased territorial signalling—and a resulting efflorescence of rock art production.

Some earlier sequences have retained support (e.g., Gilreath and Hildebrandt 2008; Garfinkel et al. 2010), while others have been contradicted by detailed superimposition studies (e.g., Grant 1968; later, Dickey 1994; Woody 1997). David Whitley's GB sequence for the Coso Range includes chronometric dating (Whitley and Dorn 2010; Whitley 2012), historical and extinct subject matter in the art, relative re-varnishing, and ethnographic evidence. Based on what he perceives to be long-term iconographic continuity, he argues for persistence of deep-time production into the ethnographic present. Ethnographic evidence supports a shamanistic interpretation for GB rock art, with the art associated with vision questing, girls' puberty initiations, the acquisition of supernatural power, healing, sorcery, weather control, education, and social memory (Whitley 1992, 1994, 2019; Keyser and Whitley 2006). It has been argued that shamanistic beliefs were part of the cultural baggage of the first inhabitants of the New World (Whitley et al. 1999, citing Kroeber 1907).

The ontological basis for a deep-time shamanistic interpretation is that Great Basin Abstract assemblages are perceived as widespread and uniformly consistent—and interpreted as universal phosphenes or entopic phenomena—indicative of physiological rather than cultural factors (Lewis-Williams 2012; Whitley 2000). Ethnographic accounts provide an understanding of North American rock art assemblages, supported by contemporary Native Americans' ritual explanatory frameworks.

But the long-held problem with this interpretation for many researchers is the assertion of deep-time stylistic continuity. From Paleoindian times, the rich Great Basin cultural record demonstrates identifiable style shifts in multiple regions across diverse symbolic behaviours: stochastic point typologies and distinctive textile decorations, changing lithic conveyancing zones, adaptations to the spread of piñon and green cone processing/storage, the demise of communal hunting with the introduction of the bow and arrow, and changed subsistence practices with seed processing and storage, irrigation farming, and language shifts. It cannot be assumed that Great Basin groups living through climatic extremes and changing social configuration over 14,000+ years all produced rock art in a monolithic fashion (see Quinlan and Woody 2003).

At the heart of this ontological impasse are two fundamental rock art issues: chronology and style.

Assigning a chronology to petroglyphs remains a challenge, and there have been few attempts to quantify local and regional Great Basin stylistic assemblages, in what represents a phenomenally rich and subtly diverse component of this archaeological record (cf. Billo et al. 2013; Giambastiani et al. 2015; Clayton 2021; Loubser 2024; Middleton 2013; McDonald et al. 2016). Radiometric dating remains mostly in the realm of relative and contextual dating (i.e., obsidian hydration patterns in the Coso Volcanic fields (Gilreath and Hildebrandt 2012), dating tephra overlying older art (Cannon and Ricks 2007), excavated portable art (Thomas 2019), and novel attempts to age desert varnish (e.g., Lytle et al. 2010; cf. Whitley and Dorn 2010; see Ritter et al. 2007)). Local stylistic variability is more extreme and widespread than the early models suggest, and there remains no well-defined, broadly accepted chronological sequence for the full spectrum of Great Basin petroglyphs.

Major theoretical and methodological questions remain, i.e., what are the differences between 'abstract curvilinear' and 'abstract rectilinear' styles? What are the stylistic differences between regional variants of patterned-bodied anthropomorphs of the Great Basin and onto the Plains (e.g., Coso Range vs. Pahranagat vs. Dinwoody)? While all Great Basin assemblages are predominantly geometric, why do some style provinces (e.g., Volcanic Tableland: Clayton 2021; Lee 2016) have almost no representational forms (e.g., Bighorn sheep and human figures), while others, like the Pahranagat Valley and Coso Ranges (Garfinkel et al. 2010; Gilreath and Hildebrandt 2008) have (multiple) phases of figurative and geometric elements? Does the Great Basin style remain unchanged for the entire occupation of the Great Basin?

These questions are approached deploying the precepts of information exchange theory ('IET', after Wobst 1977) and human behavioural ecology ('HBE'—see Figure 1). Style is seen as signalling behaviour that responds to social triggers resulting from changing mobility and environment parameters. This approach suggests that the social context of production can be based on occupation indices developed through archaeological investigation, regional pluvial and climatic data, and socio-linguistic and ethnohistoric evidence of rock writing amongst contemporary Great Basin people. Stylistic variability is seen as explaining degrees of social messaging intent in Great Basin artists through time.

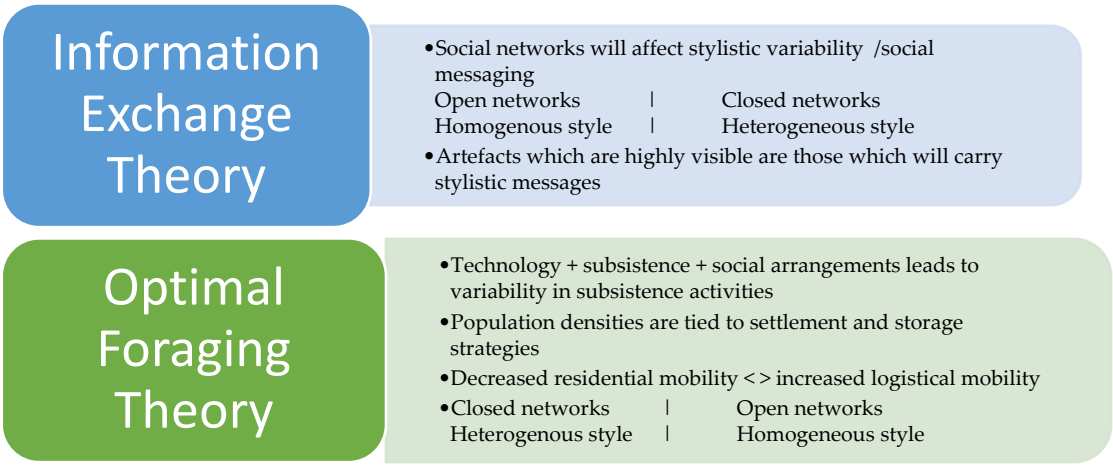


Figure 1. Comparative assumptions of IET and OFT in relation to Great Basin mobility and signalling (after Wobst 1977; Bettinger et al. 2015).

The basic precept of IET is that rock art/writing will be stylistically homogenous if social networks are open and groups are signalling the types of information that facilitate shared group identity. In a drier climate, arid-zone social groups will generally be more

mobile, and social networks will be open to allow widespread access to more limited resources (e.g., water). Art associated with higher mobility will demonstrate greater stylistic homogeneity and signify broader group signalling behaviours. In wetter/more fertile phases, when social groups become less mobile/more territorially tethered, art will display stylistic heterogeneity, demonstrating between-group signalling. HBE feeds into this type of modelling by considering logistical mobility: gendered foraging goals (pinecones and seeds), the abundance and distribution of pinyon and large prey (especially Bighorn sheep), and communal vs. individual hunting, as well as how changing environmental parameters affects the division of labour, the distribution of resources, and mobility patterns (Elston et al. 2014).

2. Materials and Methods

Modelling Rock Art into the Great Basin Occupation Sequence

During the late Pleistocene and Early Holocene, the Great Basin was cooler and, at times, wetter than today. Extensive pluvial lakes were at their fullest between 20,000 and 12,500 and ended with the Younger Dryas (Goebel et al. 2011). Pleistocene lake systems were desiccated by 11,000 BP. Between 10,000 and 7000 BP, a relatively homogeneous plant community was replaced by the mosaic of plant species now typical at lower elevations. Rapid pinyon expansion (by 8800 BP in the Pahranagat Range, Wigand 2002; see Thomas and Millar 2024) reflects initially warm and moist conditions. Temperatures in the Middle Holocene increased again with a shift from wintertime storm systems to less effective summertime precipitation (Spaulding 1991). Spring discharge increased during this period, marking a return to relatively wet regional climatic conditions in the early phase of the Late Holocene, and the distribution of pinyon and juniper expanded. The apparent shift of human populations to higher elevations later in the Middle Holocene was in part a response to the increased availability of pinyon. The mesic trend peaked after 3500 years BP, and pinyon and juniper grew in habitats well below their Middle Holocene (and modern) extent (Spaulding 1991; Wigand and Rhode 2002). The Medieval Climatic Anomaly ('MCA'—between 1200 and 650 BP) was a period of climatic instability and repeated droughts.

The identified culture periods are overlain by the climatic phases (see Figure 2).

The local Pahranagat occupation sequence was refined by the Lincoln County Rock Art project (Figure 3) based on 532 sites, with 508 diagnostic projectile points, over 2700 bifaces (and 20,000+ pieces of debitage), extensive ground stone and milling slick evidence, and 1500+ pieces of ceramic (Giambastiani et al. 2015, Table 12). The mixture of local tool stone (e.g., quartzite) and 12 distinct, more distant obsidian sources make this a large and significant assemblage for developing models of occupation through time across the region. Further evidence for symbolic behaviours includes incised stones, textiles, beads, and other ornaments. Temporal peaks in diagnostic stone tool and ceramic industries and complexities in changing obsidian conveyancing zones are rich components of the regional occupation model.

Great Basin Paleoindian populations were residentially mobile, far ranging, and wetland focused (see Elston et al. 2014; Smith 2010; Smith and Barker 2017), and earliest Pahranagat foraging territory likely fell within the Eastern Conveyance Zone ('ECZ'; Jones et al. 2012). The limited Pahranagat Paleoindian record likely relates to the absence of deep excavated rock shelters (Goebel et al. 2011): a single Great Basin Stemmed Point at Pahroc Spring is the earliest surface evidence in Lincoln County. Early Archaic occupation, between 5400 and 4300 cal BP, represents the first significant increase on previous phases. The wetter Middle Archaic (ca. 3300–1350 BP) is the main period of regional lithic production in all three ACECs. The Late Archaic (coinciding with the MCA) shows a reduction in lithic intensity, which decreases further in the Historic period. The ceramic data demon-

strate continuing occupation across the region into the Historic period (Figure 3), with the development of irrigation farming along the Pahranagat wetlands, with villages housing more than 200 people (Nye 1886, cited in Stoffle and Zedeño 2001), a clear settlement shift in this timeframe. By correlating the Great Basin environmental and culture phases—with their attendant behavioural indicators—a set of signalling correlates is proposed (Figure 4).

		Great Basin Adaptive Sequence	Ceramics	Diagnostic Points
Environment	**Calendar Yrs BP**	**Period**	**Phase**	
Late Holocene	650–150	Historic	GB Brown ware Fremont GW	Desert Side-notched, Cottonwood
	1350–650	Late Archaic	Ancestral Puebloan Gray ware	Rose Spring, Eastgate, Humboldt
Middle Holocene	3300–1350	Middle Archaic		Elko, Humboldt
	4300–3300			Gatecliff Split Stem, Gatecliff Contracting Stem
	5400–4300	Early Archaic		
	7000–5400			Pinto, Northern side notch
Early Holocene	10,000–7,000	Pre-Archaic		Great Basin Stemmed
Late Pleistocene	12,500–10,000	Paleoindian		Great Basin Fluted, Great Basin Concave Base

Figure 2. Regional Nevada culture periods correlated with broad climatic indicators (wetter—green; drier—brown; blue—colder/wetter).

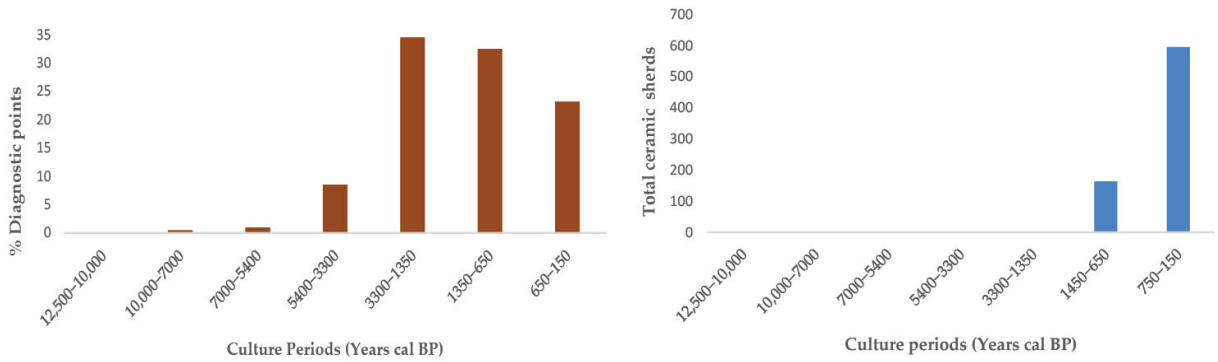


Figure 3. Proportions of surface artefacts (left) diagnostic points and (right) ceramics.

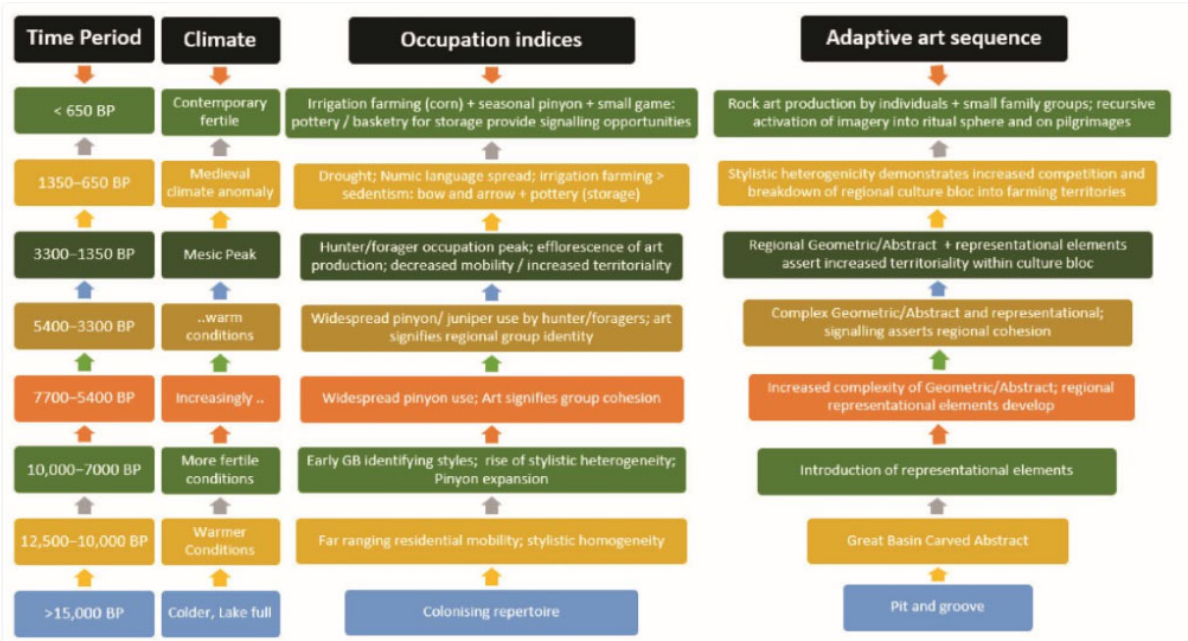


Figure 4. Proposed Great Basin art sequence, based on climate, cultural phase, occupation indices, and behavioural traits.

3. Results

3.1. Rock Art in Pahranagat Valley (Lincoln County, Nevada)

The regional petroglyph analysis is based on a sample of 6783 motifs (i.e., individual elements) from 129 sites across Shooting Gallery, Mount Irish, and Pahroc ACECs (Figure 5, see Table 1). More than half of this assemblage is classified Geometric, i.e., abstract rectilinear and/or curvilinear (see also Billo et al. 2013). There is significant variability, and 33 geometric subjects were classified for this analysis. The dominant forms are 'simple geometric' (25%, i.e., comprised of two geometric elements) and 'complex geometric' (15%, i.e., comprised of combinations of three+ geometric elements). Discrete geometric elements include lines (13%), parallel lines (8%), arcs (3%), circles (4%), dot patterns (in multiple configurations: 4%), rakes (5%), and so on. Around one-third of the assemblage depicts zoomorphic ('representative') subjects. Bighorn sheep (BHS) dominate the zoomorphs (74%), followed by quadrupeds (13%), snakes (4%), and cervids (2.4%), with a smaller number of birds (including 9 thunderbirds and 11 waders). The other representational elements are anthropomorphic depictions (8%). Tracks and material culture items (e.g., atlatls) are rare.

Table 1. Recorded subject categories in the three ACECs.

Class	Mount Irish	Shooting Gallery	Pahroc	Total	%f
Anthropomorphic	212	292	28	532	7.8
Geometric	1800	1908	158	3866	57.0
Material Culture	13	29	1	43	0.6
Other	254	173	18	445	6.6
Tracks	22	57	4	83	1.2
Zoomorphic	722	1053	39	1814	26.7
Total	3023	3512	248	6783	100



Figure 5. Lincoln County project area (from Giambastiani et al. 2015).

Pahranagat Valley rock art is not directly dated (cf. Gilreath et al. 2011). One attribute counted during the current analysis was the contrast state ('CS'), i.e., the degree to which the motif has weathered back to the same colour as the bedrock panel. This was measured on a scale of 1 to 5, with CS1 indicating the motif was the same colour as the background rock, while CS5 indicated a stark contrast, with the motif being fresh-looking (Figure 6).

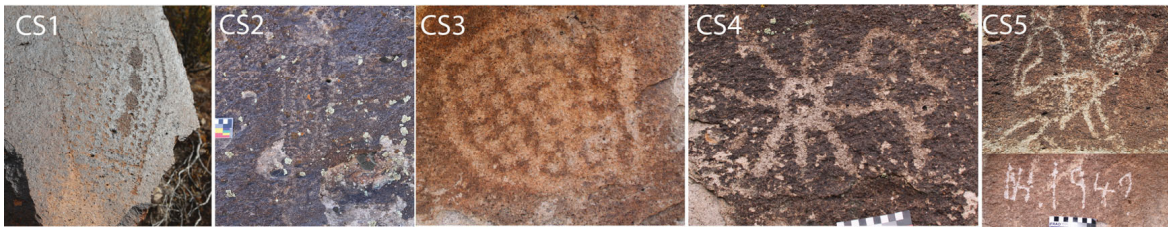


Figure 6. Contrast state (CS1–CS5) values counted on motifs across the three ACECs.

Contrast state information was collected for 5321 engraved motifs from the 3 ACECs (i.e., excluding motifs without colour photographic evidence, and those with mixed weathering conditions). While no two people necessarily see these things the same way, and different geologies and microclimates have different weathering thresholds, this provides a consistent quantification of petroglyph weathering across the region (see McDonald et al. 2016; McDonald and Mulvaney 2023). The Pahranagat bedrock geology is largely Miocene tuffaceous/perlitic material, known as Hiko Tuff, which "cliffs and weathers to form brown-stained spheroidal outcrop surfaces" and is "...widely exposed in the Pahroc, Hiko, and Pahranagat Ranges" (Tschanz and Pampeyan 1970, p. 71). Contrast state evaluations were cross-checked amongst the small rock art field team and subsequently audited by the author. The contrast states for 16 graffiti motifs (names, initials, and dates) were all clearly CS5 (see Figure 6). While these weathering phases were not assumed to have equal temporal lengths, this method allowed for seriation of different assemblage elements and the posing of hypotheses about changing art production through time (see Figure 7).

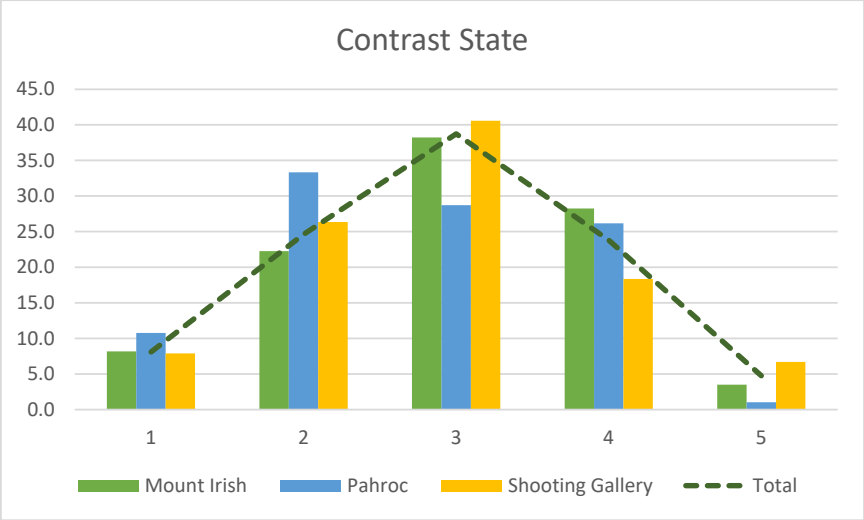


Figure 7. Contrast state trend in Lincoln County analysis.

3.2. Water Babies and Atlatl-Bearing Hunters

Human depictions represent roughly 8% of the Lincoln County assemblage (Table 1). Almost half of these are linear figures (i.e., stick figures; Nevada Rock Art Foundation 2018; Quinlan 2012), and there is quite a lot of stylistic variability (Figure 8; see Loubser 2024), including solid and outlined forms, some with exaggerated digits and genitalia, and several schemata that likely represent other regional styles (e.g., V-Torso Figures from Fremont; Simms 2010). This analysis focused on Pahranagat solid-bodied (SB) and patterned-bodied anthropomorphs (PBA). The Pahranagat solid bodies represent just over 6% of the human figures, while PBAs represent 22%.

Pahranagat solid-bodied figures (also previously called Pahranagat Man, or P-Men) and the patterned-bodied anthropomorphs (PBAs) were first described at Black Canyon (Figure 9) as:

> "*Headless (?) rectangular figures whose dress is indicated by lines of dots or connected solid circles. Each figure holds an atlatl. We believe these rectangular figures are, despite their stylized form, atlatl-bearing hunters.*" (Heizer and Hester 1974, p. 15)

Heizer and Hester argued that these geometric/human figures were wearing a hunting disguise and noted their association with Bighorn sheep. Similarities were drawn between these and the more elaborate, rectangular-bodied Coso Range anthropomorphs, from ca. 300 km to the west, and they suggested that the line-of-dots-filled rectangles were stylized

representations of costumed hunters (Grant and Pringle 1968, p. 36; see Maddock 2015). They also observed similarities with other characteristic Great Basin anthropomorphic designs in Glen Canyon (Turner 1963) and in central Wyoming (Gebhard and Cahn 1950). Many have subsequently identified, recorded, and analysed these Pahranagat representational motifs (e.g., Gilreath et al. 2011; Clabaugh and Clabaugh 2009; White 2013; White and Orndorff 1999; Lee 2004).

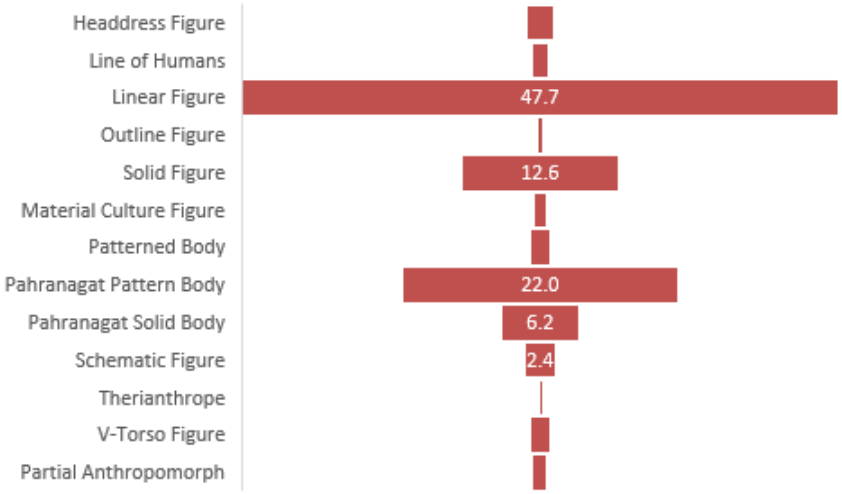


Figure 8. Proportions of anthropomorphic depictions in the three ACECs (n = 532).

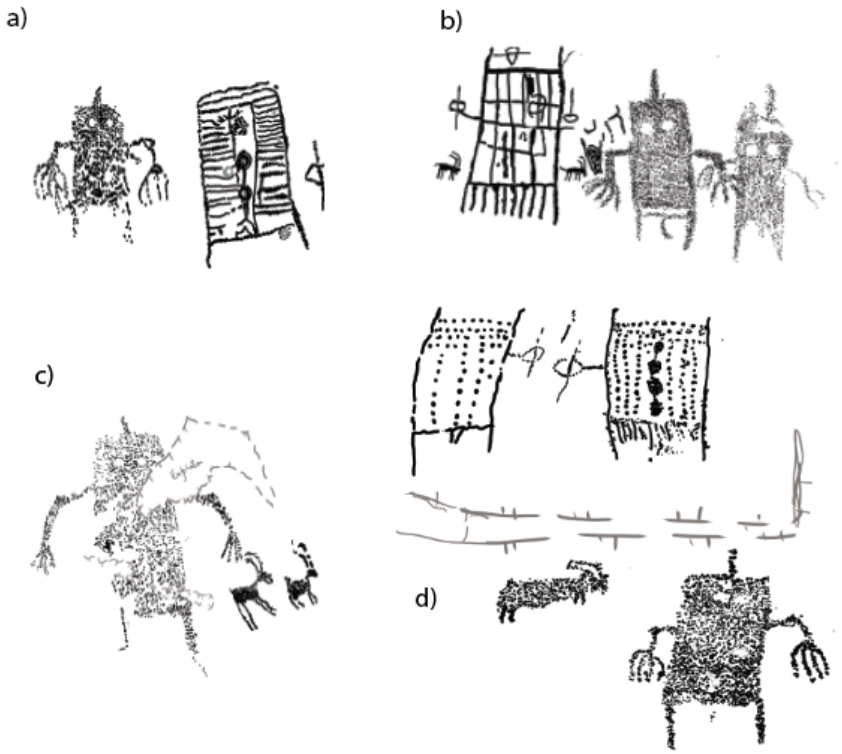


Figure 9. Black Canyon (site 26LN810) solid-bodied and patterned-bodied anthropomorphs in (**a**,**b**) are the two compositions described by Heizer and Hester. Those in (**c**,**d**) are also from this site complex.

The Southern Paiute recognise the solid-bodied Pahranagat figures as the Water Baby (Stoffle et al. 2011a; Whitley 2015). Petroglyph panels with these motifs are the "place where medicine men would acquire Water Babies" (Stoffle et al. 2011a, p. 21). Water Babies are described as:

> "...powerful spiritual beings that are associated with water and volcanic places. They live in flowing water of many kinds including rivers and artesian springs and frequently travel through natural and manmade hydrological systems. Water babies are considered to be female and are often described as around three feet high with long hair and shell-like skin. The tremendous power of water babies is complex, making them very special spiritual helpers for a shaman (Puha'gant), but also incredibly dangerous for those unable to control the power...their connection to water made them very valuable for rainmaking activities". (Stoffle et al. 2011a, p. 19)

The association between Pahranagat solid- and patterned-bodied figures has been explored previously (White 2013; Holmes and Carter 2009). The fact these motifs are depicted with atlatls has been interpreted as demonstrating that these pre-date ca. 1500 years BP (and see Gilreath et al. 2011). Whitley (2015, p. 17) further suggested that the co-association with Bighorn sheep—either directly over or on the same panel—demonstrates the ritual association between rainmaking and shamanic activities in the Pahranagat Valley.

This detailed stylistic analysis of these two motifs explores their characteristics, stylistic variability, distribution, and associations, and asks the following:

- How stylistically similar are these motifs across the region and through time, and what does this tell us about regional signalling behaviour?
- How can we interpret the spatial and chronological distribution of these motifs?
- Are the solid- and patterned-bodied figures (and Bighorn sheep and atlatls) co-located?

3.3. Solid-Bodied Pahranagat Anthropomorphs (Water Babies)

There were 57 solid-bodied Pahranagat anthropomorphs from Black Canyon (22), Shooting Gallery (14), The Gathering (12), and Mount Irish (9). Attributes were defined and counted: size (body length and width), body and head shapes, headdress configuration, leg shape, and number of fingers/toes on both hands/feet (Figure 10).

The un-pecked (i.e., bas relief) eyes were distinctive, and over half (57%) had this feature. One-third of the Water Babies had no eyes, two had only one un-pecked eye, and four individuals were positioned such that unmodified natural cavities in the rock surface fulfilled this purpose. Numbers of fingers and toes (straight or curved) varied—with three, four, and five digits being the most common (and these can vary on any one motif). The Gathering had one motif with lines of dots extending downwards from the fingers (see Figure 11).

Most (75%) of these figures were un-gendered, while 23% appeared to be male-gendered. Paired figures at Mount Irish had a fringe (clothing? See Figure 11; see Huffman and Earley 2017).

Headdresses were more variable than the originally described 'feather' variety (White 2013), and nine types were counted (see Figures 10 and 11). Nine solid-bodied motifs had no headdress. The classic feather (type 2) was found on around 46% of the assemblage, with shorter rounded nobs (type 1) being the next most common (21%), and these single vertical protuberances were found at all four site complexes. Black Canyon motifs had all but two of the described variations, and these unique forms otherwise occurred rarely at Shooting Gallery (n = 2) and Mount Irish (n = 1). The two most common forms were found in CS1–CS4, and the most variability was found in CS2 and CS3.

These motifs were found amongst the earliest weathering state (CS1) but were dominantly and equally distributed between C2 and CS3 (Figure 12). Most Water Babies were found at Black Canyon, where most of these occurred in CS2. Mount Irish figures were between CS1 and CS4, Shooting Gallery in CS2–CS5, and The Gathering only in CS2 and CS3.

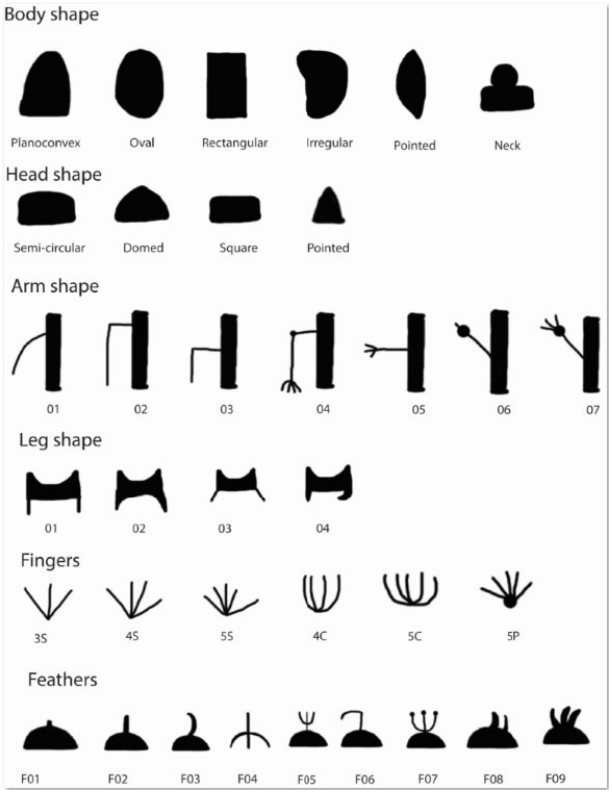


Figure 10. Pahranagat solid-bodied anthropomorphs' attributes quantified across the region.

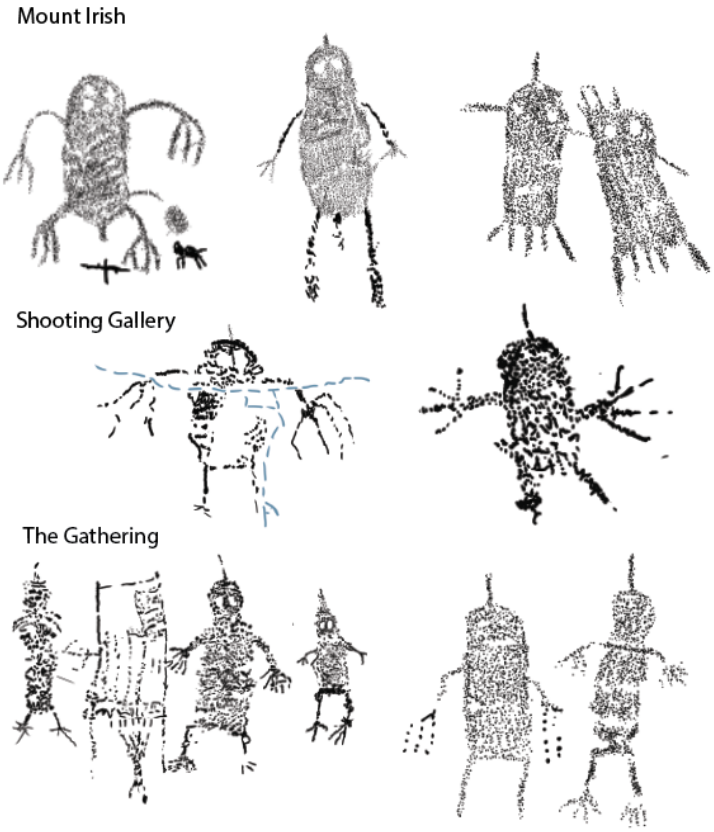


Figure 11. Pahranagat SB variability, including a paired composition at Mount Irish (top right) and SB with retouched arms, penis, and legs (top middle), and scenes from The Gathering, including (right) a pair, and (bottom left) three SB, 1 PBA, and a small solid figure.

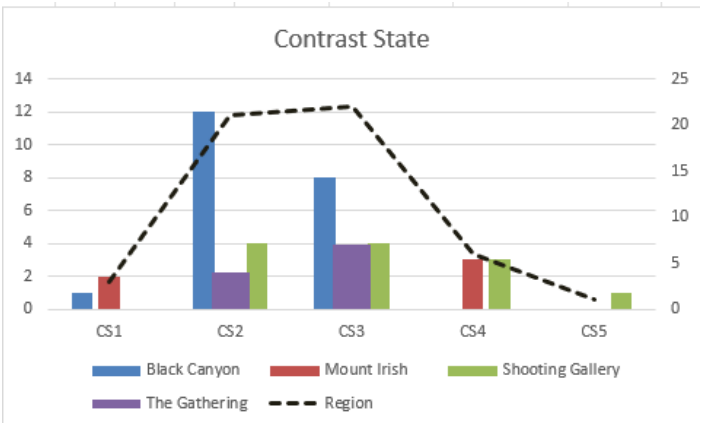


Figure 12. Water Babies produced at the four site complexes during each contrast state (n = 57).

Multiple Correspondence Analysis (MCA)

The assemblage was run through a multiple correspondence analysis (MCA), which confirmed the general stylistic homogeneity of this motif. Variables that provided the greatest variability in this analysis were size (body length and width), associated animals, eye type, and finger variability (Figure 13a). The general trend in regional size revealed that these were proportionally similar, but The Gathering examples tended to be slightly taller and thinner than those found at the other three site complexes (Figure 13b).

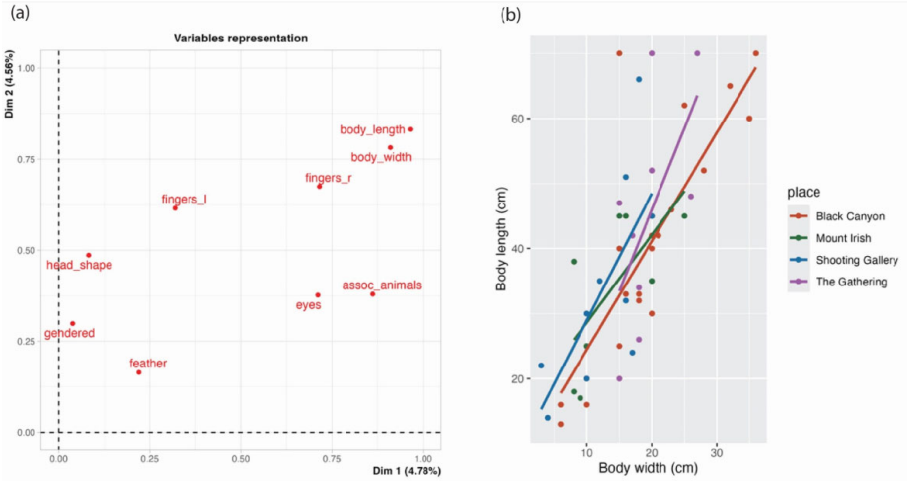


Figure 13. MCA SBA bivariate plot showing variable scores (**a**), and (**b**) regional variation in body size (length × width) at the four site complexes (line of best fit shows trends).

The MCA confirmed, however, that no one place appeared more, or less, stylistically varied than any other (Figure 14). If one of these site complexes were an aggregation locale, for instance, whether a mixed group of artists came together and produced these figures (e.g., after Conkey 1980; McDonald and Veth 2012), then greater stylistic variability, and the full regional repertoire, would be expected in that place. Several characteristics and schematic conventions were unique in each place, and the Pahranagat solid-bodied figures showed the following:

- Those from Black Canyon tended to have squarer heads and rectangular shorter bodies. Three panels here revealed subsequent production events and/or refreshing of a slightly altered form and/or placement in a proximal location.
- Those from Mount Irish tended to have the most variability in body shape (distribution on Dim2), splayed legs (Type 2), and exaggerated arms with large digits, with round

heads and square (planoconvex) bases. Several have been 'refreshed' or superimposed by newer motifs.

- Those from The Gathering formed the tightest cluster: these motifs tended to have longer, thinner bodies, three toes on each foot, and several had necks (see below).

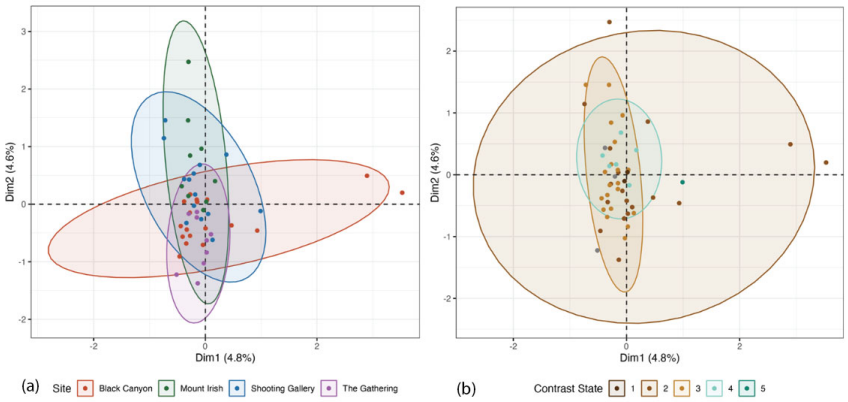


Figure 14. MCA individual scores for solid-bodied anthropomorphs showing (**a**) regional variability (individual motifs and groups coded for place) and (**b**) chronological clustering based on contrast state (note that individual motifs CS1 and CS4 are colour coded but not circled due to small sample sizes).

These results suggested a regional assemblage produced by culturally linked forager groups, producing a similar (but not identical) schema on behalf of their local residential base camp groups.

Some stylistic variability in SB figures could be due to changes through time in production. Contrast state information (Figure 12) revealed that while three SBs were produced in CS1, most SBs were CS2 and CS3, with significant declines in CS4 and CS5. The MCA revealed that the earliest motifs (CS1) were stylistically homogenous (i.e., located closest to the origin on the bivariate plot), while early in the main period of solid-body production (CS2), there was great diversity, which retracted in CS3 and then further again in CS4 to again demonstrate more stylistically homogenous motifs. Further patterning through time could be observed, as follows:

- The earliest SBs were produced at Black Canyon (n = 1) and Mount Irish (n = 2).
- Most SBs were produced in CS2 and CS3. The main production centre in CS2 appeared to be Black Canyon, at which time there was the most stylistic heterogeneity displayed in the assemblage. Production in CS3 was shared between Black Canyon and The Gathering, at which time the regional stylistic homogeneity increased.
- No SBs were created at Black Canyon and The Gathering in CS4 and CS5. Increasing stylistic homogeneity was demonstrated in this timeframe at both Shooting Gallery and Mount Irish.
- A single (visually atypical) SB occurred at Shooting Gallery in CS5: MCA placed this within the variability range of CS3. Two SBs at Mount Irish were either retouched in this phase (see Figure 11) or superimposed by other motifs.

3.4. Pahranagat Patterned-Bodied Anthropomorphs (PBAs)

A sample of 208 patterned-bodied anthropomorphs were analysed for this study (Figure 15 and Table 2): from Black Canyon (74: 35%) and The Gathering (68: 33%), Shooting Gallery (43: 21%), and Mount Irish (23: 11%). The PBAs were technically geometric in form, with their shape and patterned infill representing a combination of the region's key geometric elements (i.e., knotted string, rakes, dot patterns, and angular forms). They rarely had defined heads and limbs, a feature that distinguishes them from their Coso Range counterparts. More than half (59%) of these motifs had no arms, 51 (25%) had 1 arm

(usually associated with an atlatl), and 41 (19%) had 2 arms. Associations with atlatls (on the left and/or right side of the body) were recorded, as were arm morphologies.

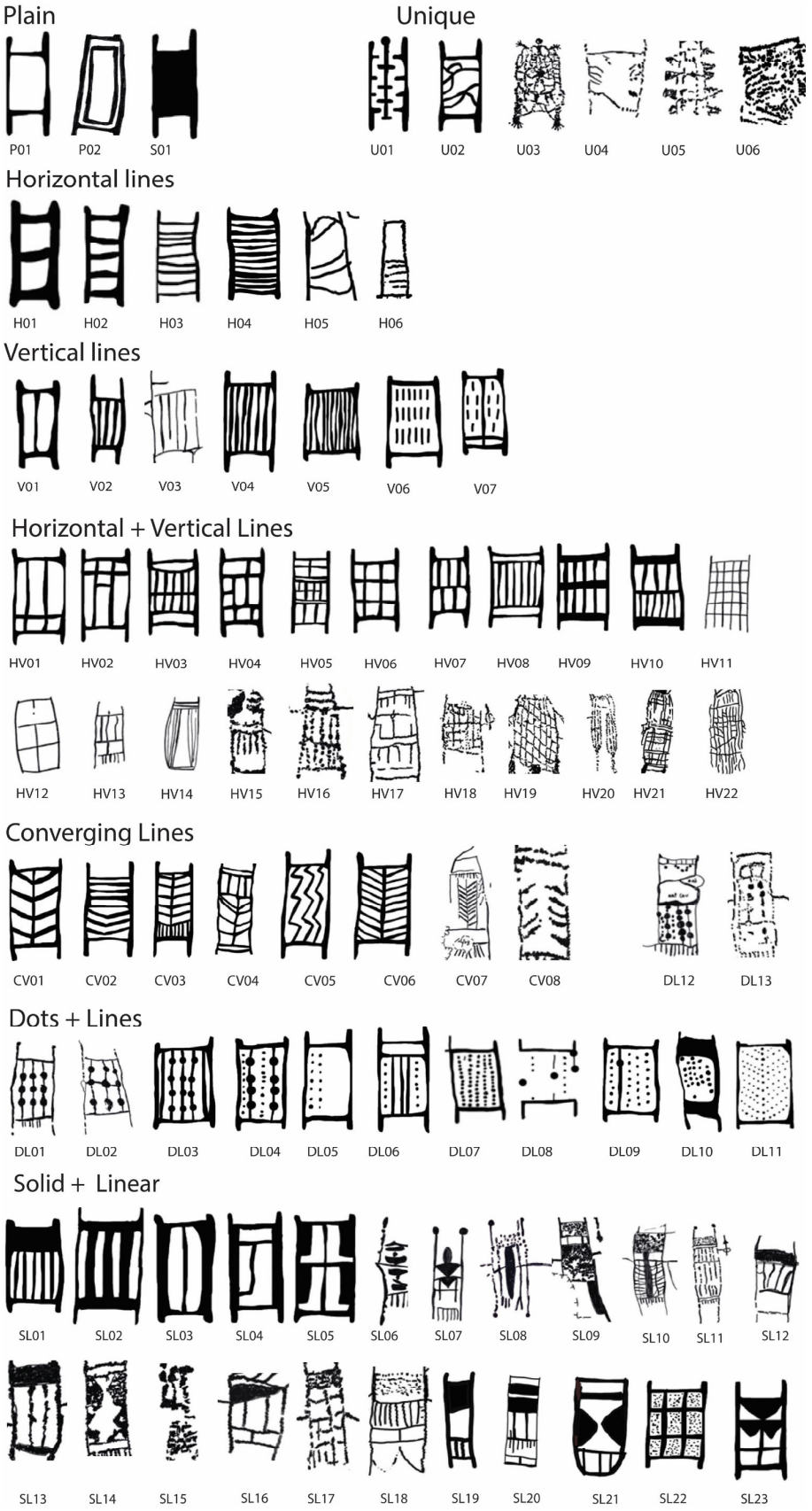


Figure 15. PBA interior design patterns identified in this analysis.

Table 2. PBA general interior design groupings found at the four site complexes.

Design	Black Canyon	Mount Irish	Shooting Gallery	The Gathering	Grand Total
HV—Horizontal + Vertical	15	9	12	21	57
SL—Solid + Linear	12	1	5	21	39
DL—Dots + Linear	25	3	8	2	38
V—Vertical lines	8	5	8	9	30
H—Horizontal lines	3	3	2	7	15
U—Unusual/irregular	8		1	5	14
CV—Converging lines	3		4	2	9
S—Plain (solid)		2	3		5
P—Plain (empty)				1	1
Total	74	23	43	68	208

Eighteen variables were counted on each PBA motif for multiple components analysis. These included interior decoration (Figure 15), varieties of top and bottom extensions and decorations (Figure 16), and length and breadth dimensions.

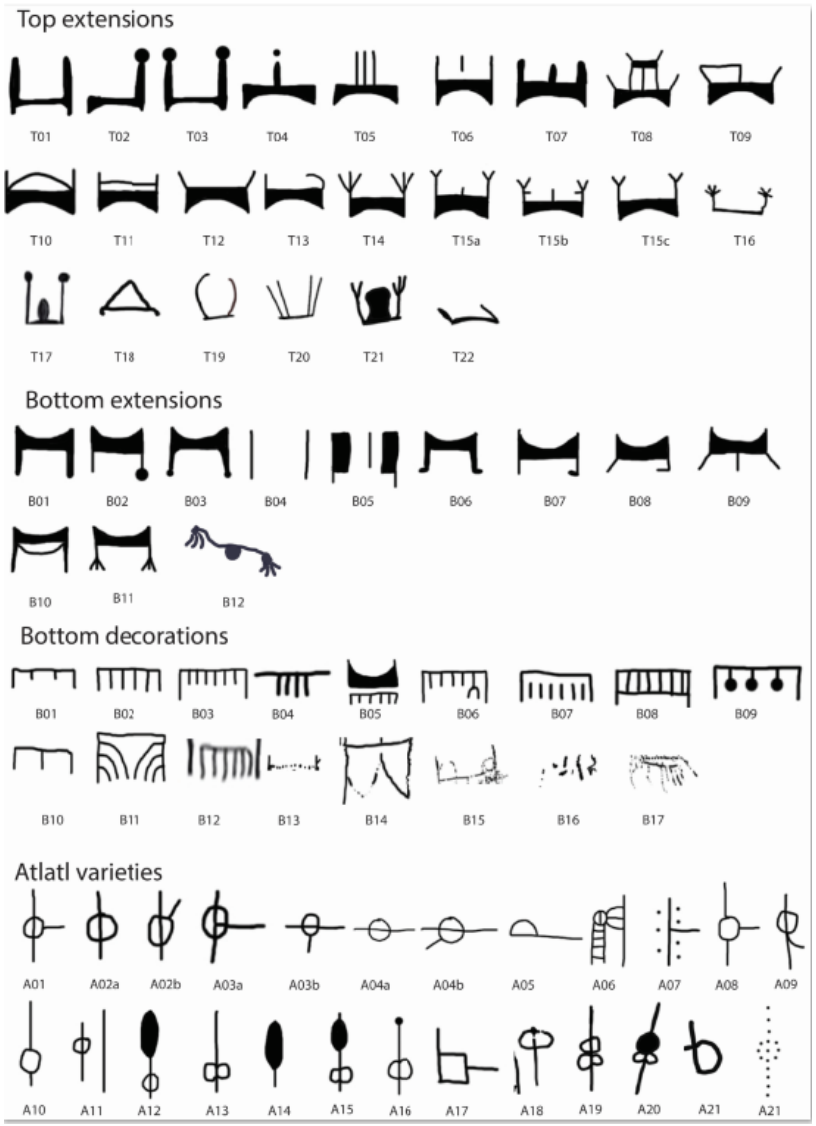


Figure 16. PBA design elements analysed in addition to size dimensions. Atlatl types include variations where the arm is included in the design (cf. associated proximally). The square A17 atlatl design (attached with an arm) is like several illustrated from the Jeffers Site (Minnesota) by Keyser and Klassen (2001).

Many—but not all—interior designs were unique (i.e., 34 designs occurred only once; see also Holmes and Carter 2009). While there was extreme design variability, 78 classifiable designs were counted in 8 broad design categories (Table 2; Figures 15 and 17). The most common design (found 11 times) was a simple vertical form (V02). Patterning was observed in the distribution of these core design elements across the four analysed site complexes/subregions.

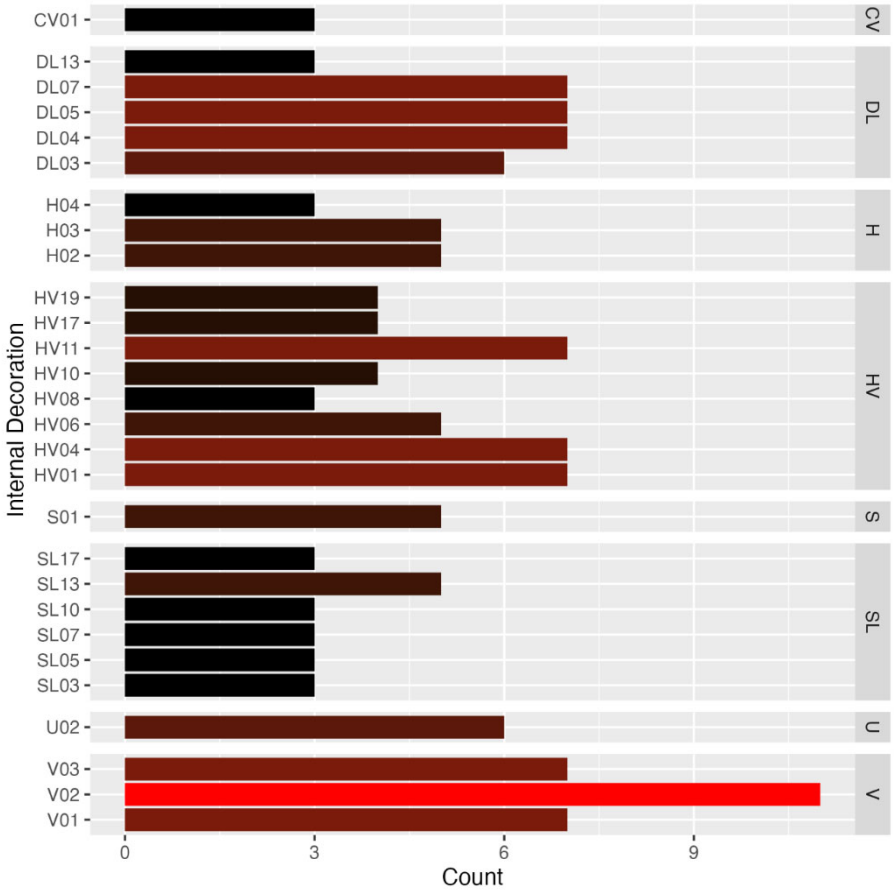


Figure 17. Counts of the most common PBA internal designs (n ≥ 2). Colour coded for emphasis.

Only three designs were found at all four locations (V01, V02, and H03), while another four designs (H04, HV11, DL03, and SL13) were found in different combinations at three of the four site complexes. Three site complexes (but not Mount Irish) had designs that were unique, although most of these were one-off designs. There were, however, repeated examples that were not found at other places, e.g., at Black Canyon: DL04 (n = 7), SL05 (n = 4), and HV02 and DL10 (2 each), as well as 11 other unique designs. At The Gathering, HV19 (n = 4) and SL17 (n = 3) were unique to this place, along with 25 unique (i.e., n = 1) designs. Black Canyon and The Gathering shared the most designs (Figure 18), of which 18 designs were not found elsewhere. There was a small but significant relationship between the PBA general pattern and site complex (chi2 = 61.66, p = 0.001; adjusted Cramer's v = 0.19), with more Dot + Line (DL) designs occurring at Black Canyon, and an inverse relationship at The Gathering, where there were more Solid + Line (SL) designs. This design variability is in keeping with these two site complexes being ritual centre(s)/aggregation locale(s) (sensu Conkey 1980; McDonald and Veth 2012).

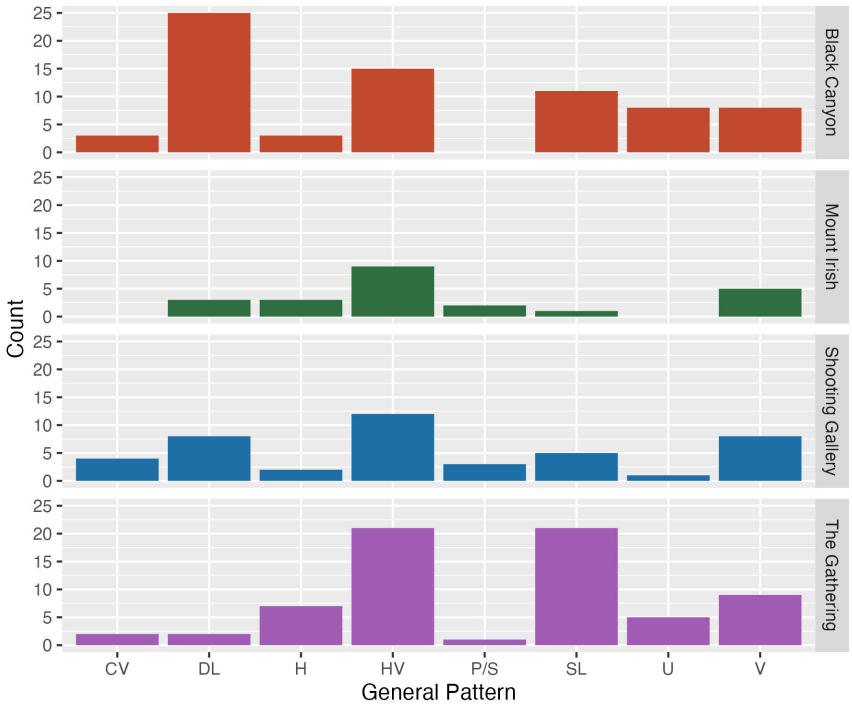


Figure 18. Distribution of general designs at the four site complexes.

Additional stylistic complexity was added to the PBA form by the addition of top and bottom extensions, and decorations above and below the rectangular body shape (Figure 16). All four site complexes demonstrated localised stylistic choices being made by artists. In general, the most common corner extensions were T01 (49.5%), followed by T03 (17%), with 9% having no extensions. Over half of the PBAs (51.4%) had no decoration between the bottom extensions, and the most common decoration (24.5%) was B03—i.e., a shorter fringe than the leg extensions. These traits were analysed via the MCA.

3.4.1. PBA—Change Through Time

As was found with the Pahranagat SBs, the PBA peak predates the main rock art production in Lincoln County (cf. Figures 6 and 19). There were 14 PBAs in CS1 (at Black Canyon and Mount Irish), and Black Canyon and The Gathering were the focus for peak production in CS2 and CS3 (n = 93 and 82, respectively). Shooting Gallery had its highest PBA production in CS4 (n = 15)—when all other areas dwindled significantly. Only two PBAs were created in CS5—one each at Mount Irish and Shooting Gallery.

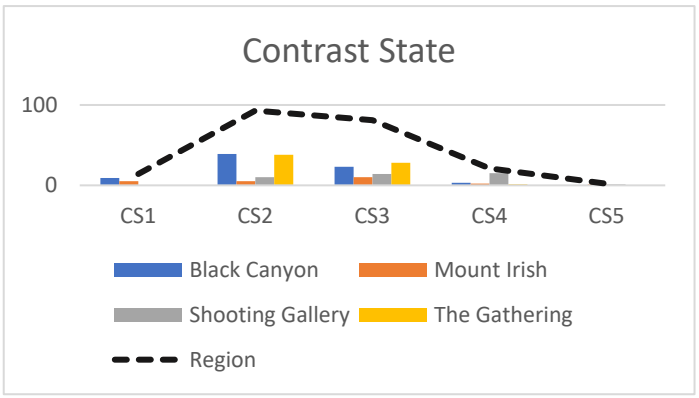


Figure 19. PBA contrast state frequencies through time (n = 208).

3.4.2. Multiple Correspondence Analysis

MCA analysed seven variables to explore stylistic heterogeneity: only 4.2% of the variance was described by the first two dimensions (Figure 20). This motif form demonstrated extreme stylistic homogeneity across the region (Figure 21). MCA identified the following about PBA patterning:

- The PBAs from all four places demonstrated stylistic homogeneity by a strong clustering around the origin (0,0).
- The attributes that contributed most to variability in these motifs were internal decoration, the top and bottom extensions, and the body length (Figure 20).
- All areas had notable outliers (see Figure 21a), i.e., motifs that were stylistically diverse. The tightest cluster around the origin, signifying greatest homogeneity, was the small Pahroc sample, followed by the Black Canyon assemblage. The Shooting Gallery PBAs were the most stylistically diverse.
- The greatest PBA homogeneity was demonstrated in CS3 (see Figure 21b), while CS4 examples displayed the most heterogeneity.

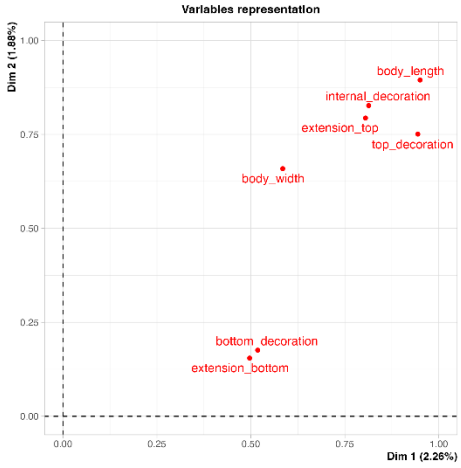


Figure 20. MCA variables' representation for PBAs based on 6 variables.

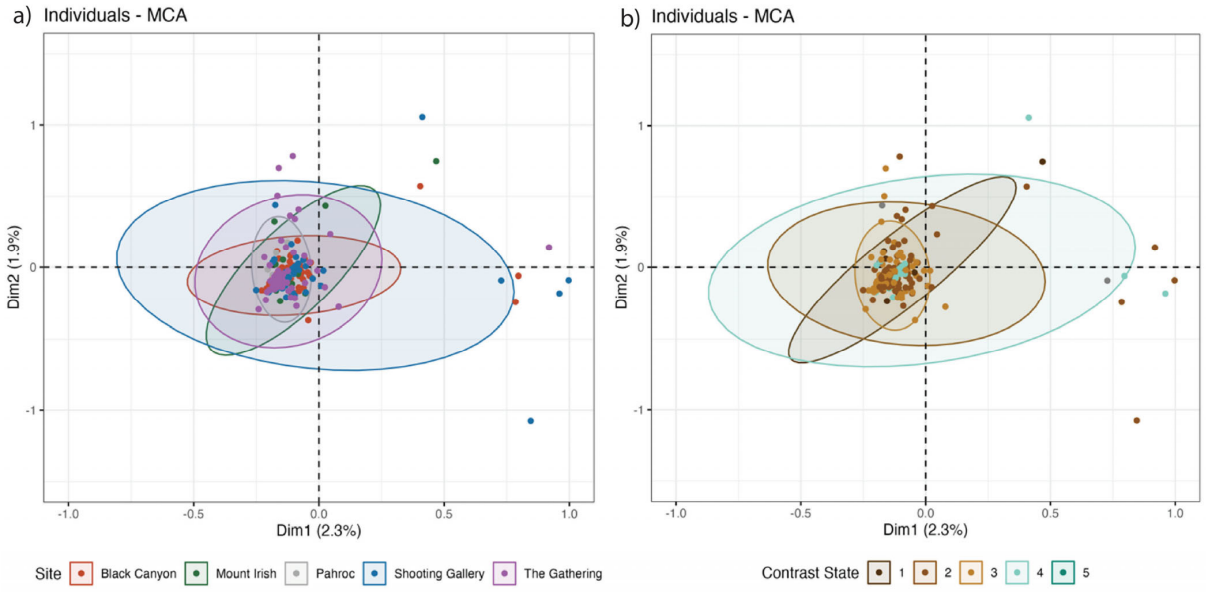


Figure 21. MCA distribution for the PBA motifs (**a**) plotted according to place and (**b**) plotted according to contrast state.

The changing degrees of homogeneity through the phases suggested a strong regional cohesion during the main phase of production, which fractured and demonstrated increasing territoriality in the final phases of production. This could demonstrate increased territoriality and inter-group rivalry in the later phases.

3.5. Atlatls

The PBAs from the four site complexes were associated with 82 atlatls of different types (Figure 16). The schema for this artefact varied through time (Table 3, Figure 22). Throughout the sequence, most atlatls were positioned parallel to the body, i.e., with no "arm" joining this to the PBA (types A2 and A10). During the main production phases (CS2, and then CS3), the dominant atlatl type was type A4 (a horizontal line extending from the body, with a circle), a schema that sees the atlatl and arm as a single entity.

Table 3. Atlatl varieties seriated by contrast states.

Types	CS1	CS2	CS3	CS4	Total
A1		9	4	1	14
A2	1	1	6		8
A3		2	1		3
A4		13	6	2	21
A5	1	2			3
A6			1		1
A8		1			1
A9		2	2		4
A10		1	4	1	6
A11			2		1
A13		1	1	1	2
A14				1	1
A15			1	3	4
A16				1	1
A17			1		1
A18		1			1
A19		2	4		6
A20		1	3		4
A21		1			1
Total	2	36	33	10	82

Almost half of the atlatls were from Black Canyon (n = 32). Most (54%) occurred in CS2, and the only two CS1 atlatls were found there. Atlatls at The Gathering (n = 24) and Mount Irish (n = 3) occurred in CS2 and CS3. The Shooting Gallery atlatls (n = 16) were in CS2–CS4, but 50% were in CS4.

No CS5 atlatls were recorded, and the two CS5 PBAs were not depicted with atlatls. The atlatl sample (n = 82) suggested that CS5 is equivalent to <1500 years in age, with CS1–CS4 increasingly older than 1500 years.

The late efflorescence of atlatl production at Shooting Gallery was matched by a schematic shift to finger loop and solid point (e.g., Types A12, A14, A15, and 19). This style of atlatl only occurred at The Gathering and Shooting Gallery (Figure 23). The shift to Shooting Gallery as a late PBA production centre (CS4) appeared to include the introduction

of a new atlatl schema found only rarely at the other locations. This later style atlatl has similarities to the Quiltanton Lake style atlatl, which has been dated to ca. 2000 cal BP (Jim Keyser, personal communication, 2025; see Fiedel 2025).

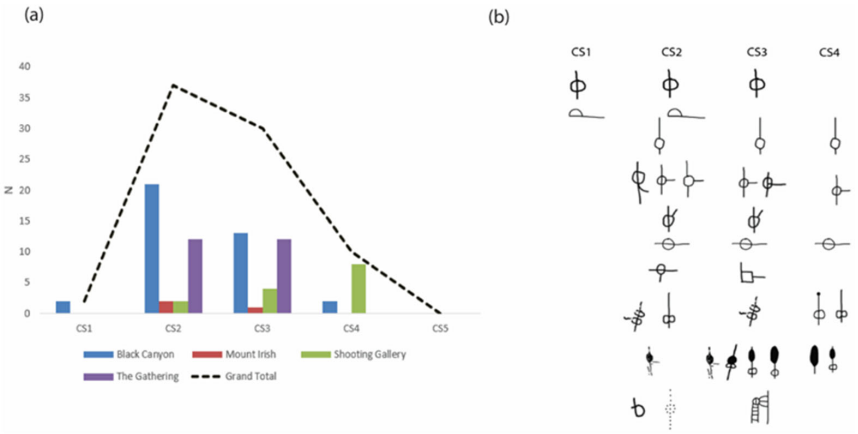


Figure 22. Atlatls found (**a**) in the four contrast states across the four site complexes, and (**b**) showing schematic seriation through these weathering phases.

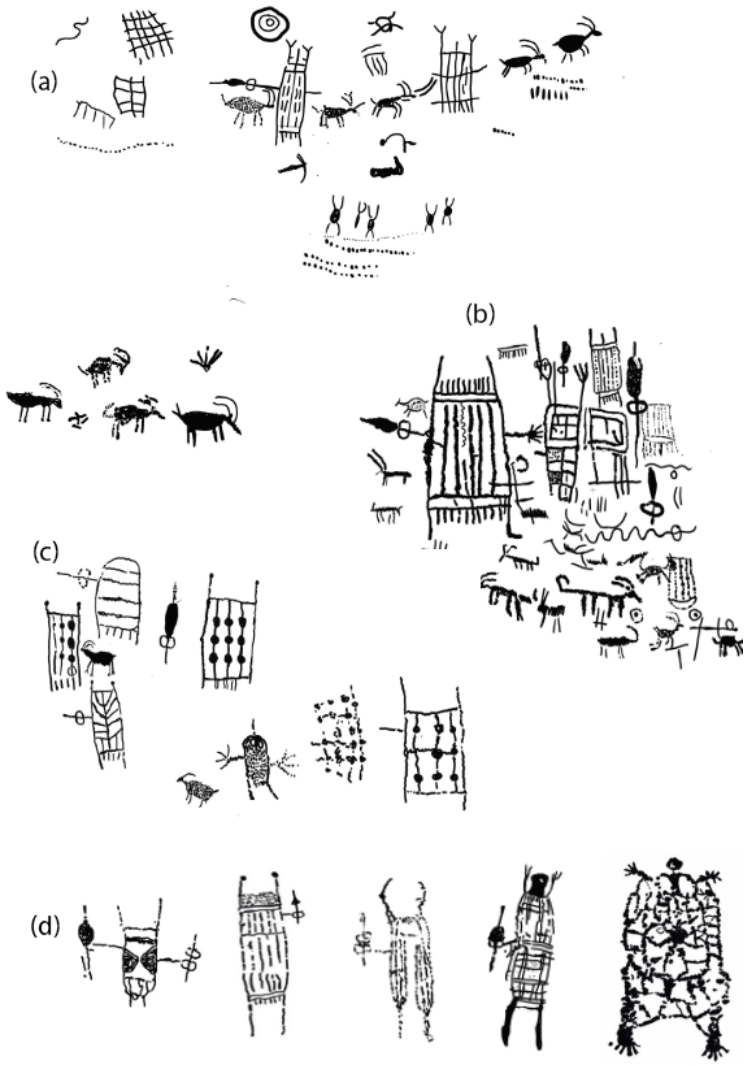


Figure 23. Shooting Gallery scenes with PBAs, BHS, more recent-style atlatls, and occasional solid-bodied anthropomorphs (**a**,**b**) in upper Red Pigment canyon, (**c**) at 26LN3749 Locus F (not to scale), which also has some earlier PBA designs and atlatl forms, and (**d**) The Gathering PBAs, with recent-style atlatls and (far right) several transitional patterned-body/attachment forms.

4. Discussion

This paper has deployed multiple lines of evidence to explore the Pahranagat Valley style sequence. Extensive archaeological evidence collected across the Lincoln County project (Giambastiani et al. 2015) provided the basis for modelling social behaviours and cultural phases. Recognised culture periods were overlain with Great Basin climate data and modelled to suggest different drivers for symbolic behaviour though time (Figure 4). The characteristic Pahranagat figures with patterned and solid bodies were analysed in detail to explore the attributes that contribute to their forms—but also to explore the possible interpretations of these motifs by contemporary communities and archaeologists. This proposed chronology sees these Pahranagat figures being produced in the Early Holocene and not in the historic past, providing a new narrative for the region.

4.1. Changing Proportions of Geometric and Representational Classes

Most of the Pahranagat assemblage was geometric (i.e., abstract rectilinear and/or curvilinear), and there was significant variability within the 33 geometric subjects classified. Dominant forms were simple and complex combined geometric forms with discrete geometric elements, including lines, parallel lines, arcs, circles, dot patterns, and rakes. While geometric elements were consistently dominant through the style chronology, the subject focus of these can be seen to vary (Figure 24).

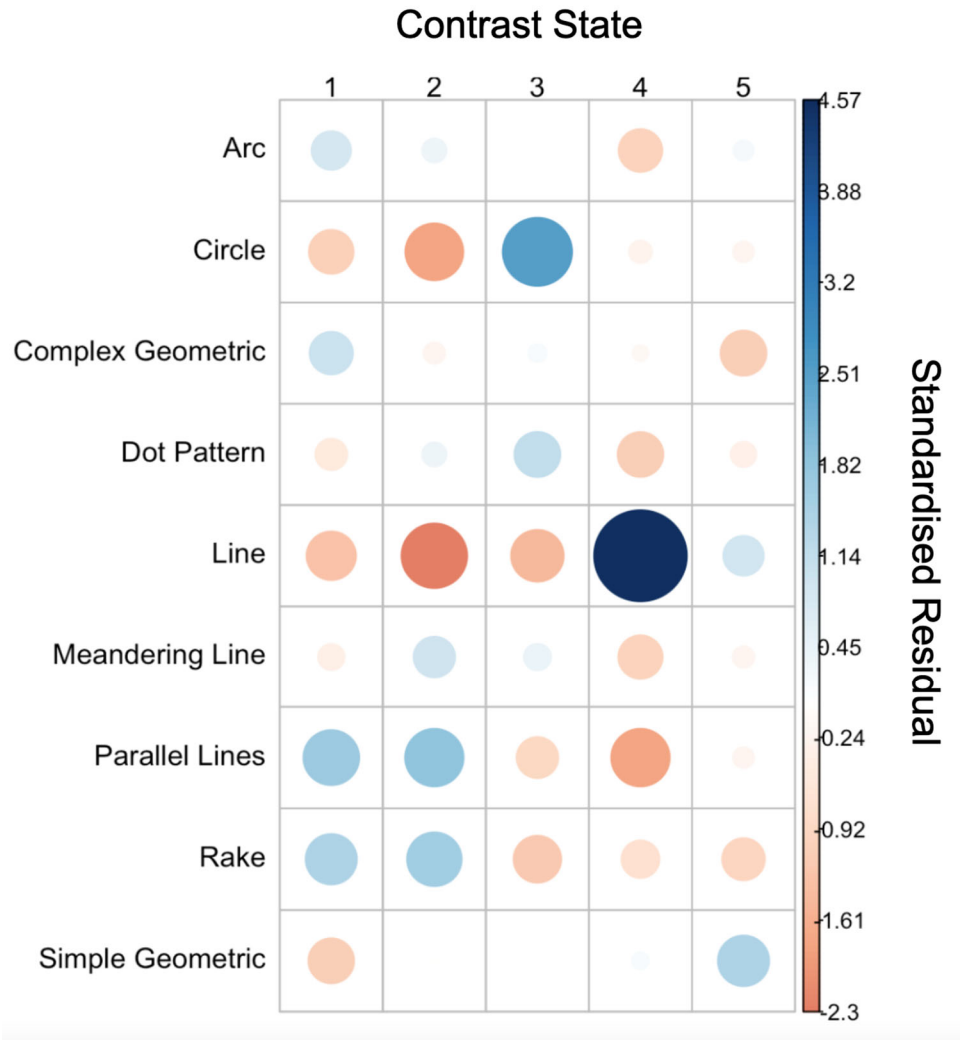


Figure 24. Chi squared plots showing significant proportions of nine geometric elements through time (i.e., geometric subjects with >100 examples).

The production of abstract/geometric forms is not static through time, and this analysis provided further evidence that the Pahranagat style sequence was not monolithic through the Holocene. There was a confirmed inverse relationship between motif class and contrast state (chi2 = 39.50, p = 0.006; adjusted Cramer's v = 0.03). An absolute chi-squared residual above 2 suggested this was driven by an underrepresentation of zoomorphs and other motifs in CS2 and geometrics in CS5, with an overrepresentation of geometrics in CS2 and zoomorphs and other in CS5, Figure 25.

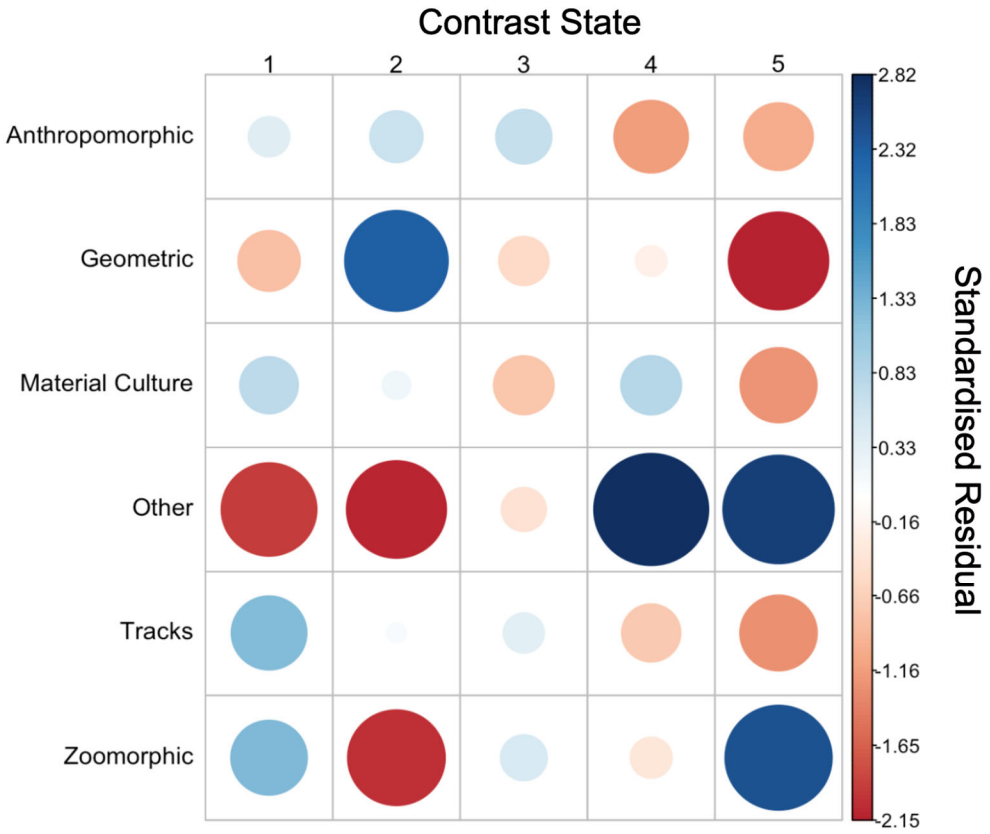


Figure 25. Chi squared plots showing significant Pahranagat motif classes and contrast state (the larger the circle size and darker the colour reveals higher statistical significance in under− and over representation).

While not the subject of this paper, it is the changing proportions of geometric elements that are likely to hold the key to regional signalling opportunities during open phases of social signalling. For instance, dot patterns, knotted strings, and rake motifs—which are more common in CS2 than CS4—are strong elements in the PBA internal designs and decorations. This is probably not coincidental.

The strong geometric element in the Early Archaic provides a more open graphic signalling during a period of increased aridity between 6 and 4000 cal BP. These and several other geometric elements, which appeared as internal and external decorations on the PBAs in this peak period of production, replace the anthropomorphic depictions—and indicate the development of an open signalling behaviour, which is widespread—during a period of increased aridity and mobility. The significant reduction of geometrics in the most recent phase demonstrated a contraction of this signalling of open/shared graphics, at a time when irrigation farming and the rise of small game hunting represent a decrease in mobility and increased territoriality.

Around one-third of the assemblage comprised zoomorphic subjects. These were mostly Bighorn sheep—but with small numbers of quadrupeds, snakes, cervids, and birds.

Animals peaked in CS3, and BHS were present in lower numbers later in the sequence (CS4) than earlier (CS2). This could be a further indication of the demise of communal big game hunting and rise of individual hunters targeting small game, later in the occupation sequence. Human figures were the other major representational elements of the assemblage, over half of which were simple stick figures. These showed a similar trend in proportions throughout the CS sequence (contra the SB and PBA).

This analysis has focused on the SB figures and PBAs, which are a relatively small proportion of the human assemblage. The SB and the PBA motifs commenced early (in CS1), demonstrated an early efflorescence in CS2, flourished during CS3, and then underwent a major decline in CS4. They, and atlatls, were absent from the most recent art repertoire. The contrast state information for both Pahranagat figures indicated that their production peaked earlier than the main production phase of the regional sequence, and that there was a shifting focus for production throughout the region (Figures 12 and 19).

While there was minimal surface archaeological evidence for Pre-Archaic occupation, the Pahranagat SB and PBA figures seemed likely to have commenced in a wetter phase during the period between 8 and 10,000 BP (as represented by CS2). Pinyon distribution overlapped the range for large game, and communal hunting of Bighorn sheep created a trigger for signalling behaviour, asserting regional identity. While these regional foragers were likely located at several base camps, Black Canyon was the geographic focus of this corporate signalling behaviour in the earliest part of this cultural phase.

4.2. A Partnered Relationship?

From the earliest observations of these motifs, archaeologists have interpreted a co-relation between PBAs and Water Babies (Heizer and Hester 1974; and see Holmes and Carter 2009; White 2013), and further with Bighorn sheep (Whitley 2015). Indeed, several of the best-known panels (located within metres of each other) at Black Canyon demonstrated this association (Figure 9). To explore this relationship further, the 111 panels that contained 1 or more of these 2 motif types were analysed (Figure 26).

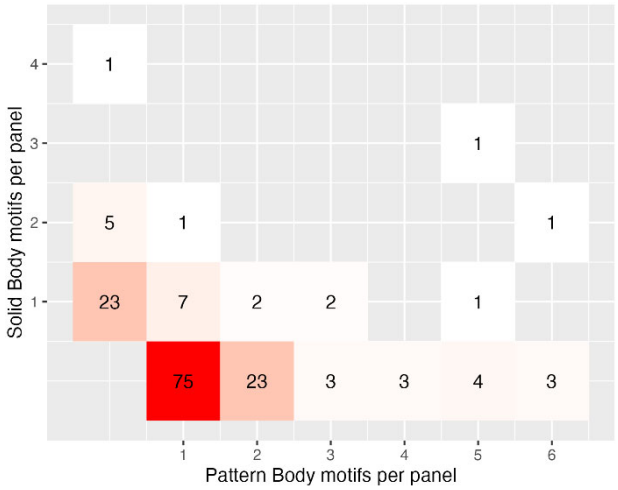


Figure 26. Combinations of individual, paired, and multiple SBs and PBAs found on panels across the Pahranagat assemblage (colour coded for emphasis).

The most common occurrence was a PBA occurring in isolation (n = 75), followed by panels with either one SB and/or two PBAs (n = 23 each). There were only seven instances of a paired Water Baby with a companion PBA. More common was one or more Water Babies combined with two or more PBAs. Multiple PBA motifs often occurred on the same panel (up to a maximum of eight at 26LN5673). Solid-bodied Pahranagat figures (Water

Babies) were mostly found alone but could also be paired with another solid body (on five panels) and occasionally up to four companion Water Babies (Figures 12 and 27).

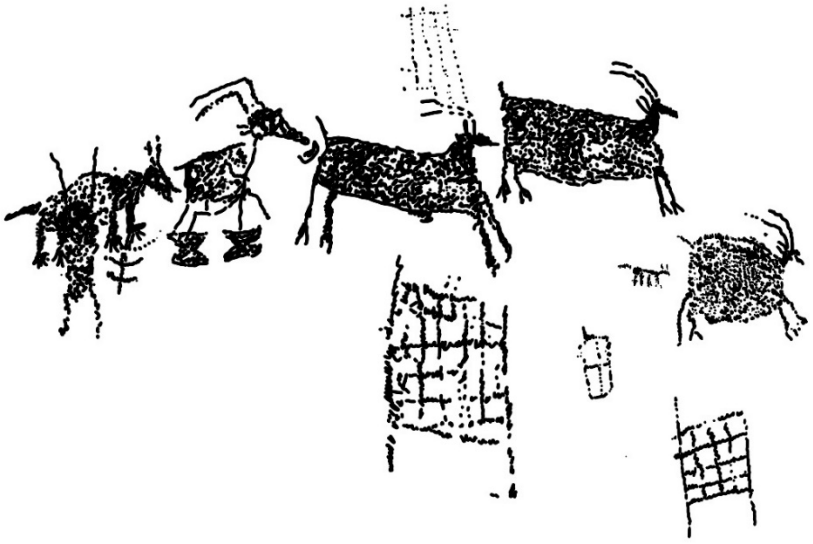


Figure 27. Highly visible panel at The Gathering, which includes a superimposed SB and multiple PBA and BHS (and other motifs).

This patterning demonstrated only limited partnering of a Water Baby with a PBA. Quantification also demonstrated no persistent association with Bighorn sheep. This was also erratically patterned but predominantly indicated no direct association between these figures and a BHS motif on the panels analysed (Table 4). Almost 85% of PBA were not associated with Bighorn sheep, and over half of the Water Babies were similarly not associated.

Table 4. Associations of Pahranagat PBA and SB motifs with Bighorn sheep.

PBA Associations	Total	%	SB Associations	Total	%
N	179	84.4	N	31	54.4
1BHS	19	9.0	1BHS	14	24.6
2BHS	3	1.4	2BHS	1	1.8
3BHS	4	1.9	SB, 3BHS	2	3.5
4BHS	3	1.4			
Total	208	100.0	Total	57	84.2

There were, however, stand-out panels in multiple locations, where there were clear narrative scenes involving all three motifs, often in highly visible landscape settings (Figures 23 and 28). Many of the contemporary narratives about this pairing can be traced to the well-known, published panels (after Heizer and Hester 1974), which have also been the focus for ethnographic studies done in the region (Stoffle et al. 2011a, 2011b). The variability demonstrated across the region in these depictions indicates that the initial signalling about these figures was likely more complex than has been realised in the contemporary narratives focused mainly on Black Canyon and its place in the cultural landscape (Stoffle et al. 2022).



Figure 28. Highly visible panels in their landscape contexts: (**a**) Black Canyon, (**b**) aspect shot, The Gathering, (**c**) Pahranagat Men panel at Shooting Gallery, and (**d**) Red Pigment Canyon SB figures at the entrance (arrows), with scale provided by human recorder (encircled).

4.3. Placement in the Landscape

Water Babies are known to be "powerful spiritual beings that are associated with water and volcanic places. They live in flowing water of many kinds, including rivers and artesian springs, and frequently travel through natural and manmade hydrological systems. . . ." (Stoffle et al. 2011a, p. 19). Previous studies have observed that the SB and PBA motifs are positioned high in the landscape (White 2013, p. 58; Gilreath et al. 2011). At high elevations (the Pahranagat Range peaks at 2268 m; Giambastiani et al. 2015, p. 16), they are in boulder fields, gorge systems, or on prominent knolls. This observation is particularly true for the SB motifs. The more numerous PBAs are more widely distributed than the SBs (reflecting their greater number), but they too are often located on highly visible panels.

At the lower elevations (ca. 1000 m) on the floor of the Pahranagat Valley, Black Canyon, petroglyphs are arrayed along and around natural amphitheatres adjacent to a large riparian wetland/wet meadow (U.S. Fish and Wildlife Services 2009). At The Gathering, the art is arrayed across the lower slopes adjacent to the dry Lake Delamar (elevation 4572 m). Both are proximal to a range of other occupation evidence (hut structures and midden/occupation deposit), and the art is often positioned on larger vertical platforms facing outwards into the landscape. There is a clear sense that these motifs are placed to the audience of the art: to signal information about the social group to the broader population (see Figure 29).

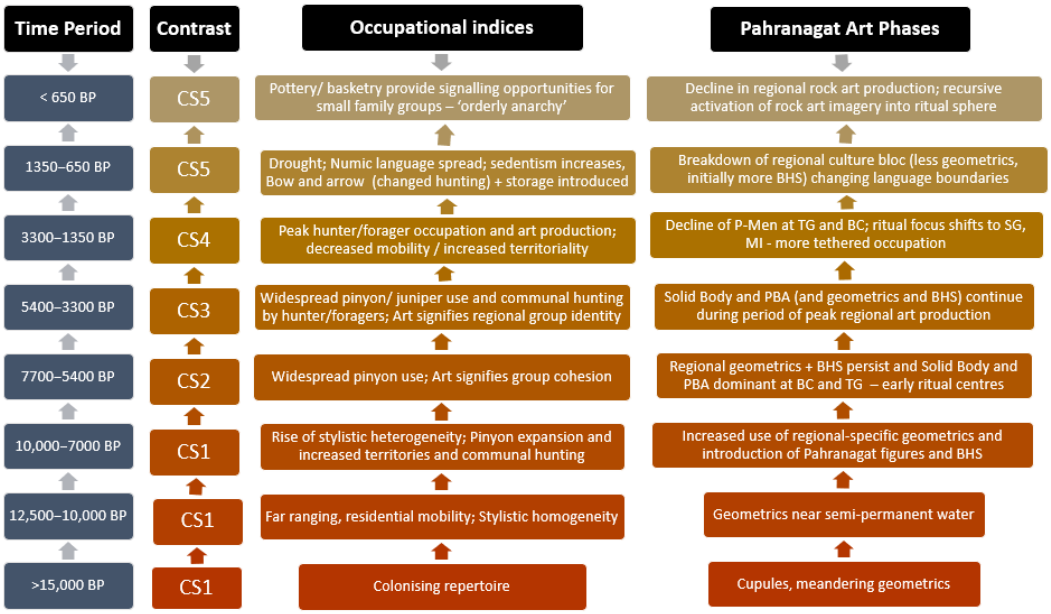


Figure 29. Pahranagat style sequence showing diagnostic art styles correlated with contrast state and the introduction and decline of Pahranagat figures.

In the secluded and difficult-to-access upper reaches of Red Pigment Canyon (Shooting Gallery) are two adjacent, highly visible panels (Figure 23). There is no obvious occupation evidence in this narrow, heavily scoured area. Just downstream are grinding slicks, portable metates, and deep tinajas, and red pigment used to embellish petroglyphs. Five SBs are all in lower reaches of this canyon—all located high—just below the rim (Figure 29). Other rock art in this canyon (including a weathered cupule panel) is on basal bedrock surfaces adjacent to the stream flow, or up to head height on vertical panels.

Numic peoples made little distinction between the sacred and profane (Fowler 1995; Walker 1991), and people's daily activities and religious lives were intimately intertwined. Thus, it is not surprising that SB and PBA motifs were placed in locations that could be argued to be both 'open' and 'closed'—in terms of their association with obvious domestic habitation evidence. Association, per se, does not either allow or preclude the interpretation of a ritual purpose of production (Whitley et al. 2025). Certainly, vision questing does require seclusion—and most art produced for this type of ritual would be expected to be produced 'privately'. More detailed analyses than those reported here are needed to fully explore the landscape context of this art's production, including likely auditory considerations of the natural amphitheatres in which many of these images occur (Díaz-Andreu and Mattioli 2015; Waller 2010). In terms of social messaging (Wobst 1977; McDonald 2008), it is concluded that this art was produced with the intention of being seen by its audience—and it thus had clear signalling intent.

4.4. The Pahranagat Art Sequence

The Pahranagat occupation sequence commenced in the late Pleistocene. No Great Basin Carved Abstract was found here, confirming that Pahranagat is outside that Paleoindian rock art style region and its related textile regions (Connolly et al. 2016; Middleton et al. 2014, Figure 2; Barker 2019, Figure 13.2). Paleoindian occupation (contextualised elsewhere in the Great Basin) is followed by more widespread indicators of Pahranagat Pre-Archaic and Middle Archaic occupation, with the interval between 5400 and 4300 BP representing a major upswing on previous phases. Most diagnostic lithic material is Middle Archaic (ca. 3300–1350 BP)—the main period of lithic production, pinyon harvesting, and communal hunting. Late Archaic evidence is more intensive than the Early Archaic

but indicates a contraction following the Middle Archaic. While the rock art sequence is poorly contextualised by conventional dates, contrast state patterning demonstrates that the hunter–forager occupation of this region included different phases of rock art production, which, like the lithics data, suggests differing levels of intensity and subject focus. Atlatl depictions (broadly accepted as being replaced by the bow and arrow ca. 1500 BP) provide an opportunity to correlate the art and occupation phases chronologically (Figure 30). Lithics and ceramics provide abundant evidence for continuing occupation in the Late Archaic and Historic periods, but rock art production declined significantly in the most recent period. A change in residential mobility, related to family groups focused on seed processing, the individual hunting of small game, and irrigation farming, combined with drought (MCA), resulted in the changed signalling purpose for rock art. This was likely replaced by the signalling tied to ceramics, textiles, and other personal identity markers, as well as the rise of individuals on vision quests and shamans undertaking a range of practices and activities in the storied landscape.

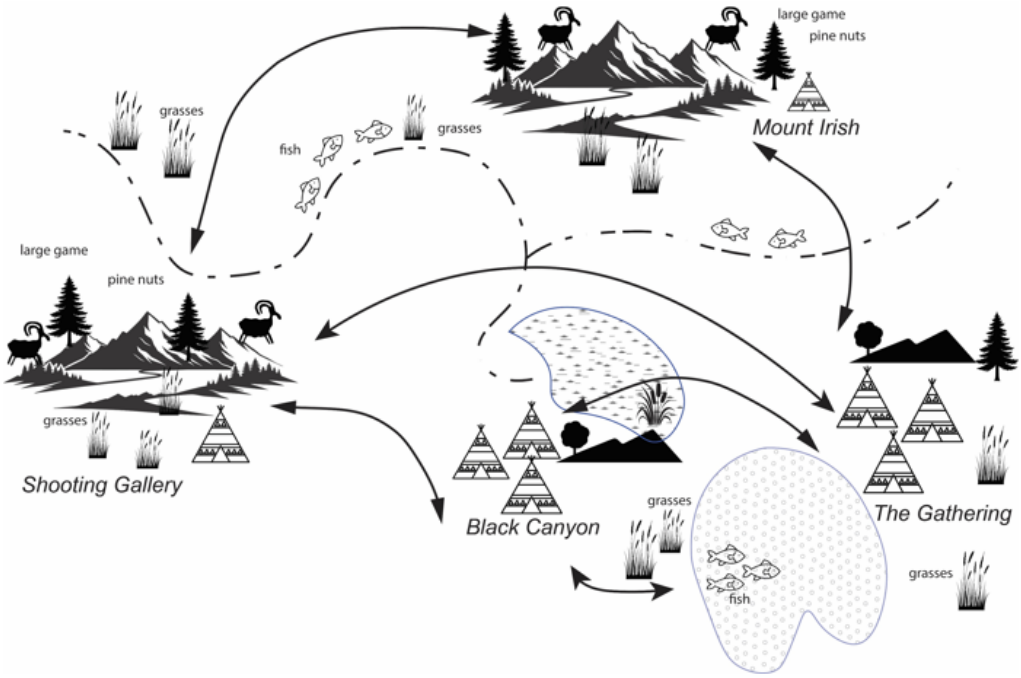


Figure 30. Modelled Pahranagat forager mobility (after Barker 2019, Figure 13.8a).

Pahranagat solid-bodied and patterned-bodied anthropomorphs were an important part of regional bonding behaviour that included communal hunting and large social gatherings in the Early Holocene (Figure 30). Climatic amelioration, the spread of pinyon, and the rise of communal hunting of Bighorn sheep resulted in a change in cooperative social organisation and decreased residential mobility. Rock art as a mode of signalling behaviour increased—and the Pahranagat region became a culture bloc. Given that style is a mechanism for demonstrating larger-scale group cohesion, and for carrying social information (Wiessner 1983, 1984; McDonald 2008), the overriding stylistic homogeneity of SB and PBA demonstrated broad-scale group cohesion. Geometric elements from the region's broader iconography are part of the stylistic messaging in the PBAs, and these provide an avenue for local and group identity signalling.

While the overall shape and construction of the PBAs motifs was regionally persistent, the extreme design variability within signalled information at the local and personal levels (Wiessner 1983). Repeated designs across the region demonstrated broad social group cohesion, while design innovation at individual site complexes signalled further information at the band level (Sackett 1990). Building on previous forager mobility models

(e.g., Barker 2019), the interplay between foragers across the Pahranagat style region was envisaged during the main production phase of PBA and SB motifs (Figure 30).

Each of the four site complexes analysed here were, at different times, the likely ritual centres for production. Black Canyon and The Gathering, at lower elevation and in seasonally abundant seed and lacustrine locations, were the likely locations for base camps, where the imagery was produced nearby to signal important social messaging about themselves and the broader group's attachment to that part of their social geography (after Rosenfeld 2002; McDonald 2021). Mount Irish, at higher elevation, was an important place for this Pahranagat forager signalling from its earliest days. In the final stages of this regional phase, and potentially into the changed social structure of the last 1500 years, the continuing importance of earlier imagery was indicated by the retouching/reactivating of several SB motifs. At higher elevation in Shooting Gallery, there was a late switch and increased design variability in PBAs and the use of a new atlatl design, also found at The Gathering. This suggested a continuing importance of these figures beyond the main period of regional production, along with continued interest with Bighorn sheep (Figure 23).

Drought, the introduction of the bow and arrow, and a change in subsistence strategies towards the individual pursuit of small animals and small family groups exploiting more reliable seeds/geophytes resulted in changes to social mobility and the use of rock art as group signalling behaviour. While the most recent rock artists in the Pahranagat Valley did not continue to produce these characteristic anthropomorphic forms, they continued to use the same landscapes and harvest many of the same resources—although their residential patterns and need to signal information about their identity changed (Bettinger 2015).

Once the Pahranagat Valley was settled by irrigation farmers and foragers, the main population would have been clustered along the Valley in villages. Reports in the late 1800s (e.g., Nye 1886) indicate that up to 200 people resided in these places, focused on springs. Irrigated crops would have been augmented by seasonal seed and pine nut harvesting, facilitated by storage in locally made pottery. Marking of the landscape by small forager groups, shamans during local rituals and on pilgrimages, and young initiates in seclusion resulted in rock writing that signified local and individual information. The main occupation focus was on the lower-elevation valley, except during seasonal times, and the drivers for producing rock imagery declined. Water Babies and the patterned-bodied figures in the landscape entered a reenvisaged cosmology. People sometimes interacted with this imagery, refreshing the images or adding new ones.

4.5. Negotiating Multiple Narratives

Contemporary interpretations of the characteristic Pahranagat figures are integrally linked to Southern Paiute understandings of storied rocks and powerful ritual beings (Stoffle et al. 2024) and an ontological view that Great Basin rock art production is fundamentally shamanistic (Whitley 2021). The persistent use of an abstract/geometric repertoire, interpreted as universal phosphenes linked to shamanistic beliefs and vision questing, is partly predicated on perceived deep-time cultural and stylistic continuity across the Great Basin (Whitley 2015, p. 234).

This analysis and resultant model for the Pahranagat region demonstrated a dynamic and changing Holocene Great Basin style sequence and interpreted this as evidence for changing signalling modes by hunter–foragers through time. The recursive nature of rock art imagery and the iterative ways that people engage with art practice allow for stochastic symbolic behaviours and multiple interpretive frameworks for Great Basin hunter–foragers over the past ca. 15,000 years.

Rock art/writing provides a reservoir of images for succeeding generations who not only view and interpret the record but also use it as a source of information that influences

their present practice (Morphy 2012). Rock art galleries are the art history of the artists themselves, with subsequent generations being socialised into and often contributing to the array of imagery:

> "In many cases, living cultures are likely to accommodate representations from the past within their present day cosmological and mythological schema". (Morphy 2012, p. 295)

Southern Paiute's connection with their cultural and inscribed landscapes and the imagery results from their engagement with that imagery through their cosmological belief systems. As with most Indigenous communities, they have a recursive relationship with the art and recognise that this was not all produced by themselves. In Australia, the Martu distinguish petroglyphs as the marks or tracks left by creator-beings when they visited galleries—where these Beings were literally transmogrified into stone (McDonald and Veth 2013). Native American explanations are similar:

> "We talk about the little people, the De-ju-gu-oos that are responsible for making [the] original drawings. They were for the powerful people who knew how to read [the markings] and use those and they could grow from there". (Stoffle et al. 2011a, p. 29)

Black Canyon ('Butte') is where the "plants, animals, water, small flat rocks, and the style of the pecking" are part of the cultural significance: where Water Babies, shaman's helpers, and mountain sheep adorning the cliff faces all contribute to the interpretation of this as a shaman's rainmaking site and place of pilgrimage. The iterative nature of this engagement with place is recognised: while "of great antiquity. . .portions have been re-pecked, thus documenting repeated use" (Stoffle et al. 2022, p. 14).

This Native American attribution of the art to the actions of spirits—with the lack of distinction between the actions of a shaman and his spirit helper—has been taken by Whitley as "straightforward attributions of the art to shamanic vision questing"... or "the spirit helper acts through the shaman, who is a conduit for supernatural power" (Whitley 2015, p. 203).

This analysis aimed not to dismantle these contemporary interpretative frameworks, nor to upset the ontological applecart (Whitley 2021) or to argue that there no genetic continuity between Paleoindian populations and the modern Paiute (Thomas et al. 2025). This model offers an alternative pathway to exploring the mechanisms of how this rock art may have been produced in deeper time and how it has continued to function as a signalling behaviour as part of forager adaptive behaviours throughout the Holocene. It fully acknowledges that SB and PBA are etic labels that derive from a western approach to categorisation of rock art, and no attempt has been made to suggest an interpretation for what these powerful spirit figures likely meant to their Early Holocene artists. Early Holocene Pahranagat artists created this imagery in a patterned way, which is explicable in terms of broader understandings of mobility patterns and regional interactions.

This archaeological analysis has approached the Pahranagat sequence of styles and representational practices, via inference, to sequential generations of Great Basin artists. It substantiates that stylistic changes can be accommodated by subsequent groups belonging to a different dimension of existence (Morphy 2012).

5. Conclusions

This paper explored Great Basin arid-zone hunter–forager rock art and viewed this as signalling behaviour. The rock art in the Pahranagat Valley in Lincoln County, Nevada, was the focus. This paper mobilised a theoretical approach, which integrated optimal foraging theory and the precepts of information exchange theory to generate some explicit

assumptions about style and signalling behaviour. The goal was to construct a deep-time rock art chronology and anchor this to chronological markers in the archaeological record. This sequence of geometric/abstract forms still requires analysis at multiple levels, as the focus here was on the patterned-bodied and solid-bodied Pahranagat human figures.

The archaeological approach deployed here contextualised petroglyphs in space and time and provided a deeper understanding of changing symbolic behaviours as part of the Great Basin adaptive strategy. It was proposed that the characteristic Pahranagat solid-bodied and patterned-bodied anthropomorphs were introduced during a period of climatic amelioration and pinyon expansion in the Early Holocene, as part of regional bonding behaviour that included communal hunting and large social gatherings. Drought, changed subsistence strategies, such as the introduction of the bow and arrow, individuals hunting small animals, and small family groups exploiting more reliable seeds, plus the rise of irrigation farming, resulted in changes to social mobility and the demise of rock art as a regional signalling behaviour. While the most recent rock writers in the Pahranagat Valley did not continue to produce these characteristic anthropomorphic forms, the recursivity of rock art in the cultural landscape allows their persistence in the symbolic lives of Native Americans today.

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Note

[1] The author recognises that Paiute and Western Shoshone descendent communities of the Great Basin prefer the term "rock writings" to "rock art". Because this paper refers to human rock markings more broadly, and in a global context where the term is more broadly accepted, I use the terms "rock writings", "rock art", petroglyphs, and pictographs interchangeably, and advisedly.

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