Chapter Three
Data and Analysis

Summary statistics for the Tutuveni petroglyphs reveal the magnitude of clan symbols concentrated there. The site contains 154 boulders with 235 separate panels, with 2,376 elements, or rows of images, which total 5,103 individual symbols. The purpose of this chapter is to explain how these data were collected and to conduct preliminary analyses to explore patterns of variability in them. The analyses presented here only scratch the surface of the data's research potential; therefore, future research directions are suggested at the conclusion of the chapter.

Field Procedures

Documentation of the Tutuveni petroglyphs began with an aerial photograph of the site taken from a balloon-mounted digital camera (Fig. 3.1). The aerial photograph was georectified in ArcMap 9.0, printed, and then used to trace boulder outlines and generate a map of the boulder field (Fig. 3.2). Boulders with petroglyphs were numbered sequentially along the lower terrace from north to south and on the hill-slope from south to north.

For the purposes of recording, each boulder was divided into one or more panels, or flat surfaces, which were labeled according to the direction the panel faces. Panels were labeled in the format "Boulder number, Panel." In the field, the first recording step was to fill out a form detailing each panel's dimensions, the presence of natural and cultural damage, and the details of the petroglyphs present (Fig. 3.3). Each panel was then photographed at five-megapixel resolution in its entirety with a metric scale. Then, close-up shots of individual elements or sections of the panel were taken. In all, 1,802 digital pictures were taken of the panels (DVD0001–DVD1802).

In the field, one or more of the overview photographs for each boulder face was printed on standard 8.5x11-inch paper using a portable color printer, and a transparency was placed over the print for tracing and note taking. The purpose of the in-field transparency drawings was not to trace every element, but rather to note details that were unclear in the photograph that might cause confusion in the lab. For example, elements in shadow or bright sun were highlighted, while elements covered by lichen or badly eroded were clarified. Several layers of transparencies were recorded for each boulder face (e.g., one layer to record petrolyph information, one layer to record vandalism, etc.).

Lab Analysis

In the lab, a photograph of each boulder panel was enlarged, color and contrast were enhanced in Adobe Photoshop, and the image was printed on a color plotter at approximately a fifth of its original size, typically 24x36 in. Acetate sheets were then placed over the prints and

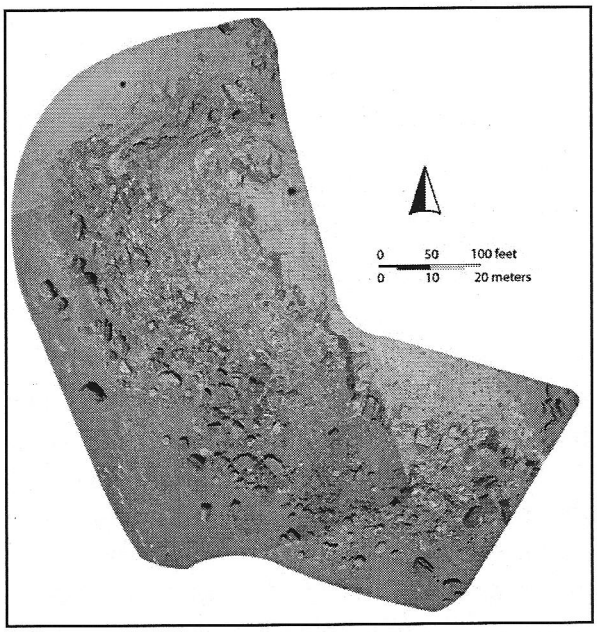


Figure 3.1. Aerial photograph of Tutuveni.

all visible petroglyphs were traced onto the acetate. To tabulate individual symbols, these line drawings were scanned and imported into CorelDraw 11.0. Using CorelDraw, each row of repeated symbols was designated as an element, outlined with a dashed-line box, and labeled with a capital letter or number (for example, a row of six corn symbols equals one element) (Fig. 3.4). Using the labeled line drawings, the number of different symbols present on each panel and the number of symbols within each element was then tabulated. These panel tables were compiled and entered into a master database, which is included on the DVD (Fig. 3.5).

Historical Photographs

In an effort to reconstruct the site in its pre-vandalized form and to establish the timing of damage to different boulders, a database of historical photographs of Tutuveni was compiled. Twelve sets of pictures spanning the period from 1930 to 2005 were assembled from the MNA, the UCLA Rock Art Archive, and several rock art researchers (Table 3.1), totaling 766 photographs (a digital copy of each historical photograph is included on the DVD [DVD1803–DVD2564]). Each historical photograph was scanned and relabeled to correspond to the boulder numbering system used in the current project. The historical photographs enable researchers to work backwards to identify the original appearance of individual elements that have since been damaged or obliterated by vandalism. Table 3.2 lists the boulders and panels included in each of the historical photograph sets. Figure 3.6 shows the condition of a panel heavily affected by vandalism in its pre- and post-vandalism conditions (see Appendix I for more examples).

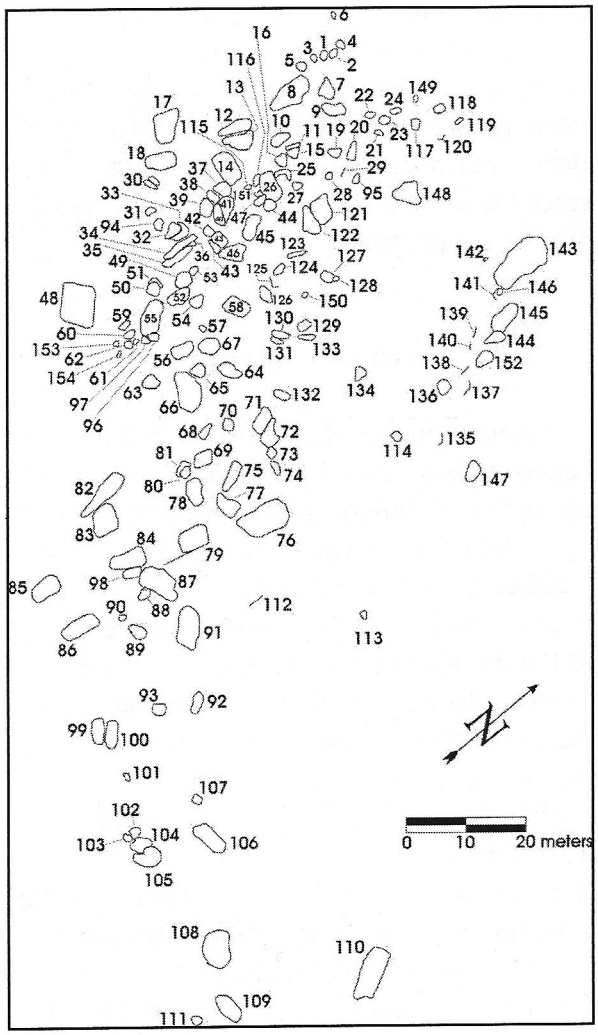


Figure 3.2. Numbered boulders at Tutuveni.

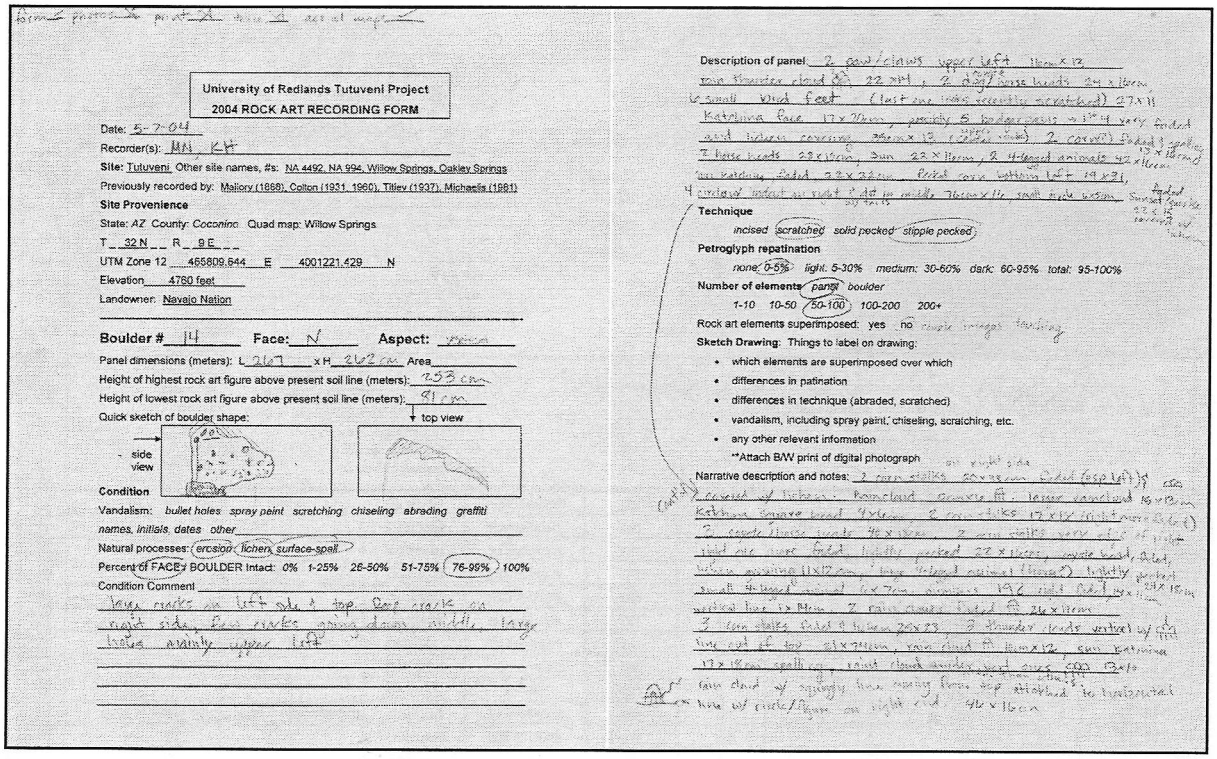


Figure 3.3. Sample boulder recording form, front and back.

Table 3.1. Sources of Historical Tutuveni Photographs.

Date of photographs	Institutional photo credit	Individual photo credit
1930	Cline Library, MNA	Harold Colton
1978	UCLA Rock Art Archives	Helen Michaelis
1981	-	Patricia McCreery
1984	-	Evelyn Billo & Robert Mark
1984	-	Donald Weaver
1989	-	Donald Weaver
1997	-	Donald Weaver
1998	-	Barbara Gronneman
1998	-	Evelyn Billo & Robert Mark
1999	-	Evelyn Billo & Robert Mark
2003	-	Wesley Bernardini
2004	University of Redlands	Wesley Bernardini
2005	University of Redlands	Wesley Bernardini

Line Drawings

The line drawings of each panel presented in this study reflect the pre-vandalism condition of petroglyphs whenever possible, although not all damaged elements could be reconstructed from the historical photograph database. Panels for which historical photographs were consulted to produce the line drawing are labeled in the caption as reconstructed; all others depict the panel condition in 2004. Panels were reconstructed back to the earliest available photograph(s),

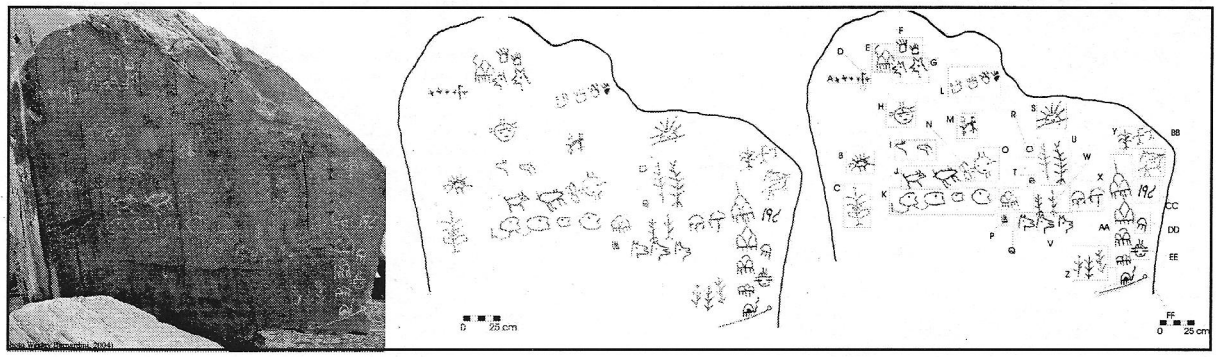


Figure 3.4. Example of element labeling.

136	014_N	M	eagle		2	no	moderate	pecked	
137	014_N	N	unidentifiable		1	no	moderate	pecked	
138	014_N	O	sun		1	no	moderate	pecked	
139	014_N	P	katsina		1	no	moderate	pecked	
140	014_N	Q	water		1	no	moderate	pecked	
141	014_N	R	cloud	water	1	no	moderate	pecked	
142	014_N	S	sun forehead		1	no	moderate	pecked	
143	014_N	U	corn		4	no	moderate	pecked	
144	014_N	V	coyote		3	no	light	pecked	
145	014_N	X	water		8	no	moderate	pecked	repatination and style vary in row
146	014_N	Y	corn		3	no	moderate	pecked	
147	014_N	Z	corn		3	no	light	pecked	
148	014_S	A	modern symbol		1	no	light	scratched	human figure
149	014_S	AA	water		1	no	moderate	pecked	lightning
150	014_S	B	coyote		1	no	moderate	pecked	
151	014_S	BB	unidentifiable		1	no	light	scratched	
152	014_S	C	corn		10	no	moderate	pecked	
153	014_S	CC	unidentifiable		1	no	light	scratched	
154	014_S	D	bear/badger		4	no	moderate	pecked	
155	014_S	DD	corn		1	no	moderate	pecked	
156	014_S	E	parrot		3	no	moderate	pecked	
157	014_S	EE	Máasaw	Fire	5	no	heavy	pecked	style changes in row
158	014_S	F	unid. bird		3	no	moderate	pecked	
159	014_S	FF	corn		4	no	moderate	pecked	
160	014_S	G	bear/badger		4	no	moderate	pecked	
161	014_S	GG	corn		5	no	heavy	pecked	Germ God is one of 5
162	014_S	I	coyote		2	no	light	pecked	
163	014_S	II	katsina		1	no	moderate	pecked	one-horn katsina
164	014_S	J	sun forehead		1	no	moderate	scratched	
165	014_S	JJ	unid. bird		1	no	moderate	pecked	
166	014_S	K	bow		2	no	light	pecked	
167	014_S	KK	Máasaw	Fire	2	no	moderate	pecked	
168	014_S	L	katsina		2	no	moderate	pecked	possible mudhead
169	014_S	M	horn		1	no	moderate	pecked	
170	014_S	MM	bear/badger		5	no	moderate	pecked	
171	014_S	N	unid. bird		1	no	light	pecked	3-toed
172	014_S	NN	Germ God	corn	1	no	moderate	pecked	
173	014_S	P	Máasaw	Fire	5	no	moderate	pecked	
174	014_S	Q	corn		5	no	moderate	pecked	
175	014_S	R	bear/badger		7	no	moderate	pecked	
176	014_S	S	unidentifiable		1	no	light	scratched	scratched line
177	014_S	T	corn		1	no	moderate	scratched	
									possible parrot; symbol on left has

Sheet1 / Sheet2 / Sheet3 /

Figure 3.5. Sample page from the Tutuveni database.

Table 3.2. Boulders and Panels Included in the Historical Photograph Sets.

Panel	1930 Colton	1978 Michaelis	1981 McCreery	1984 Billo-Marks	1984 Weaver	1989 Weaver	1997 Weaver	1998 Gronneman	1998 Billo-Marks	1999 Billo-Marks	2003 Bernardini	2004 Bernardini
1 SE												X
2 TOP												X
3 TOP												X
4 W												X
5 S												X
5 N												X
5 W												X
6 S												X
7 S												X
7 SW												X
8 S												X
8 W	X	X	X	X	X	X		X	X	X	X	X
8 SE										X		X
9 SE		X	X						X	X		X
10 W				X					X	X		X
11 W												X
12 SW		X	X	X		X				X	X	X
12 E	X			X	X					X	X	X
13 NW										X		X
13 W												X
13 T												X
13 SW									X	X		X
13 NE	X			X	X				X	X		X
14 N	X	X		X	X			X		X		X
14S	X	X		X	X	X	X	X	X	X	X	X
14 E				X							X	X
15 T												X

Table 3.2. Boulders and Panels Included in the Historical Photograph Sets, cont'd.

Panel	1930 Colton	1978 Michaelis	1981 McCreery	1984 Billo-Marks	1984 Weaver	1989 Weaver	1997 Weaver	1998 Gronneman	1998 Billo-Marks	1999 Billo-Marks	2003 Bernardini	2004 Bernardini
16 E												X
17 NW	X		X	X	X				X	X		X
17 T												X
17 SE	X	X		X					X	X	X	X
17 NE												X
17 S	X	X	X	X	X		X	X	X	X		X
18 T	X			X	X			X	X	X		X
18 T(W)												X
18 N	X								X	X		X
18 S	X	X	X							X		X
18 W	X	X	X	X	X			X	X	X		X
18 SW	X									X		X
19 NW												X
20 SW			X	X	X					X		X
21 SE												X
22 E												X
23 S		X										X
24 NE												X
25 T												X
26 W												X
27 S												X
28 S				X						X		X
29 SW												X
30 T												X
30 S	X	X	X	X	X	X		X	X	X	X	X
30 N										X		X
31 E												X

Table 3.2. Boulders and Panels Included in the Historical Photograph Sets, cont'd.

Panel	1930 Colton	1978 Michaelis	1981 McCreery	1984 Billo-Marks	1984 Weaver	1989 Weaver	1997 Weaver	1998 Gronneman	1998 Billo-Marks	1999 Billo-Marks	2003 Bernardini	2004 Bernardini
32 SW												X
32 B												X
33 N		X								X		X
33 T												X
34 T				X	X				X	X		X
34 S		X	X							X		X
34 N		X			X							X
34 W									X	X		X
34 E												X
35 NE												X
35 T	X		X			X				X	X	X
35 W												X
35 E												X
35 S		X	X							X	X	X
36 E	X	X								X		X
37 T	X	X	X	X	X		X		X	X	X	X
38 S												X
38 SW												X
39 N												X
39 T												X
40 S										X		X
40 E	X	X	X	X	X					X		X
41 T												X
42 T												X
43 S	X	X		X	X		X		X	X	X	X
44 T												X
45 NW												X

Table 3.2. Boulders and Panels Included in the Historical Photograph Sets, cont'd.

Panel	1930 Colton	1978 Michaelis	1981 McCreery	1984 Billo-Marks	1984 Weaver	1989 Weaver	1997 Weaver	1998 Gronneman	1998 Billo-Marks	1999 Billo-Marks	2003 Bernardini	2004 Bernardini
45 T		X		X	X					X	X	X
46 W		X		X					X	X	X	X
46 SW												X
47 S												X
48 SE	X	X	X	X	X			X		X	X	X
48 NE	X		X	X							X	X
48 NE TOP SHELF												X
48 N SHELF N												X
48 NW	X	X							X			X
48 SW	X	X	X	X	X			X	X	X	X	X
48 T				X								X
49 NW					X				X	X		X
49 NE												X
49 SW	X	X							X	X	X	X
49 SE												X
50 T									X	X		X
50 W				X								X
50 SW												X
51 NW												X
51 B								X				X
52 T		X			X	X			X	X		X
52 W			X	X					X	X		X
52 E												X

Table 3.2. Boulders and Panels Included in the Historical Photograph Sets, cont'd.

Panel	1930 Colton	1978 Michaelis	1981 McCreery	1984 Billo-Marks	1984 Weaver	1989 Weaver	1997 Weaver	1998 Gronneman	1998 Billo-Marks	1999 Billo-Marks	2003 Bernardini	2004 Bernardini
52 S												X
53 SE												X
53 T										X	X	X
54 S		X										X
55 NE									X		X	X
55 N												X
55 W	X	X			X				X	X	X	X
55 S										X	X	X
55 T												X
56 T		X								X		X
56 SE												X
57 SE												X
58 T			X							X	X	X
59 W												X
60 T		X		X	X				X	X	X	X
60 S		X								X	X	X
60 SW												X
60 W									X	X	X	X
61 S												X
61 NW					X							X
61 SW												X
62 T												X
63 T												X
64 S											X	X
64 T		X								X		X
65 E												X
66 SE												X

Table 3.2. Boulders and Panels Included in the Historical Photograph Sets, cont'd.

Panel	1930 Colton	1978 Michaelis	1981 McCreery	1984 Billo-Marks	1984 Weaver	1989 Weaver	1997 Weaver	1998 Gronneman	1998 Billo-Marks	1999 Billo-Marks	2003 Bernardini	2004 Bernardini
66 S												X
66 NW												X
66 E												X
67 E												X
68 T												X
69 W												X
70 T												X
71 T												X
72 W				X								X
72 SE										X	X	X
73 T												X
74 SW												X
75 W		X	X	X					X	X	X	X
76 W		X		X								X
77 S										X		X
78 SW												X
79 SW			X									X
80 W												X
81 T												X
82 W		X	X	X					X	X		X
83 SW												X
83 SE										X		X
84 T												X
85 SW			X									X
85 NW												X
85 SE												X
86 E												X

Table 3.2. Boulders and Panels Included in the Historical Photograph Sets, cont'd.

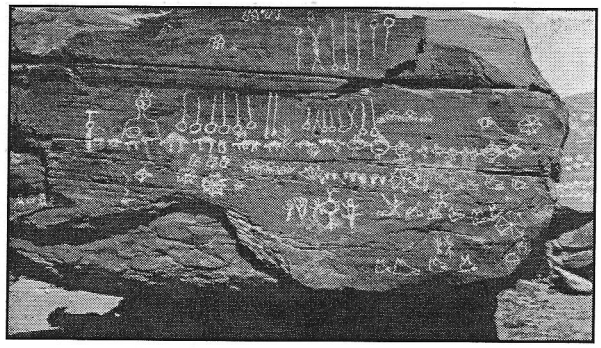
Panel	1930 Colton	1978 Michaelis	1981 McCreery	1984 Billo-Marks	1984 Weaver	1989 Weaver	1997 Weaver	1998 Gronneman	1998 Billo-Marks	1999 Billo-Marks	2003 Bernardini	2004 Bernardini
87 W												X
87 T												X
88 T												X
89 N												X
89 T												X
90 NE												X
91 E												X
92 W												X
93 T												X
94 SW			X							X		X
95 T											X	X
96 SE											X	X
97 SE												X
98 T												X
99 SW												X
99 SE												X
100 NE												X
101 T												X
102 SW												X
103 SW												X
104 NW												X
105 S												X
105 E												X
106 SW												X
107 T												X
108 S												X
108 E												X

Table 3.2. Boulders and Panels Included in the Historical Photograph Sets, cont'd.

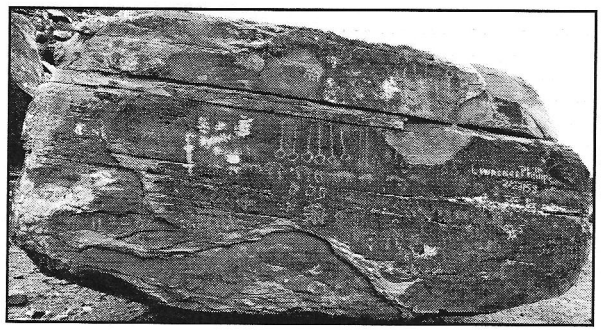
Panel	1930 Colton	1978 Michaelis	1981 McCreery	1984 Billo-Marks	1984 Weaver	1989 Weaver	1997 Weaver	1998 Gronneman	1998 Billo-Marks	1999 Billo-Marks	2003 Bernardini	2004 Bernardini
109 N												
109 S												X
110 T												X
111 T												X
112 W												X
113 S												X
114 NW												X
115 NW		X										X
116 SW												X
117 T												X
118 T												X
119 W												X
120 NW												X
121 SE												X
122 W												X
122 SE											X	X
123 NW												X
124 W												X
125 SW												X
126 SW	X				X							X
127 T										X		X
128 W												X
129 W												X
130 T					X							X
131 T					X					X		X
132 T										X		X
133 SE												X

Table 3.2. Boulders and Panels Included in the Historical Photograph Sets, cont'd.

Panel	1930 Colton	1978 Michaelis	1981 McCreery	1984 Billo-Marks	1984 Weaver	1989 Weaver	1997 Weaver	1998 Gronneman	1998 Billo-Marks	1999 Billo-Marks	2003 Bernardini	2004 Bernardini
134 T												X
135 SW												X
136 SW												X
137 W										X		X
137 SW										X	X	X
138 NW												X
139 SW												X
140 SW												X
141 NW												X
142 T												X
143 T												X
143 NW												X
143 SW												X
144 T												X
145 T												X
146 NW												X
147 T												X
148 T												X
149 T												X
150 T												X
151 NW												X
152 T												X
153 T									X	X		
154 SW										X		



a 1930 photograph by Harold Colton (copyright Museum of Northern Arizona; DVD1811).



b. 2004 photograph by Wesley Bernardini (DVD0329).

Figure 3.6., I.18. Boulder 17 Northwest .

which is usually either 1930 or 1978, as these are the two most comprehensive sets of historical images. The repatination column in Fig. 3.5 also records the pre-vandalism repatination whenever it was possible to observe this.

The resulting line drawings of all 235 panels are included on the DVD (DVD2565–DVD3050) and each panel is presented once unlabeled and once labeled, for a total of 488 drawings. Some panels were so large that they were drawn in quarters, thirds, or halves. The labeled line drawings permit other researchers to independently tabulate symbols. An example of a line drawing of a panel with significant numbers of clan symbols is illustrated in Figure 3.7 (additional line drawings appear in Appendix I).

Identifying Clan Symbols

Petroglyph elements were initially identified and named based on information provided to anthropologists by Hopi cultural advisors at four different points over the past 120 years. The two earliest sources of information are publications by Jesse Walter Fewkes (1892, 1897). In the first source, Fewkes (1892) consulted a number of unnamed Walpi inhabitants for assistance in interpreting petroglyphs on First Mesa, including a number of clan symbols. The second Fewkes (1897) publication is perhaps the most valuable historical source, as it contains a collection of clan symbols used as signatures by Hopi workmen in the late nineteenth century. Fewkes documented 24 clan symbols produced by 116 Hopi men, each of whom provided a verbal interpretation of his signature.

A third source of information is found in Harold and Mary Colton's (1931) account of a visit to Tutuveni with Hopi advisor Edmund Nequatewa. Nequatewa was a member of the Sun Forehead clan from Second Mesa. Although he was an initiated, and therefore knowledgeable, Hopi man, because he was not from Third Mesa, he did not have an insider's view of Tutuveni and of the clans that used the site most frequently. Thus, although Nequatewa's identifications of clan symbols are likely accurate, they are not necessarily comprehensive. Nequatewa suggested that symbols he did not recognize might be extinct clans, an interpretation seconded by current Hopi CRATT members (Notes from CRATT meeting, August 18, 2005).

A fourth source is an article by Helen Michaelis (1981) summarizing her documentation of the Tutuveni site. During her site visits several unnamed Hopi consultants accompanied her and helped interpret petroglyphs. Michaelis' field identifications, combined with her review of Nequatewa's clan list published

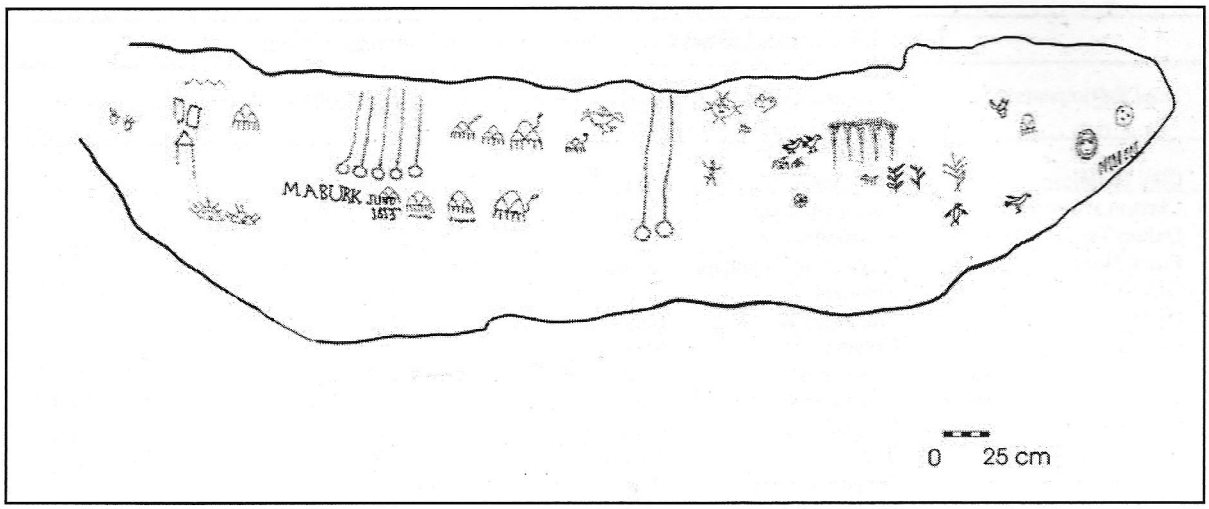


Figure 3.7, I.91. Boulder 8 west (reconstructed using 1930 photographs).

in Colton and Colton (1931), resulted in the documentation of 40 Hopi clan symbols at Tutuveni.

For the current project, the clan symbols identified by all four sets of Hopi cultural advisors were compiled into a single reference sheet that was used to make preliminary identifications of the Tutuveni elements. These preliminary identifications were then presented to a Hopi CRATT meeting on August 18, 2005 for confirmation and clarification. A paper survey form, including copies of line drawings of all major panels, was also circulated to representatives of the 11 occupied Hopi villages. The participants in these consultations are listed in Table 3.3. The identifications of symbols across all five independent consultations with Hopi advisors over 120 years are remarkably consistent (Table 3.4). Especially encouraging is the correspondence between totemic petroglyphs at Tutuveni and the hand-drawn totemic signatures of Hopi workmen recorded by Fewkes (1897) (Figure 3.8), as these symbols were produced to symbolize clan identity in two completely different cultural contexts.

This process resulted in the identification of 76 totemic symbols, including several different categories. Thirty-two symbols corresponded to the marks of living or recently extinct clans (Fig. 3.9); six symbols corresponded to katsinas still active in Hopi ritual (Fig. 3.10); and 38 symbols, which occurred repeatedly but did not correspond to any current or recently extinct Hopi clan, were interpreted as symbols of extinct clans (Fig. 3.11). Images were classified as extinct clan symbols if they had clear iconography and occurred multiple times either in a row or in different places, but did not correspond to any historically documented Hopi totem. Each of these symbols was assigned a number (for example, Extinct-1, Extinct-2, etc.). The vast majority of these extinct clan symbols are found on boulder 48, the oldest rock at Tutuveni based on repatination. The assemblage of extinct clan symbols is discussed in further detail below.

Three additional categories were used for elements that could not be linked to a historically recorded clan symbol. The Unknown category was used for elements that appeared to be representations of a recognizable object, such as a plant, but which did not contain sufficient distinguishing characteristics for a definitive identification. The unknown category was comprised primarily of three groups: unknown birds, unknown plants, and unknown quadrupeds (Fig. 3.12). The Unique category was used for elements that had clear iconography, but

Table 3.3. Hopi Advisors Consulted During the Tutuveni Project.

Hopi Participants	Village	Clan	August 18, 2005 CRATT meeting	Village Survey Form
Clay Hamilton	Sitsomovi	Deer	X	
Clayton Honyumptewa	Lower Munqapi	Snake	X	
Dalton Taylor	Songòopavi	Sun	X	
Frank Honahnie, Sr.	Kiqötsmovi/Munqapi	Coyote	X	X
Gilbert Naseyouma	Munqapi	Sun	X	X
Harlan Williams	Musangnuvi	Eagle	X	
Harold Polingyumptewa	Hotvela	Sand	X	X
LaVern Siweumptewa	Musangnuvi	Water	X	
Lee Wayne Lomayestewa	Songòopavi	Bear	X	
Leigh Kuwanwisiwma	Paaqavi	Greasewood	X	
Marvin Lalo	Walpi	Tobacco/Rabbit	X	
Morgan Saufkie	Songòopavi	Bear	X	
Owen Numkena, Jr.	Musangnuvi	Corn	X	X
Raleigh Puhayaoma, Sr.	Supawlavi	Sun Forehead	X	X
Stewart Koyiyumptewa	Hotvela	Badger	X	
Sue Kuyvaya	Songòopavi	Water/Fog	X	
Valjean Joshevama	Songòopavi	Sun	X	
Walter Hamana	Old Orayvi	Greasewood	X	
Wilton Kooyahoema	Hotvela	Fire	X	

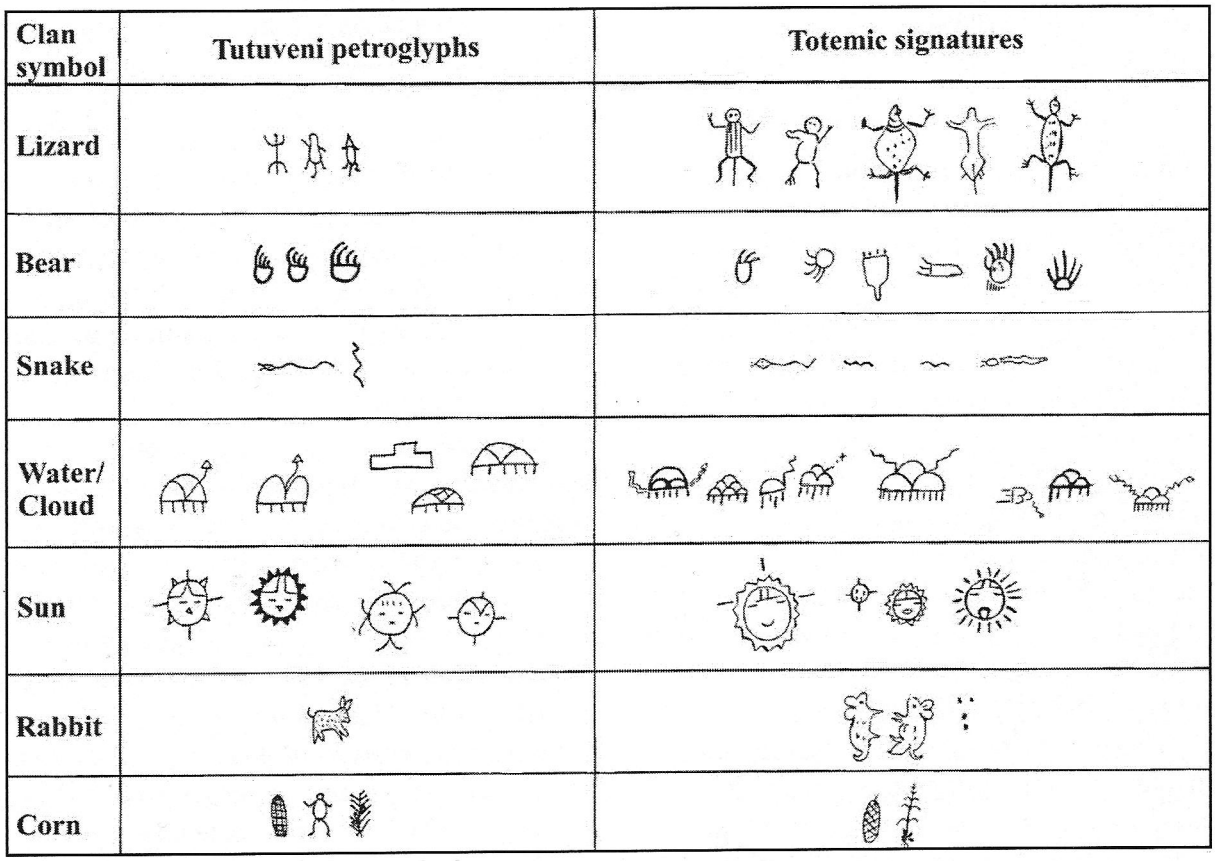


Figure 3.8. Examples of clan symbols from Tutuveni (left) and Fewkes' (1897) list of Hopi totemic signatures.

Table 3.4. Clan Symbols Identified by Hopi Consultants.

Clan Symbol	Fewkes 1897	Fewkes 1892	Forde 1931	Colton 1931	Michaelis 1981	2005 CRATT meeting
Arrow						X
Badger				X		X
Bear	X		X	X	X	X
Bear Strap				X		X
Bluebird				X		
Bow				X		X
Butterfly	X			X	X	X
Cactus	X					
Cloud				X		X
Corn	X	X	X	X	X	X
Coyote	X			X	X	X
Deer	X					
Eagle				X		X
Fire						X
Greasewood						X
Horn				X		X
Katsina	X	X	X	X	X	X
Lizard	X		X	X	X	X
Máasaw (Fire)						X
Moon				X		
Mud Head Katsina						X
Oak				X	X	
Parrot				X		X
Qööqöqlö Katsina						X
Rabbit				X		X
Red Ant				X		
Reed				X		
Sand				X		X
Snake	X	X	X	X	X	X
Snow						X
Soyoko Katsina						X
Spider				X		X
Squash	X					X
Sun						X
Sun Forehead				X		X
Tobacco	X				X	
Water						X

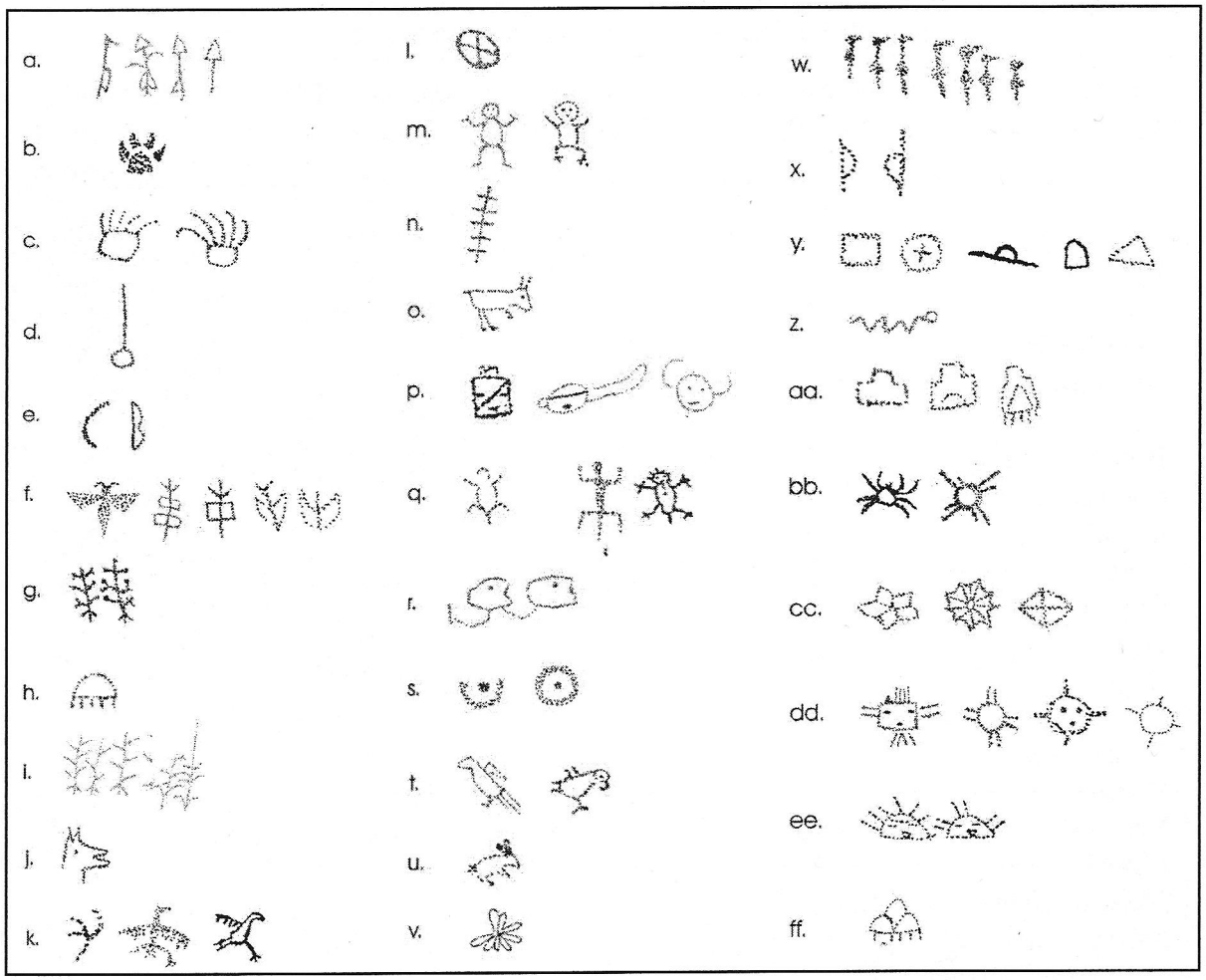


Figure 3.9. Clan symbols of living or recently extinct Hopi clans observed at Tutuveni. a. arrow, b. badger, c. bear, d. bear strap, e. bow, f. butterfly, g. cactus, h. cloud (water), i. corn, j. coyote, k. eagle, l. fire, m. germ god (corn), n. greasewood, o. horn, p. katsina, q. lizard, r. Máasaw (Fire), s. moon, t. parrot, u. rabbit, v. rabbit brush, w. red ant, x. reed, y. sand, z. snake, aa. snow (water), bb. spider, cc. squash, dd. sun, ee. sun forehead, ff. water.

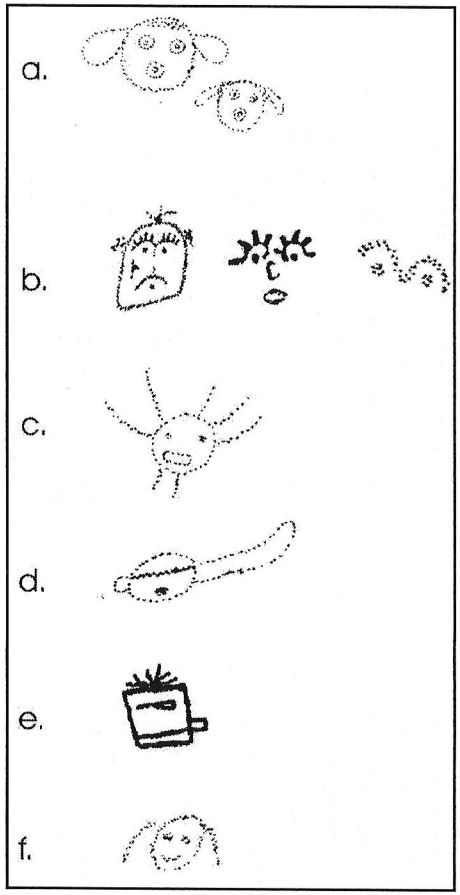


Figure 3.10. Katsina symbols at Tutuveni that correspond to historical Katsinas. a. Mud Head Ogre (Colton 1959:28), b. Qööqölö (Colton 1959:21), c. Soyal, d. Wupa'-ala (Colton 1959:42), e. Áhooli (Colton 1959:2), f. an unnamed katsina associated with the Wuwtsim society.

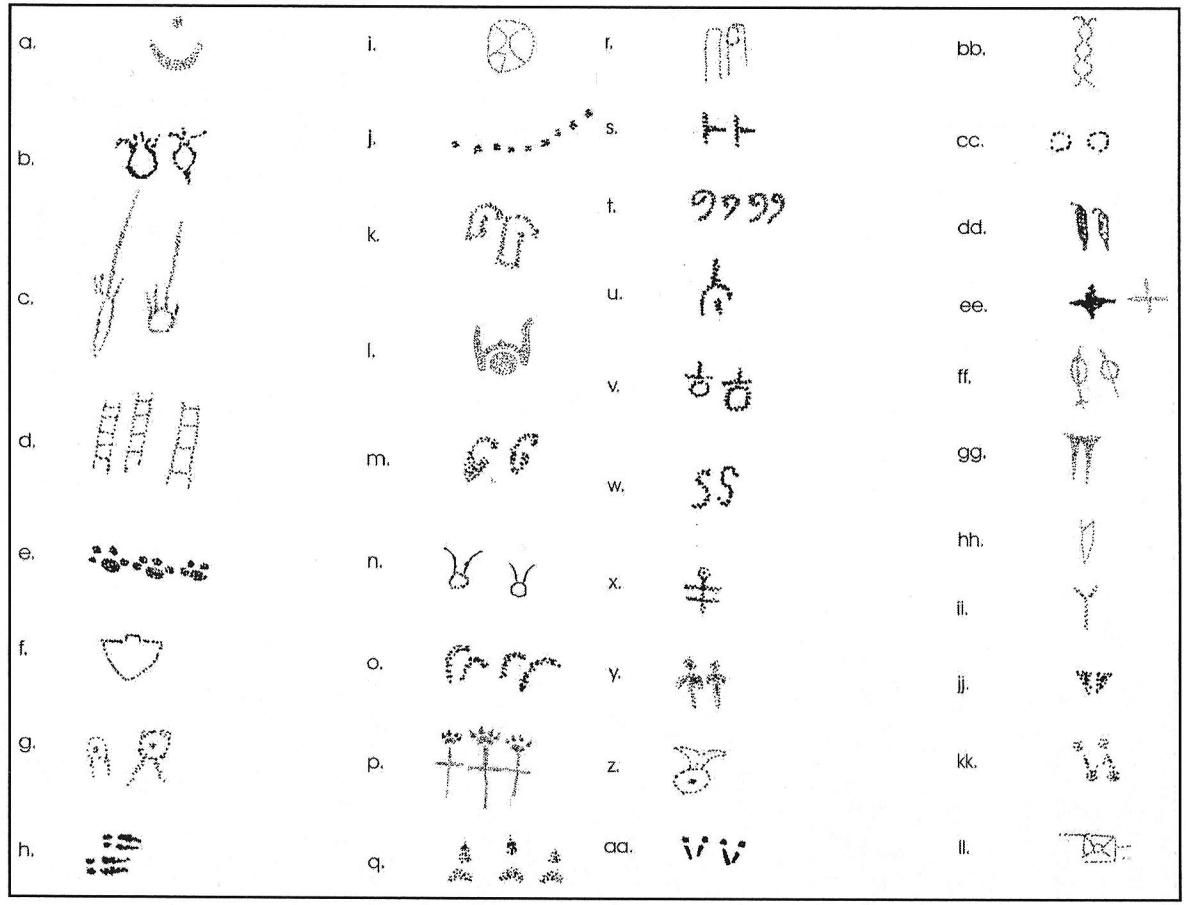


Figure 3.11. Symbols of extinct clans at Tutuveni. a. Extinct-1, b. Extinct-2, c. Extinct-3, d. Extinct-4, e. Extinct-5, f. Extinct-6, g. Extinct-7, h. Extinct 8, i. Extinct-9, j. Extinct-10, k. Extinct-11, l. Extinct-12, m. Extinct -13, n. Extinct-14, o. Extinct-15, p. Extinct-16, q. Extinct-17, r. Extinct-18, s. Extinct-19, t. Extinct-20, u. Extinct-21, v. Extinct-22, w. Extinct-23, x. Extinct-24, y. Extinct-25, z. Extinct-26, aa. Extinct-27, bb. Extinct-28, cc. Extinct-29, dd. Extinct-30, ee. Extinct-31, ff. Extinct-32, gg. Extinct-33, hh. Extinct-34, ii. Extinct-35, jj. Extinct-36, kk. Extinct-37, ll. Extinct-38.

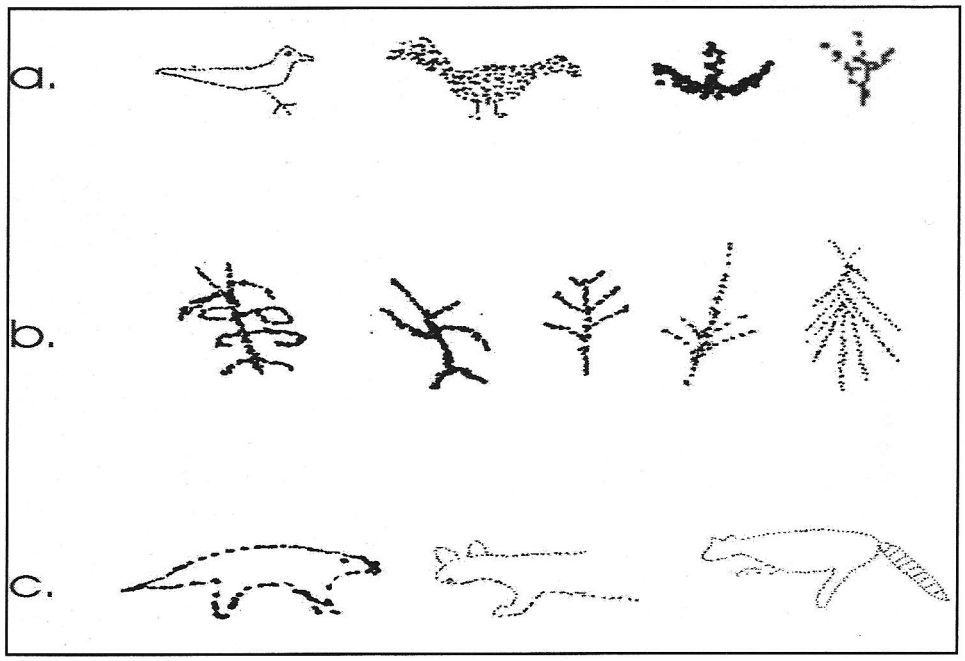


Figure 3.12. Examples of unknown symbols at Tutuveni. a. unknown birds, b. unknown plants, c. unknown quadrupeds.

occurred only once at the site (Fig. 3.13). These were labeled with a number, such as Unique-1. The Unidentifiable category was used for elements that were visually unintelligible, such as images that were badly faded or eroded.

A number of symbol categories require clarification to make the criteria for their classification explicit:

- Bear and Badger are separately named Hopi clans in different phratries, and although Hopi consultants indicated that bear and badger paws should be distinguishable by the number of fingers depicted (five vs. four or three, respectively [CRATT meeting, August 18, 2005]), this variable proved inadequate to discriminate the paw symbols. After many attempts to separate bear paws from badger paws, they were eventually lumped into a single bear/badger category, despite the fact that this combines two currently distinct clans.

- The Unknown Bird category subsumes considerable variability in form and style, probably encompassing at least five different living or recently extinct Hopi bird clans, including Bluebird, Crow, Crane/Heron, Pigeon-Hawk (Colton and Colton 1931:34–35), and perhaps several additional ones. Unfortunately, neither morphology nor input from Hopi cultural advisors was sufficient to consistently separate most bird symbols into discrete categories.

- Distinguishing corn symbols from other plants proved difficult, and it is likely that some of the symbols grouped under the category corn could be separated into sub-classes of plants. The horizontal leaves of greasewood symbols, for example, grade into the curved leaves of corn. The totems of the Young Corn and Corn clans (see Table 2.1) are also indistinguishable with the current information.

- Sun and Sun Forehead symbols of-

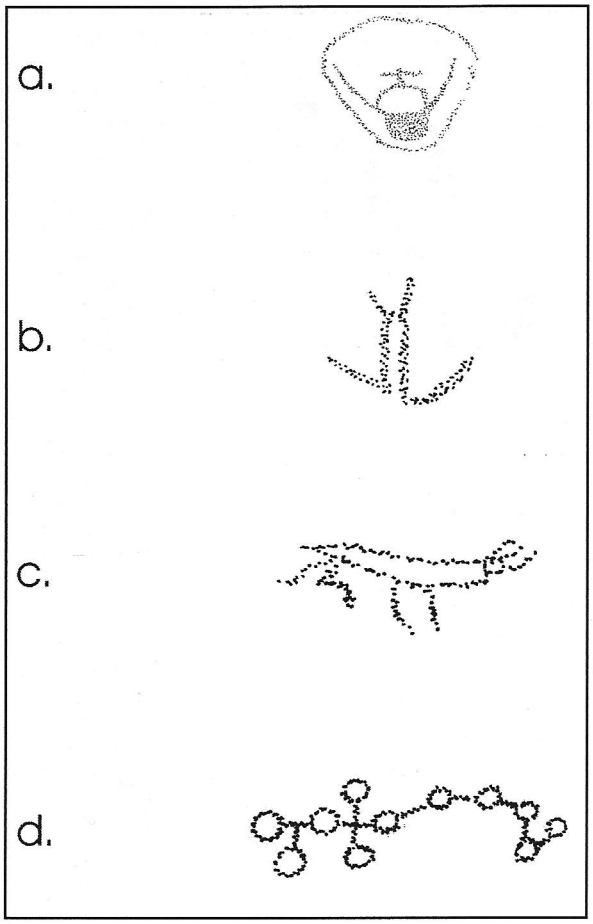


Figure 3.13. Unique symbols at Tutuveni. a. Unique-1 (boulder 48 southeast element 73), b. Unique-2 (boulder 30 south element KK), c. Unique-3 (boulder 30 south element NN), d. Unique-4 (boulder 48 southwest element 76).

ten occurred on the same row (e.g., 18 North element C, 17 Northwest element L), suggesting that they may have been used as alternate totems at Tutuveni.

- Snake and Lizard symbols occasionally occurred on the same row, suggesting that they may have been used as alternate totems at Tutuveni. This is clearly demonstrated in 33 Top element H.

- Water, Cloud, and Snow symbols were separated by Hopi cultural advisors at the 2005 consultation, but these symbols occasionally occurred on the same row (e.g., 14 North element AA), suggesting that they may have been used as alternate totems at Tutuveni.

- Hopi cultural advisors consulted in 2005 revised two of Edmund Nequatewa's symbol identifications made in 1931, concluding that Nequatewa had mistakenly identified a butterfly symbol as a red ant, and several arrow symbols as reeds (Colton and Colton 1931:Figure 2; Fig. 3.9, this volume). In both of these cases, the present study deferred to the identifications of the 2005 assembly of cultural advisors given the breadth of the traditional knowledge they brought to the process.

- A large number of katsina images were identified at Tutuveni, but the majority proved difficult to correlate with historically recorded katsinas or dolls; therefore, most of these are lumped under a general Katsina category. The Katsina category almost certainly encompasses a number of distinct symbols, potentially of distinct clans (see below).

Patterns and Analysis

Of the 5,103 symbols at Tutuveni, the vast majority (4,283 or 84 percent) are intelligible glyphs. The remaining marks are English graffiti, or are too faint, eroded, or poorly executed to be interpreted. All further statistics presented in this chapter were generated from study of the 4,283 intelligible glyphs (excluding the categories "English writing" and "unidentifiable"). Sixty percent (2,537) of the symbols are found on boulder 48, the largest, most centrally located, and most heavily repatinated boulder on the site. Of the remaining images, most (24 percent) are found on seven boulders which cluster around boulder 48, which include boulders 8, 14, 17, 18, 30, 34, and 55 (Fig. 3.14). The remaining symbols are scattered among

144 other boulders, most of which contain fewer than six glyphs each.

Symbol Frequency

The symbols at Tutuveni are dominated by three very common images: Bear/Badger paws, Unknown-birds, and Corn (Table 3.5, Fig. 3.15). Together, these three categories comprise 23 percent of the total symbols at Tutuveni. These "Class A" symbols are common in large part because they are all composite categories, encompassing a diversity of symbols that potentially refer to multiple clans. If all katsina images are grouped together, including Katsina, Sun, Sun Forehead, *Qööqöqlö*, Mud Head, and *Soyàlkatsina*, they represent the fourth most common symbol, with 312 images. Closer examination of the rest of the frequency distribution suggests the existence of five additional frequency categories: Class B (165–210 symbols); Class C (90–120 symbols); Class D (40–62 symbols), and Class E (20–30 symbols); and Class F (11 or fewer symbols) (Figure 3.16; Table 3.6).

Symbol frequency at Tutuveni is a product of clan size and clan longevity. In an effort to identify unusually large and/or long-lived clans, symbol frequency was quantified using Z-scores. Z-scores express the deviation of a quantity from the mean of a distribution in terms of numbers of standard deviations (Shennan 1997:75). For example, a Z-score of two indicates that the observed value is two standard deviations greater than the mean. In a normally distributed population, only 16 percent of the values would deviate from the mean by more than one standard deviation, and only 2.5 percent would deviate by more than two standard deviations. Thus, Z-scores provide a basis for identifying outlying cases that are substantially different from the rest of the sample.

For a given set of observations, Z-scores

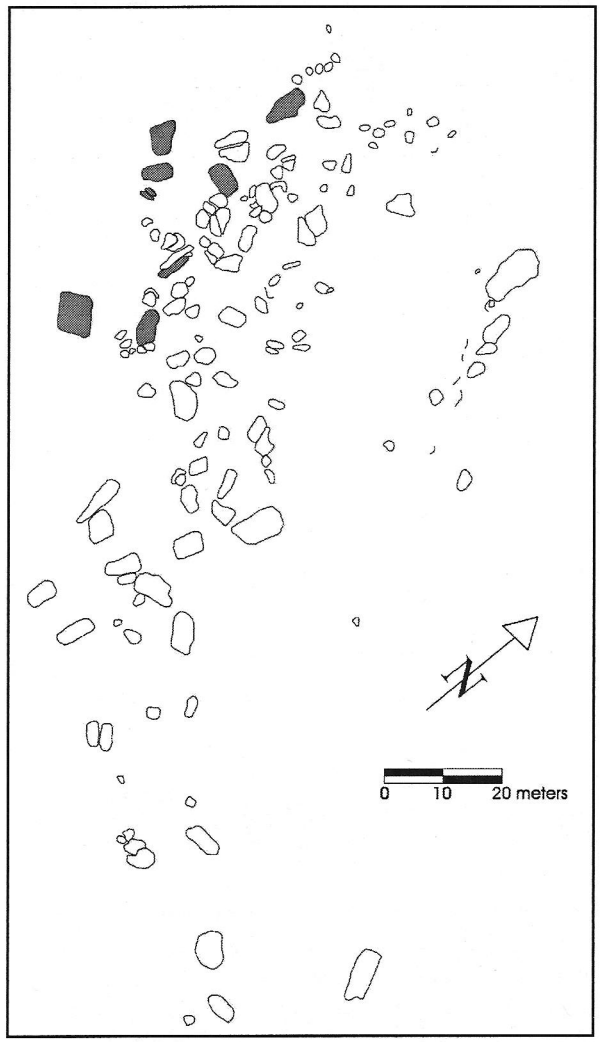


Figure 3.14. Primary boulders at Tutuveni.

are calculated by subtracting the mean from the observed value and dividing the results by the standard deviation. In order to calculate Z-scores at Tutuveni, each symbol's mean percentage of occurrence across the entire site was subtracted from its observed percentage on a particular boulder panel, and the result was divided by the standard deviation for that symbol across the entire site. Table 3.7 displays the Z-scores for 28 large boulder panels at Tutuveni. To simplify the display, Z-scores of 1.0–1.99 are represented by a +, and Z-scores of 2.0 or greater are represented by a ++. The table reveals a complex pattern in which every symbol except one, Extinct-20, is unusually

Table 3.5. Tutuveni Petroglyph Symbols by Frequency.

Clan Symbol	Number of Elements	Total Number of Symbols
Bear/Badger	215	587
Unknown-Bird	205	576
Corn	192	473
Unidentifiable	329	457
English Writing	350	363
Coyote	74	208
Lizard	77	208
Sun	87	188
Extinct-10	27	166
Máasaw	38	120
Cloud	44	119
Snake	53	113
Unknown	70	113
Bow	30	109
Water	50	102
Snow	37	91
Bear Strap	25	90
Butterfly	32	62
Katsina	44	60
Parrot	30	60
Sand	24	56
Red Ant	16	51
Arrow	15	47
Modern Symbol	32	45
Eagle	22	42
Extinct-30	10	41
Rabbit	13	40
Germ God	11	30
Extinct-31	14	28
Horn	14	28
Squash	10	28
Qööqöqlö Katsina	13	27
Spider	5	27
Sun Forehead	15	26
Extinct-20	3	25
Unknown-Plant	20	25
Extinct-05	10	23
Reed	9	23
Extinct-18	2	11
Extinct-32	8	11
Greasewood	9	11
Mud Head Katsina	3	11
Extinct-29	6	10

Table 3.5. Tutuveni Petroglyph Symbols by Frequency, cont'd.

Clan Symbol	Number of Elements	Total Number of Symbols
Extinct-33	2	10
Extinct-16	2	8
Extinct-34	2	8
Moon	5	8
Extinct-17	3	8
Extinct-22	1	7
Unknown-Quadruped	7	7
Extinct-04	4	6
Extinct-06	5	6
Extinct-27	1	6
Extinct-28	2	6
Fire	3	6
Oak	2	6
Cactus	4	5
Extinct-02	3	4
Extinct-14	3	4
Extinct-15	1	4
Extinct-23	1	4
Extinct-35	3	5
Extinct-37	1	4
Extinct-03	2	3
Extinct-09	3	3
Extinct-11	1	3
Extinct-12	2	3
Extinct-21	2	3
Extinct-25	1	3
Extinct-36	1	3
Extinct-38	1	3
Badger	1	2
Extinct-01	1	2
Extinct-07	1	2
Extinct-08	1	2
Extinct-13	1	2
Extinct-26	1	1
Rabbitbrush	1	1
Soyàlkatsina	1	1
Unique-1	1	1
Unique-2	1	1
Unique-3	1	1
Unique-4	1	1
Total	2375	5103

abundant on at least one panel. This pattern suggests that most clans are locally abundant on at least one boulder face, and that clan symbols do not regularly cluster together.

Spatial Patterns

Further exploration of relationships among clan symbols using cluster analysis (Ward's method and Average Linkage, run on squared Euclidean distance of the Z-score data) suggests several clusters of panels with similar sets of images. This includes six panels with unusually abundant sun, unidentified bird, corn, and bear symbols (48 Northeast, 48 Top, 48 Southwest, 35 West, 48 Northwest, and 48 Southeast); three panels with *Máasaw* and

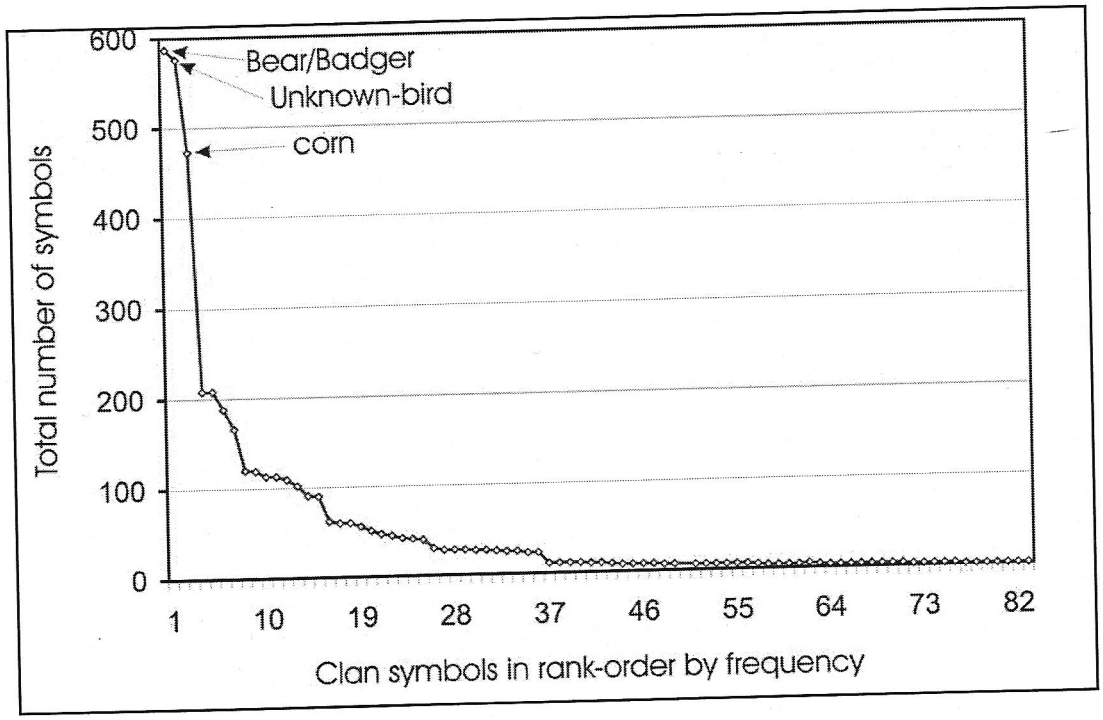


Figure 3.15. Symbol frequency at Tutuveni.

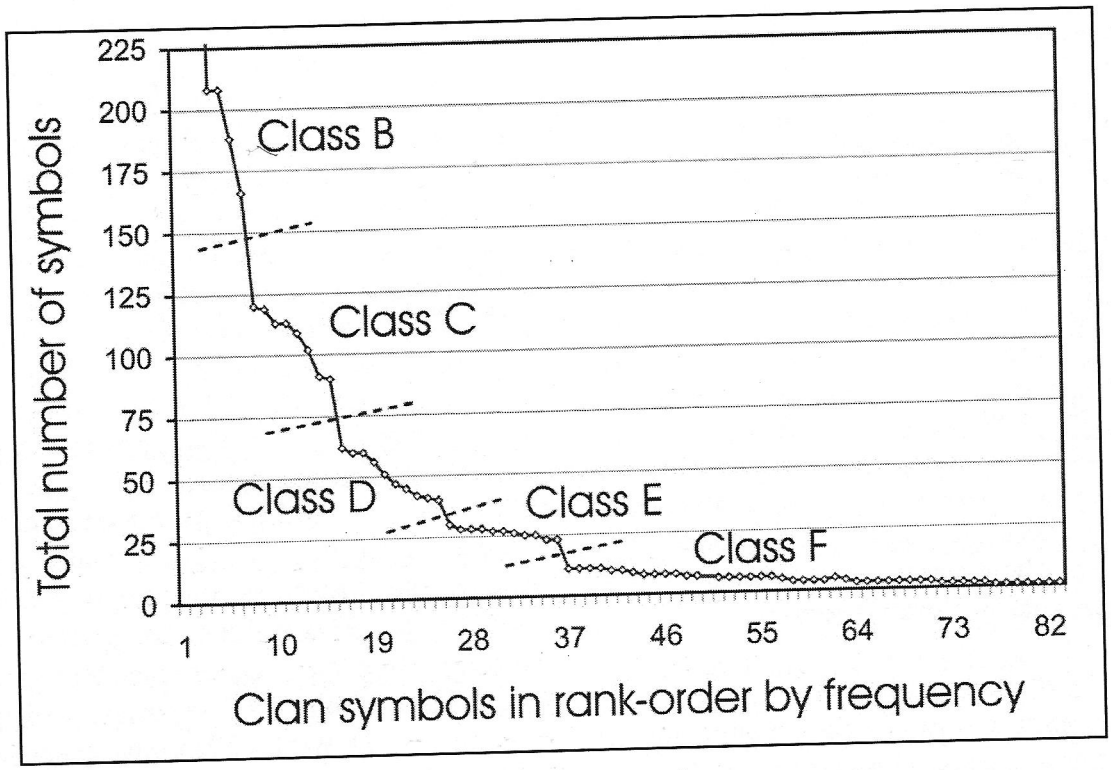


Figure 3.16. Symbol frequency at Tutuveni, Class B – Class F.

Table 3.6. Symbols Arranged by Frequency Class.

Class	Symbol
Class A	Bear/Badger
	Unknown-Bird
	Corn
	Katsina (combined)
Class B	Coyote
	Lizard
	Sun
	Extinct-10
Class C	*Máasaw*
	Cloud
	Snake
	Bow
	Water
	Snow
	Bear Strap
Class D	Butterfly
	Katsina
	Parrot
	Sand
	Red Ant
	Arrow
	Eagle
	Extinct-30
	Rabbit
Class E	Germ God
	Extinct-31
	Horn
	Squash
	Qööqöqlö Katsina
	Spider
	Sun Forehead
	Extinct-20
	Unknown-Plant
	Extinct-05
	Reed

Table 3.6. Symbols Arranged by Frequency Class, cont'd.

Class	Symbol
Class F	Extinct-18
	Extinct-32
	Greasewood
	Mud Head Katsina
	Extinct-29
	Extinct-33
	Extinct-19
	Extinct-16
	Extinct-34
	Moon
	Extinct-17
	Extinct-22
	Unknown-Quadruped
	Extinct-04
	Extinct-06
	Extinct-27
	Extinct-28
	Fire
	Oak
	Cactus
	Extinct-02
	Extinct-14
	Extinct-15
	Extinct-23
	Extinct-35
	Extinct-37
	Extinct-03
	Extinct-09
	Extinct-11
	Extinct-12
	Extinct-21
	Extinct-25
	Extinct-36
	Extinct-38
	Badger
	Extinct-01
	Extinct-07
	Extinct-08
	Extinct-13
	Extinct-26
	Rabbitbrush
	Soyàlkatsina
	Unique-1
	Unique-2
	Unique-3
	Unique-4

snake symbols (33 Top, 49 Southwest, and 35 Top); three panels with corn, sun forehead, and water symbols (14 North, 18 Southwest, and 8 West); and three panels with cloud, coyote, squash, and sun symbols (18 Top, 18 West, and 17 Northwest). All of these panels are in the northwest corner, or old, section of the site (Fig. 1.5), and within this relatively small area none form particularly discrete spatial clusters. All of the clusters combine symbols of clans currently housed in different phratries (Table 3.1) and clans of diverse ceremonial

Table 3.7. Relative Abundance of Clan Symbols Based on Z-score Transformation of Symbol Percentages.

Symbol	35 T	35 W	37 T	43 S	48 NE	48 NW	48 SE	48 SW	48 T	49 SW	50 T	55 W	60 T	82 W
Arrow							+							
Bear/Badger		+	++					+	++					+
Bear Strap											++			++
Bow							+							
Butterfly				++				++						
Cloud														
Corn		++				+	+		+					
Coyote	++	+												
Eagle				++							++			
Extinct-05			++											
Extinct-10							++	++						
Extinct-20														
Extinct-30														
Extinct-31						++				++				
Germ God	++	++								++				
Horn					+									
Katsina				++		++						++		
Lizard			+			+	++							++
Máasaw										++	++			
Parrot	+													
Qööqöqlö	++		++									++	+	
Rabbit			++											
Red ant	++					+								
Reed														
Sand		+										++		
Snake	++					+				++				
Snow								++	+					
Spider													++	
Squash														
Sun					++				++					
Sun Forehead														++
Unknown-Bird					+	++			+					
Water	+			++		+						+		

Table 3.7. Relative Abundance of Clan Symbols Based on Z-score Transformation of Symbol Percentages, cont'd.

Symbol	8 W	13 NE	14 N	14 S	17 NW	17 S	17 SE	18 S	18 SW	18 T	18 W	30 S	33 T	34 T
Arrow														
Bear/Badger								++	+				++	
Bear Strap	++			++	++		+						+	
Bow										++		+		
Butterfly														
Cloud		+							++	++	++	+		
Corn			++	++		++			++	++		++		
Coyote		+	++		++			++		++	++			
Eagle			+				++							
Extinct-05										++				
Extinct-10														
Extinct-20														
Extinct-30	++							++						
Extinct-31														
Germ God														
Horn			++			+						+	+	
Katsina	++	++		+										
Lizard		+				++	++							
Máasaw			+	++			+			++			++	
Parrot	++						+							+
Qööqöqlö														
Rabbit														
Red ant														
Reed														
Sand	++	+						+						
Snake							++						++	++
Snow														
Spider														
Squash	+				++		++				++			
Sun		++			++	++					++			
Sun Forehead	++	++	++				+	+						
Unknown-Bird		++							+		+	+		
Water	++		++		++	+			++					++

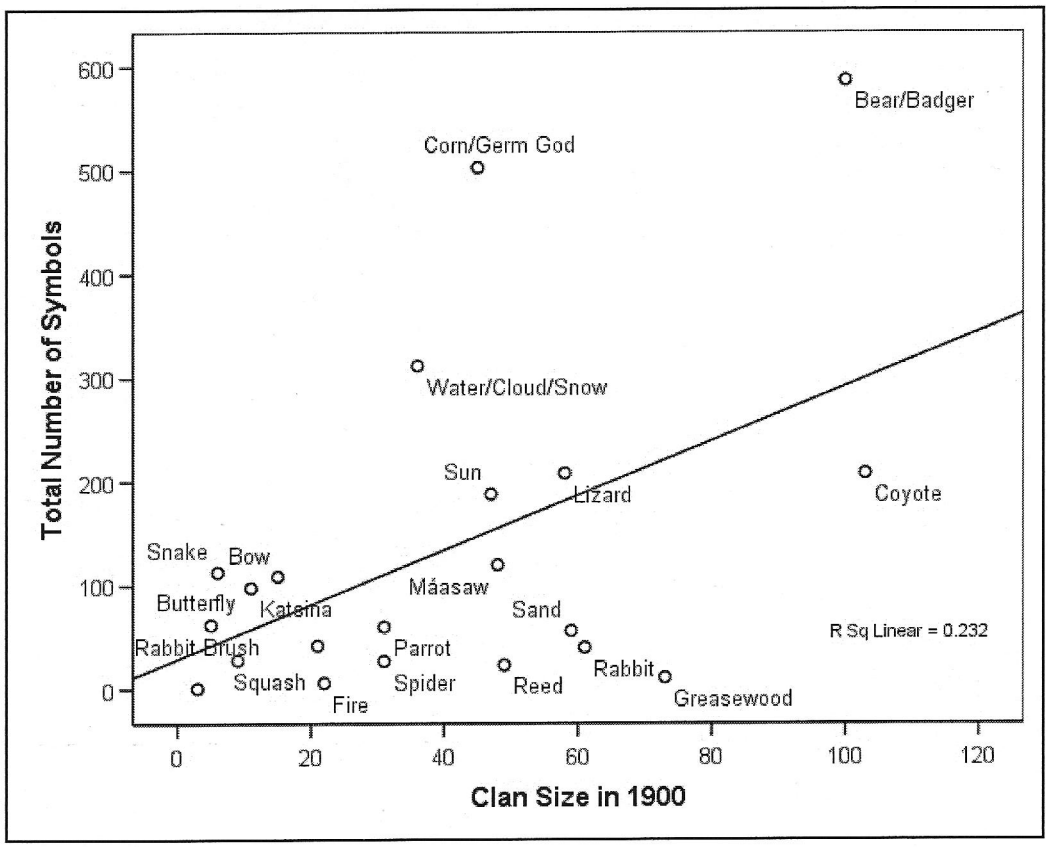


Figure 3.17. Plot of clan size in 1900 (data from Titiev 1944:Chart VI) vs. symbol frequency at Tutuveni.

ranks (Levy 1992: Table 3.1). Further spatial analysis might reveal additional patterns, or suggest additional meaning for those identified here, but this preliminary analysis indicates that clans did not concentrate their symbols together. Instead, each panel appears to reflect the diversity of each class of *Wuwtsim* initiates who traveled to Tutuveni together on a given year's salt pilgrimage.

Symbol Frequency and Clan Population

Clan symbol frequency correlates only weakly with clan population in Orayvi in 1900 (Titiev 1944:Chart VI [note that several totems are combined to match the clans observed at Orayvi, such as Water/Cloud/Snow]) ($r^2 = 0.23$; see Fig. 3.17). That is, the symbols of the more populous Orayvi clans of the early 1900s tend to be somewhat more common at Tutuveni than are the symbols of smaller clans, but about 77 percent of the variation in symbol frequency is unexplained by clan size in 1900. Given the long history of use of Tutuveni by Hopi clans, the use of Tutuveni by multiple villages and mesas, and the high rate of demographic turnover likely suffered by small social groups (Gaines and Gaines 1997), it is unsurprising that population size at one village during one recent moment in time is a poor predictor of overall symbol frequency.

Symbol Frequency and Clan Rank

Symbol frequency also shows no correlation ($r^2 = 0.07$; Fig. 3.18) with a clan's early twentieth-century ceremonial and land ownership ranking, as compiled by Levy (1992:41) for Orayvi in 1900. That is, the symbols of higher-ranking clans are not more frequently

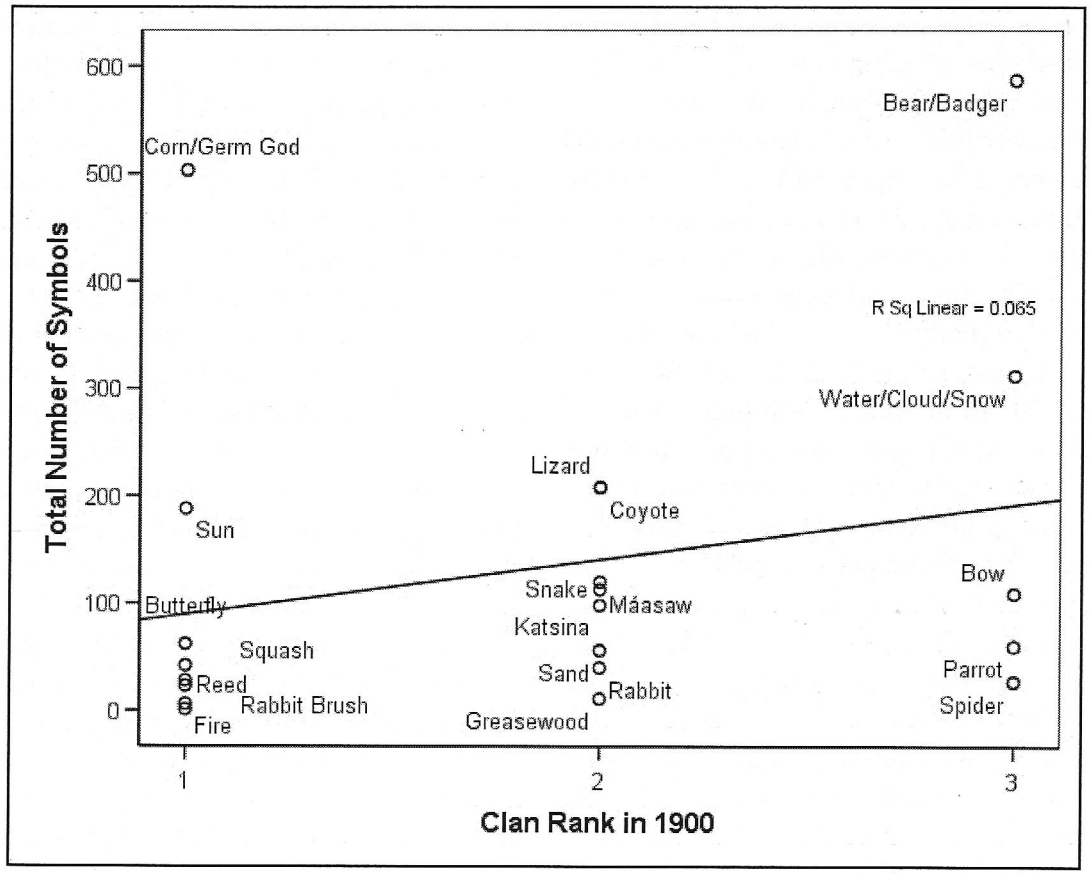


Figure 3.18. Plot of clan rank in 1900 (data from Levy 1992:Table 3.1) vs. symbol frequency at Tutuveni.

represented at Tutuveni than the symbols of lower-ranking clans. While this is again unsurprising given that clan status likely shifted over the centuries of visitation at Tutuveni, the lack of any patterning in the relationship of these two variables confirms that participation in the *Wuwtsim* initiation was not limited to clans of certain ceremonial status. This accords with ethnographic accounts of the *Wuwtsim* as the pan-tribal initiation ceremony through which most Hopi boys passed into adulthood (Titiev 1944:136). Also supporting an interpretation of relatively democratic access to the Salt Trail pilgrimage among Hopi clans is the fact that the clan symbols of the leaders of the salt pilgrimage are present but not unusually abundant at Tutuveni (compare Eggan 1950:94-95 to Fig. 3.18).

Number of Visits Per Clan

As recorded ethnographically and in Hopi traditional knowledge, the pilgrimage along the Salt Trail was a regular event, ideally held every four years. Each visit produced one clan signature for each member of the pilgrimage. Repeated visits by the same individual or by members of the same clan produced lines of the same symbol, representing the number of consecutive trips made to the site. Interestingly, symbols were placed to the left of previous signatures (Titiev 1937:245–246). Analysis of the number of symbols in a row is therefore a measure of the longevity of different clans.

Table 3.8 presents a list of symbols ranked by the number of times they are found in a given row. As can be seen, the vast majority of

rows are short, with a mean of 2.1 and a standard deviation of 2.2 symbols in a row. Some symbols, however, occur in very long rows, suggesting regular visitation by a populous and stable clan. The longest row, at 27 symbols, which represents 27 visits, is comprised of unknown bird symbols, which cannot be linked to a specific historical clan. Other symbols found in unusually long rows include *Máasaw*, Lizard, Cloud, Corn, Bear/Badger, Bow, and Extinct-20, all of which are found in rows of 15–21 symbols. If the *Wuwtsim* initiation was held every four to sixteen years in the past, as it was in the historical period, members of these clans participated in pilgrimages for stretches of 60–330 years. The members of these long-lived, active clans must have been prominent in the political structure of Third Mesa Hopi villages. In fact, Bow, Bear, and Water Clans were among the most powerful Hopi clans in the early twentieth century, and *Máasaw* and Lizard were second-level clans (Levy 1992:Table 3.1). Future research could compare symbol frequency at Tutuveni to other lines of evidence from residential sites, measuring clan size, longevity, and status.

Extinct Clans

During a 1930 visit to Tutuveni by Harold and Mary Colton, Hopi consultant Edmund Nequatewa identified several symbols of recently extinct clans (Colton and Colton 1931:32). His identifications were subsequently confirmed by contemporary Hopi consultants (August 18, 2005 CRATT meeting). In fact, 38 different types of symbols, comprising 447 images, conform to the style and size that characterize contemporary clan symbols at Tutuveni, and appear alongside known clan symbols in similar, repeated rows (Fig. 3.11), strongly suggesting that these icons were used to symbolize the group identities of now extinct clans (tentative identifications by current Hopi Cultural Preservation Office staff include: Extinct-1, *Muyaw* [Moon]; Extinct-5, coyote; Extinct-8, deer; Extinct-16, coyote; Extinct-24, *Holi* [Butterfly]; Extinct-25, parrot; Extinct-27, deer/rabbit; Extinct-30, corn; and Extinct-31, star). The term *extinct* is somewhat problematic given the discussion of clans and clan totems in Chapter 2, because alternate totems can be latent for long periods of time before being reactivated to link individuals or groups together. Nevertheless, it is clear that some totems have passed out of use, whether through the actual extinction of group members or through decline in social status of the symbol.

The large number of extinct clan symbols at Tutuveni testifies to the time depth of Hopi use of the site. If we assume that the rate of clan extinction observed in the historical period has been constant through time, we can estimate the age of Tutuveni from the number of extinct clans. This is an admittedly questionable assumption, given the concentration of epidemic disease outbreaks in the post-contact period; nevertheless, it is a potentially useful heuristic one. Two historical-era censuses of the village of Orayvi, one by Stephen in 1891 and one by Titiev in 1932, provide the data to estimate a rate of clan extinction over time. There are three clans listed by Stephen as present in 1891 that were not counted by Titiev in 1931 (*Kwan*, Moth, and Burrowing Owl); however, Titiev (1944:55) emphasizes that most such discrepancies are due to differences in nomenclature, with only *Kwan* qualifying as a possible instance of clan extinction. If we take a range of 1–4 clan extinctions over the period from 1891–1931 (equivalent to 2.5–10 extinctions per century) and apply this range to the 38 extinct clan symbols at Tutuveni, we may infer an age of 380–1500 years for the site.

Working in the opposite direction, given that ceramics, repatination and petroglyph style

Table 3.8. Symbols Arranged by Maximum Row Length.

Clan Symbol	Maximum Row length
Unknown-Bird	27
Máasaw	21
Lizard	20
Cloud	19
Corn	18
Bear/Badger	16
Bow	15
Extinct-20	15
Bear Strap	12
Extinct-10	12
Germ God	12
Spider	12
Arrow	11
Coyote	11
Extinct-30	11
Sun	11
Parrot	10
Red Ant	8
Reed	8
Water	8
Extinct-19	7
Extinct-22	7
Sand	7
Snow	7
Squash	7
Butterfly	6
Eagle	6
Extinct-18	6
Extinct-27	6
Extinct-34	6
Katsina	6
Qööqöqlö Katsina	6
Rabbit	6
Snake	6
Extinct-05	5
Extinct-16	5
Extinct-28	5
Extinct-31	5
Extinct-33	5
Sun Forehead	5
Extinct-15	4

Table 3.8. Symbols Arranged by Maximum Row Length, cont'd.

Clan Symbol	Maximum Row length
Extinct-17	4
Extinct-23	4
Extinct-37	4
Fire	4
Horn	4
Mud Head Katsina	4
Oak	4
Extinct-04	3
Extinct-11	3
Extinct-25	3
Extinct-29	3
Extinct-32	3
Extinct-35	3
Extinct-36	3
Extinct-38	3
Moon	3
Unknown-Plant	3
Badger	2
Cactus	2
Extinct-01	2
Extinct-02	2
Extinct-03	2
Extinct-06	2
Extinct-07	2
Extinct-08	2
Extinct-12	2
Extinct-13	2
Extinct-14	2
Extinct-21	2
Greasewood	2
Extinct-09	1
Extinct-26	1
Rabbitbrush	1
Soyàlkatsina	1
Unique-1	1
Unique-2	1
Unique-3	1
Unique-4	1
Unknown-Quadruped	1

indicate an age for Tutuveni of perhaps 500 years, we may infer that an average of 7.5 clans from Hopi villages, or 12 percent of the 62 clans listed in Table 2.1, must have gone extinct every century, suggesting considerable dynamism or turnover in the labels used to identify groups, if not in the actual groups themselves. Simulations of small group survival rates produce comparable figures, demonstrating that up to 47 percent of 10-person groups may die out within three human generations simply due to stochastic fertility and mortality factors (Gaines and Gaines 1997).

KATSINAS

Katsinas are spirit beings who visit Hopi villages in the form of rain and clouds. Ceremonies involving katsinas have been observed as a part of Pueblo ritual since the time of Spanish contact (Hammond and Rey 1928:79). Katsina iconography, found on both petroglyphs and ceramics, appears first in the archaeological record of northern Arizona around A.D. 1250 to 1325 (Adams 1991). The collection of 312 katsina petroglyphs at Tutuveni is by far the largest concentration recorded at any site in

the American Southwest.

The relationship between individual katsinas and particular clans is of special concern to the present study. Eggan (1950:91) noted that the Katsina clan controls the major opening and closing katsina ceremonies in each Hopi village; however, the control of the katsina rituals during the rest of the season was more complex. During the "open" katsina season anyone can ask the village chief's permission to sponsor a dance, and new katsinas may be introduced to the village. Each katsina ceremony is theoretically sponsored by a clan, but membership in the kiva groups that perform the dances is drawn from multiple clans (Eggan 1994:13). There is, however, one important exceptional category of katsinas. The exception is *mong*, or chief, katsinas, each of which is associated with just one clan (Titiev 1944:109).

The totemic signatures recorded by Fewkes (1897) suggest a complex relationship between clan and katsina in contemporary Hopi society, because workmen who self-identified as Katsina clan members signed with a variety of katsina totems, including Mud Head, *Hehey'a*, Navajo, and *Áhooli* katsinas. As the discussion in Chapter 2 made clear, it is difficult to determine whether these different katsina images, which include both *mong* and common katsinas, are intended to signify sub-groups within a larger unit, or simply alternative symbols of the same social unit.

Plog and Solometo (1997) hypothesize an earlier, one-to-one relationship between katsinas and clans, and suggest that that the modern Hopi ritual cycle evolved as a way of binding these diverse groups into an integrated whole. Supporting this hypothesis is the fact that the longer rows of katsinas at Tutuveni tend to contain a single, repeated katsina face, rather than mixing various faces in a row. Rows with three or more identical katsinas include sets of Sun, Sun Forehead, *Qööqöqlö*, and Mud Head katsinas. Because these rows of symbols are homogenous, the symbols could be interpreted as totems of a particular social unit in which katsina image and clan totem are isomorphic. Of these images, however, only the Sun (*Taawa*), katsina today is a *mong* katsina associated with a particular clan.

Seventy-one percent of the katsina symbols at Tutuveni occur in isolation, which is a substantially higher proportion than symbols in the total population (46 percent). While many of these isolated symbols may simply be records of a single visit by a member of the Katsina clan, the high frequency of isolated katsina images suggests that not all may have been produced to symbolize clan identity. Several katsinas identified at Tutuveni play important roles in major katsina ceremonies and the depiction of these katsinas at Tutuveni may have been intended to symbolize broader ritual concepts, rather than clan identity *per se*. The *Soyàlkatsina*, for example, wears *Wuwtsim*-related objects and has the honor of opening the katsina season (Titiev 1944:110). The *Áhooli* katsina is involved in the Solstice and Bean Dance ceremonies. The *Kwaakwant* and *Aa'alt* societies that are part of the *Wuwtsim* initiations are known as the One-Horn and Two-Horn societies, respectively, and the one-horned and two-horned katsinas depicted at Tutuveni could represent these societies.

Non-clan symbols

The presence of several unique symbols (Fig. 3.18), which do not correspond to the conventions of the majority of symbols at Tutuveni, suggest that, like some katsina images, they may not be clan symbols. In addition to their relative isolation on the panel, these unique symbols also tend to be two or three times larger than the average symbol. Furthermore,

their subject matter is distinctive. For example, Unique-1 depicts a katsina-like image inside a larger circle, situated prominently high in the center of the southeast panel of boulder 48. Unique-2 and Unique-3 are closely spaced, oversized images amidst a cluster of conventional clan symbols on the south panel of boulder 30, the latter apparently an insect of some sort. Unique-4 is a series of circles conjoined by lines, stretching for nearly a meter across the middle of boulder 48 southwest. Patricia McCreery notes that a petroglyph closely resembling Unique-4 has also been observed at the Boundary site in the Petrified Forest. Consultations with Hopi cultural advisors produced no information on these unique symbols.

Conclusion

Presentation and preliminary analysis of the Tutuveni petroglyphs demonstrates the incredible potential of this material for research into Puebloan identity. One of the most promising avenues of future inquiry at Tutuveni may be in-depth spatial analyses of symbols across the site. Spatial statistics such as K-means (Kintigh and Ammerman 1982) and a variety of cluster-analysis techniques could be used to identify clusters of co-occurring symbols. Clusters might be inferred to reflect partner clans, clans of similar status, or contemporaneous clans. Comparing patterns of frequency and spatial distribution of the Tutuveni petroglpyphs to other lines of evidence that reflect relationships among social groups from Hopi villages would also likely be very rewarding.