

- 1981 The historical importance of Tlaxcala in the cultural development of the central highlands. In: Jeremy A. Sabloff (ed.), *Handbook of Middle American Indians: Supplement 1 Archaeology*: 244–276. The University of Texas, Austin.
- García Cook, Ángel and B. Leonor Merino Carrión
- 1988 Notas sobre la cerámica prehispánica en Tlaxcala. In: Mari Carmen Serra Pucho and Carlos Navarrete Cáceres (eds.), *Ensayos de Alfarrería Prehispánica e Histórica de Mesoamérica, Homenaje a Eduardo Noguera Auza*: 275–542. Universidad Nacional Autónoma de México, Mexico, D.F.
- 1989 El Formativo en la región Tlaxcala-Puebla. In: Martha Carmona Macías (ed.), *El Preclásico o Formativo, Avances y Perspectivas, Seminario de Arqueología “Dr. Roman Piña Chan”*: 161–193. Instituto Nacional de Antropología e Historia, México D.F.
- Hayashida, Frances M.
- 1999 Style, technology, and administered production: the manufacture of Inka pottery in the Leche Valley, Peru. In: *Latin American Antiquity* 10(4): 337–352.
- Hill, David V.
- 1994 Technological analysis: making and using ceramics on Black Mesa. In: Marion F. Smith, Jr. (ed.), *Function and Technology of Anasazi Ceramics from Black Mesa, Arizona*, Southern Illinois University at Carbondale, Center for Archaeological Investigations, Occasional Paper No. 15, Carbondale.
- Kingery, W. David
- 1997 Operational principles of ceramic kilns. In: Prudence M. Rice and W. David Kingery (eds.), *The Prehistory and History of Ceramic Kilns*: 11–20. The American Ceramic Society, USA.
- Orton, Clive, Paul Tyers, and Alan Vince
- 1993 *Pottery in Archaeology*. Cambridge University Press, Cambridge.
- Payne, William O.
- 1982 Kilns and ceramic technology of ancient Mesoamerica. In: Jacqueline S. Olin and Alan D. Franklin (eds.), *Archaeological Ceramics*: 189–192. Smithsonian Institution Press, Washington, DC.
- Pool, Christopher A.
- 2000 Why a kiln? Firing technology in the Sierra de los Tuxtlas, Veracruz (Mexico). *Archaeometry* 42(1): 61–76.
- Rice, Prudence M.
- 1987 *Pottery analysis, a sourcebook*. The University of Chicago Press, Chicago.
- Santley, Robert S., Philip J. Arnold III, and Christopher A. Pool
- 1989 The ceramics production system at Maticapan, Veracruz, Mexico. *Journal of Field Archaeology* 16:107–132.
- Stark, Barbara L.
- 1985 Archaeological identification of pottery production locations: ethnoarchaeological and archaeological data in Mesoamerica. In: Ben A. Nelson (ed.), *Decoding Prehistoric Ceramics*: 175–204. Southern Illinois University Press, Carbondale.
- Tite, Michael S.
- 1999 Pottery production, distribution, and consumption—the contribution of the physical sciences. *Journal of Archaeological Method and Theory* 6(3): 181–233.
- Underhill, Anne P.
- 1991 Pottery production in chiefdoms: the Longshan Period in northern China. *World Archaeology* 23(1): 12–27.
- Wandibba, Simiyu
- 2003 Ceramic ethnoarchaeology: some examples from Kenya. In: Chapurukha M. Kusimba and Sibel B. Kusimba (eds.), *East African Archaeology: Foragers, Potters, Smiths, and Traders*, University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia.
- Winter, Marcus C.
- 1984 Exchange in Formative highland Oaxaca. In: Kenneth G. Hirth (ed.), *Trade and Exchange in Early Mesoamerica*: 179–214. University of New Mexico Press, Albuquerque.

RESUMEN: Históricamente, el estudio de la producción de cerámica ha sido un componente fundamental de las investigaciones del Periodo Formativo en Mesoamérica, aunque la identificación de los lugares de cocción y de otras características asociadas haya sido rara. En 2007, un área de la fabricación de la cerámica Formativo fue excavado en el flanco meridional de Cerro Tlaquexpa en la región de Tepeaca en el Valle de Puebla central. Dos lugares de cocción, una zanja de la levigación, y un pozo de la basura fueron descubiertos. Los lugares de cocción son del tipo “horno de pozo”, similares a otros del oeste de Puebla-Tlaxcala. Presumimos que la extensión de la población y el aumento de la complejidad socioeconómica en el Valle de Puebla durante este tiempo hicieron la producción de las cerámicas para el comercio atractiva a los hogares Formativos locales.

ZUSAMMENFASSUNG: Die Erforschung der Produktion von Keramik ist immer schon eine wichtige Komponente der Beschäftigung mit der Formativen Periode in Mesoamerika gewesen. Dennoch sind bislang kaum Brennstätten und mit ihnen assoziierte Elemente gefunden worden. Im Jahr 2007 wurde eine formativzeitliche Töpferwerkstätte an den südlichen Abhängen des Cerro Tlaquexpa in der Tepeaca-Region des zentralen Tals von Puebla gefunden. Zwei Feuerstellen, eine Schlammgrube und eine Abfallgrube wurden freigelegt. Die Brennstellen sind vom Typ der Grubenöfen, die grundsätzlich denen ähnlich sind, die weiter westlich in der Puebla-Tlaxcala-Region ausgegraben wurden. Wir stellen die Hypothese auf, dass die Expansion der Bevölkerung und die damit verbundene Zunahme sozioökonomischer Komplexität im Tal von Puebla zu dieser Zeit die Herstellung von Töpferwaren für den Handel zu einer attraktiven Ergänzung formativzeitlicher Haushalte machte.

Ancient Maya Cave Use at Caracol, Belize

Reiko Ishihara-Brito, Jaime J. Awe, and Arlen F. Chase

Caves and other related subterranean features such as cenotes and rockshelters are ubiquitous topographic features in the landscape in the Maya area. They have been the subject of intensive archaeological investigations in recent years, shedding light on the multifaceted roles these features played as cosmologically important places where supernaturals were venerated and through which they were communicated (e.g., Awe 1998; Awe 1999; Awe and Griffith 2002; Bonor Villarejo 1989; Brady 1989; Brady and Prufer 2005; Griffith, et al. 2000; Helmke 2009; Ishihara 2008, 2009; Ishihara, et al. 2001; Morehart 2002; Moyes 2001, 2006; Peterson 2006; Prufer 2002; Prufer and Brady 2005; Rissolo 2003; Woodfill 2007). Stemming from research conducted at Dos Pilas, one line of investigation focused on the centrality of caves in the spatial layout of buildings and settlements, pointing out the abundance of Maya sites which have architecture associated with caves (Brady 1997). At a more basic level, cave features with evidence of prehispanic use have been reported from in and around many major Maya sites including Copan (Brady 1995; Gordon 1898), Mayapan (Brown 2005; P. E. Smith

1954; 1955; R. E. Smith 1953; 1954), and Pusilha (Joyce 1929; Joyce et al. 1928), among others. At Caracol, reconnaissance in the vicinity of the epicenter revealed the presence of a number of caves and sinkholes. These were first formally investigated by William Feld (1994), and more recently, by Ishihara-Brito and Awe (Ishihara 2003).

The Caracol Regional Cave Survey

In the Caracol Regional Cave Survey, caves were broadly defined, based on the linguistic premise that the term *ch'en*, meaning “hole in the earth” in many Mayan languages, encompasses a range of subterranean features such as springs, waterholes, ravines, sinkholes, rockshelters, cenotes, and chasms (Vogt 1981:120; Vogt and Stuart 2005; see also Ishihara 2009; Prufer 2002; Rissolo 2003). Ethnographic and ethnohistoric sources show that what was conceptually important to the Maya peoples is and was the break in the earth’s surface and not necessarily the morphology or the size of the feature (e.g., Brady 1997:603). As access points where the levels of the universe could be traversed (e.g., Chase and Chase 2009),

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subterranean features were portals to the supernatural world, and as places laden with potent powers, various ritual activities were performed in caves (e.g., Brady and Prufer 2005; Guerra and Ishihara 2007; Ishihara 2009; Moyes et al. 2009; Prufer and Brady 2005; Scott 2009).

The morphology of the Caracol caves varies and consists of sinkholes, sinkholes with horizontal passages, horizontal caves, and depressions filled with debris. Sinkholes are generally vertically sided pits with circular entrances. Some sinkholes have horizontal passages that branch out from the shaft sides, usually from the basal portion of the feature. Horizontal cave entrances occur along the sides of hills and such caves consist of dark zones where sunlight does not extend beyond a penumbral zone. Depressions are relatively shallow (0.4 – 3.0 m deep) and may be sinkholes, chultuns, or reservoirs, but because they are largely filled in with humic debris, their identification cannot be securely determined.

One of the primary objectives of the survey was to assess the extent of the use of subterranean features in the landscape surrounding Caracol. In an effort to cover as much ground as possible, the reconnaissance was facilitated by the assistance of several site rangers and Belizean workers; these individuals were familiar with both the general Caracol topography and the location of the cave sites previously reported by Feld (1994). All cave locations were recorded with a handheld GPS unit. The caves were explored and mapped. If present, artifacts were collected from the surface. All modifications in caves, including the construction of architectural features and speleothem¹ breakage, were documented. Any associations of a cave with surface structures were also noted. While the survey was able to cover only a small fraction of the area surrounding the Caracol epicenter, a high frequency of cave features was documented.

Survey Findings

A total of 25 subterranean features were located and recorded (Figure 1), revealing a geomorphological diversity consisting of two horizontal caves (Figure 2), five sinkholes with horizontal passages (Figure 3), nine sinkholes (Figure 4), and nine depressions. Three, possibly four, of the seven caves reported by Feld (1994) were located. Most of the caves reported here are located within a 3 km radius from the site center of Caracol; the other three lie about 6 km from the site center,

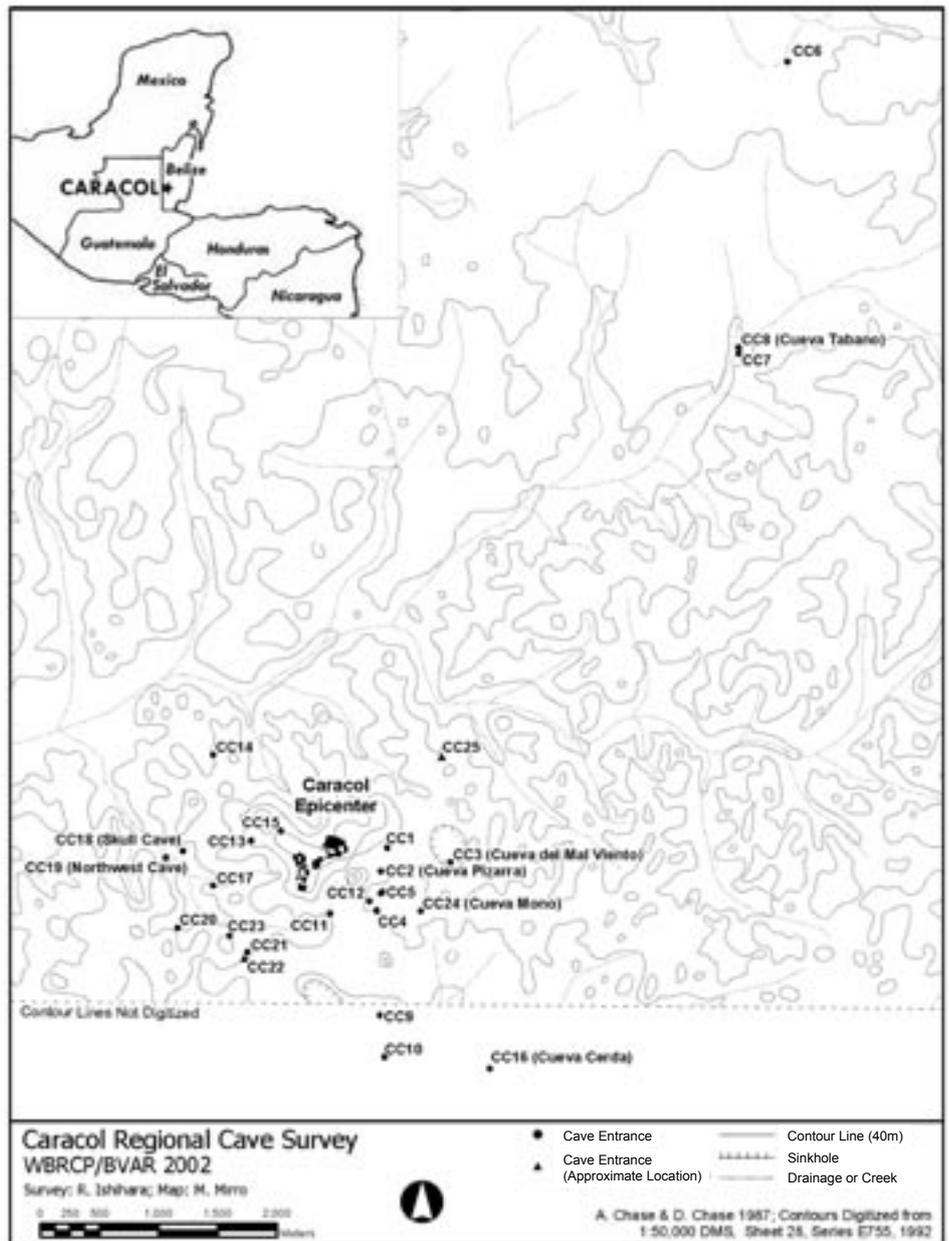


Fig. 1. Location of cave features in relation to the Caracol epicenter.

along the Caracol access road. These subterranean features were only opportunistically located and many more exist in the area surrounding Caracol, as the LIDAR data obtained in 2009 shows that scores of other caves remain to be visited (Weishampel et al. 2010; 2011).

During the course of this research, fourteen caves were explored and ten were mapped. Archaeological materials – including artifacts, architectural features constructed in the caves, petroglyphs, broken speleothems, and associated architectural features immediately outside the cave entrance – were observed in ten caves. Many of the underground features consist of sinkholes and a large number of them showed evidence of ancient usage including construction of architectural features, presence of artifacts, and speleothem breakage. In half of the sinkholes, prehispanic use was not confirmed as excavations were not conducted, but it is likely that any remains are buried under layers of soil that have been deposited at the bottom of these features over the years. All of the sinkholes that have a horizontal, dark-zone component contained archaeological materials, suggesting that people

were entering these sinkholes and not simply tossing materials, such as offerings, into these features from the ground surface. Although the sinkhole or horizontal cave openings could measure upwards of 10 m in diameter, usually they are much smaller and measured only 2 to 3 m in diameter. This is in stark contrast to the more grandiose cave entrances common in the lower Macal River Valley north of Caracol (Griffith et al. 2000; Ishihara et al. 2001).

Structural Modifications to Caves

One of the striking findings of the reconnaissance was the documentation of a variety of structural modifications to the subterranean features. These modifications were produced by either additive or subtractive techniques. Additive techniques include construction of minor architectural features within the cave environment or in the immediate entrance area outside of the cave. The vertical walls of the sinkhole entrances were reinforced in a few cases with retaining walls (CC6, CC16, possibly Cueva del Mal Viento and CC10; for cave locations, see Figure 1). Spaces inside some caves were also reconfigured at some point during their use; in several cases, entranceways or passageways were restricted to varying degrees by the stacking of uncut stones and speleothems (Cueva Tabano, Northwest Cave, Skull Cave, Cueva Mono) (Figure 5). Visual inspection suggests that the stones and speleothems were dry-laid with no apparent mortar. In at least one instance (Northwest Cave), the entrance to the cave may have been blocked entirely, as suggested by the large quantity of stones that collapsed inward (Figure 6); similar cases have been observed at Cueva de El Duende and Cueva de Sangre in the Petexbatun region of Guatemala (Brady and Colas 2005: 153–154) and several cave sites in the upper Macal River Valley such as Chechem Ha and Actun Chapat. Such blockage of cave entrances may be significant, especially as recent epigraphic research suggests that caves were targeted places of attack and were desecrated by rival political entities as an act of war (Brady and Colas 2005; Colas 1998; Helmke and Brady 2010).

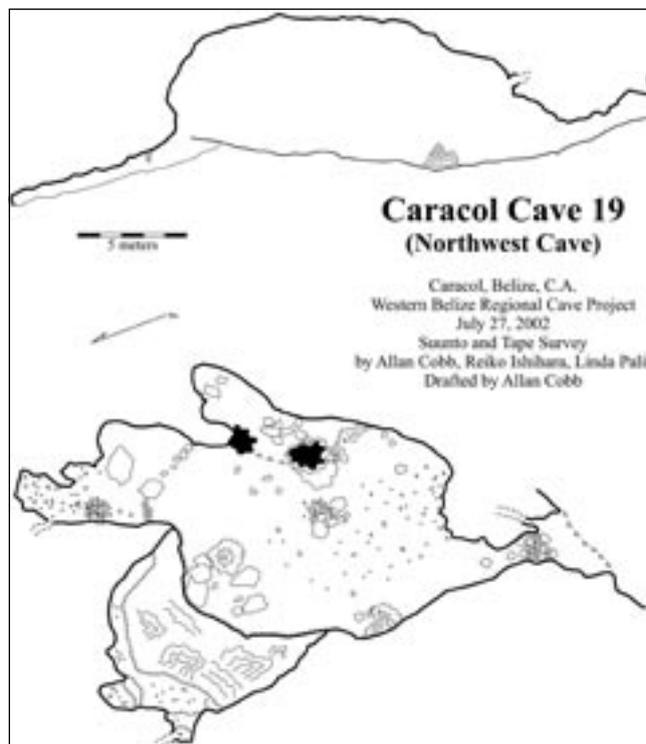


Fig. 2. Map of Northwest Cave as an example of a horizontal cave.

Simple bridges were created by stacking rocks and broken speleothems across small pits or depressions to seemingly facilitate access within the caves (Cueva del Mal Viento, Skull Cave). In still other cases, passages were modified by a combination of breaking and stacking speleothems. At the end of the entrance passage of Cueva Tabano, the western portion of the curtain-like speleothem formation that runs across the passage had been broken and removed, while the eastern portion appears to have been blocked by the placement of rocks and speleothems. Other possible architectural features include platforms (Cueva Pizarra, Cueva Tabano, and Cueva Mono) and an altar-like feature comprised of a pile of large stones in an otherwise cleared chamber (Cueva Tabano).

Subtractive techniques of structural modification to cave interiors include the aforementioned breakage of speleothems (Cueva Pizarra, Cueva del Mal Viento, Cueva Tabano, Cueva Mono). Close examination of the breakage scars on speleothems noted rounded scar edges along with the presence of re-growth on the formation surfaces. These features indicate that the speleothems had not been broken recently and were likely the result of ancient human modification. Human-induced speleothem breakage is also indicated when evidence of selective breakage occurs (e.g., when breakage does not occur uniformly in one area). Breakage and subsequent transportation or removal of speleothems is evident in several caves (Cueva Pizarra, Cueva del Mal Viento, Cueva Tabano, and Cueva Mono). Some were used in the caves as construction materials, such

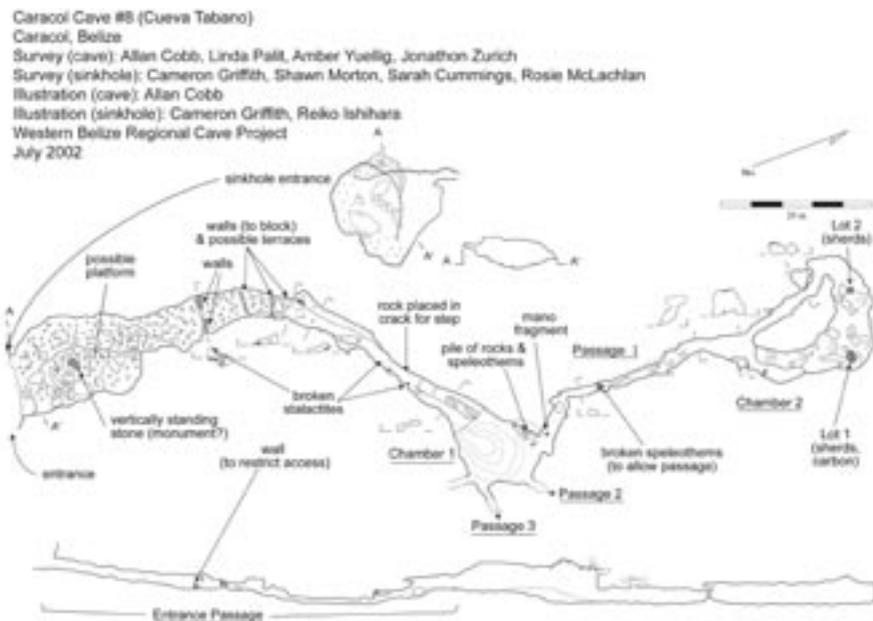


Fig. 3. Map of Cueva Tabano as an example of a sinkhole with horizontal passages.



Fig. 4. Map of Cueva Pizarra as an example of a sinkhole.

as at Cueva Tabano. Their presence in archaeological contexts at the surface site suggests that they also served important ritual functions. Speleothems are often found within the fill or in front of the eastern buildings of Caracol's residential groups (Figure 7; see also Chase and Chase 1994:57; Chase and Chase 1998:311). As these buildings served as shrines and mausoleums for the various residential groups, the place-



Fig. 5. Photo of access way restricted by stacked uncut stones and speleothems in Cueva Tabano.

ment of speleothems within these structures must have been purposeful. Other speleothems have also been recovered from construction fill within Caracol's monumental architecture (Structure A1, Structure A6, and Caana), possibly reflecting the ritual functions of these epicentral edifices and complexes. The inclusion of speleothems in construction programs may have been a widespread practice, as it has been documented at sites including Aguateca, Guatemala (Structure L8-8) (Takeshi Inomata, personal communication, 2004) and several others in the Sibun Valley of Belize (Peterson et al. 2005: 232–236). Elsewhere, the occurrence of speleothems has been related to ritual cache deposition within building projects; they occur within the ball court alley at Baking Pot (Ferguson 1998) and the Hershey Site (Peterson et al. 2005:233) as well as in circular shrines at Pechtun Ha, Samuel Oshon, and Augustine Obispo (Peterson et al. 2005:233). Small cave pearls, spheroid speleothems, were documented from Middle Preclassic caches at Cahal Pech and Barton Ramie (Awe 1992:308–309, figs. 91 l-o; Willey et al. 1965:487–488).

Important cultural modifications are often found in the immediate vicinities of cave entrances. Modern ritual activities carried out at caves demonstrate that this area is an integral activity space that should not be ignored in archaeological investigations of cave rituals (Guerra and Ishihara 2007; Halperin et al. 2003). The area in front of the entrance of Northwest Cave and the area around the sinkhole entrance of Cueva Tabano have relatively flat surfaces that are suspected to have been the loci of ritual ceremonies, but excavations are necessary to confirm this observation.

Another decorative modification found within caves consists of petroglyphs executed on cave formations. At Northwest Cave, at least two simple pecked faces, each comprised of two eyes and a linear mouth, were identified. Such simple faces are commonly reported from caves throughout the Maya area, such as at Actun Uayazba Kab in the Roaring Creek Valley (Helmke et al. 2003:figs. 40a, b, f, h, h-j) and Te Tun Cave in the Caves Branch area of Belize (Bonor Villarejo 2002), the Main Chasm at Aguateca (Ishihara 2009:fig. 4.9) and Cueva Jutéria in the department of Peten in Guatemala (Stone 2003: fig.45), and Aktun Ch'en Chin and an unnamed cave in the state of Yucatan in Mexico (Bonor Villarejo and Sanchez y Pinto 1991: figs. 7, 11).

Occasionally, caves are integrated into the layout of buildings and other structures. In the Caracol residential area, several possibilities were located. At Cueva del Mal Viento small low structures were noted adjacent to the cave entrance. At one sinkhole (CC7), two walls were observed adjacent to the entrance: a one- to two-course high wall outlines a quarter of the circumference of the sinkhole entrance and a three-course high linear wall runs on the opposing side of the sinkhole. Another sinkhole (CC6) has a possible low wall and structures on its southern side.

Cultural Materials

Cultural materials observed in the Caracol caves are consistent with those documented for caves elsewhere in the Maya area. In addition to human and faunal remains, ceramics and lithics were found in seven caves. Over a third of the ceramic sherds were diagnostic and all but one sherd are of Late Classic types typical of the area. The predominance of Late Classic sherds and a lack of Postclassic material suggest that the

last major time period of use was during the Late Classic; this would be consistent with other data from the site (Chase and Chase 2010). Earlier use is hinted at by the occurrence of one Late Preclassic sherd of Flor Cream type in Northwest Cave. Other earlier material, if present, is likely buried within cave sediments. In addition, a concentration of slate or shale fragments was recovered in Cueva Pizarra (CC2), a miniature greenstone celt was encountered in Skull Cave (CC18), and a metate and kaolinite, or sascab, were noted in Cueva Cerda (CC16).

A noteworthy, though inconclusive, find was a possible stone monument. In Cueva Tabano a large, flat, triangular limestone slab (1.9 m at base, 1.8 m high, 0.8 m high) was found in a free-standing vertical position; it was supported by smaller limestone rocks and was atop what may be a long platform structure that ran along the passage (Figure 8). It is unlikely that natural causes could account for the upright placement of this exceptionally large rock, meaning that the rock's placement likely was intentional. Albeit apparently uncarved and with no visible traces of paint, it may have been a monument akin to those reported from other cave sites in western Belize (Awe et al. 2005). Indeed, the vertically-standing, triangular stone slab found in Cueva Tabano (CC8) may be evidence of a pattern of raising megalithic monuments in caves as a focal point to conduct ritual activities. Four stelae (all without any inscriptions, but some of which were modified) have been reported from cave sites in Belize and it has been suggested that they may have functioned to demarcate spaces reserved for ritual performances by people of high status (Awe et al. 2005). The dimensions of the Tabano stone are larger than those discussed by Awe and his colleagues, but another cave in western Belize, Stela Cave, houses two large stone slabs, one of which is similar in size, shape, and

position (Ishihara and Griffith 2004). As excavations were not conducted in Cueva Tabano, the cultural significance of this monument cannot be contextualized.

Human remains are commonly found in caves, although the frequency varies between sites. In the sample discussed here, Skull Cave was the only cave noted to contain human remains. Without a careful analysis of the bones and their spatial distribution, it is difficult to assess whether they represent secondary interments and whether they were thrown in from an upper level (Feld 1994). Feld (1994:81) observed five crania on the surface of this deposit, further recording eight femurs, eight radii, three mandible fragments with teeth, and two vertebrae. Excavation would surely show the MNI to be much higher. However, the relatively low frequency of individuals represented in this cave negates any notion of an osuary. Other bones may have been curated as part of ancestor veneration and associated ritual activities (McAnany 1995: 61–63). Scott and Brady (2005:274–278) note that human remains in caves may sometimes represent human sacrifice, specifically as offerings to the earth gods and ancestors.

Poor Air Quality in Caves

One noteworthy observation of many of the caves explored during this survey was the poor air quality – unusually high levels of carbon dioxide in the caves. This fact was commented on by Feld (1994:82) in 1994 and was noted for five caves in the current survey. Even earlier, Anderson (1962: 327) reported similar air conditions in other caves in the general area. Further studies are necessary to determine why the higher levels of carbon dioxide occur and to see if the presence of such poor air quality extends back to the Classic period when these caves would have been used.



Fig. 6. Photo of possibly blocked entrance, suggested by the collapsed stones, Northwest Cave.

Sacred Landscape and Caves at Caracol

The majority of the caves identified and investigated in 1994 and 2002 were not located within the Caracol site core and were, thus, not directly associated with monumental architecture. However, it may be misleading to conclude that the spatial configuration of the Caracol epicenter does not follow the hypothesis presented by Brady (1997), in which he argues that major architecture at Maya sites was often aligned with caves. The two primary plaza groups in the site core, the A Group and B Group, appear to be sited upon areas of poor drainage that retain below-surface water well into the dry season. The water retention in both of Caracol's main plazas is cosmologically synonymous with the Maya underworld, and the many caves within the broader region would symbolically have been the entrances to it. Test units excavated in both plazas have yielded extensive seepage. Caana, the largest pyramidal structure at the site sits atop modified rock, which has been suggested to be tufa (Allan Cobb, personal communication, 2002), a soft and porous calcium carbonate deposited from springs, rivers, or lake water (Field 2002). Water has been observed seeping out of the modified portions of this rock (Ishihara 2003). Similarly, excavations in the middle and eastern part of the A Plaza and in front of Structure A1 revealed a high water table; the lower parts of these investigations filled with water once the matrix of clay and stone was removed.

In general, however, Caracol is devoid of natural water, causing the Maya living there to construct large reservoirs in areas of major architecture (such as the epicenter) and smaller reservoirs throughout the settlement area. Contemporary drilling for water revealed subterranean streams some 100 m below the present ground surface of the site epicenter, but it is unlikely that these deep water sources were exploited by the ancient Maya.

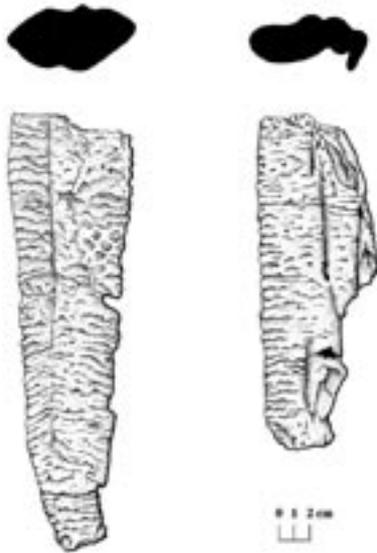


Fig. 7. Archaeologically recovered speleothems included in the building core of Caracol Structure F39 and recovered during the 2010 field season of the Caracol Archaeological Project.

Concluding Remarks

A high frequency of cave sites exists in the karst landscape of the greater Caracol area. Of the 25 subterranean features thus far investigated, ten evinced archaeological materials or modifications, suggesting that the ancient use of caves in the area was more common than previously recognized. In fact, the majority of the caves that could be entered to any depth contained archaeological evidence of ritual use, including artifacts, speleothem breakage, petroglyphs, and architectural modifications. Possible associations with surface site structures were also noted in two cases, suggesting a direct integration of caves into the architectural and cosmological vernacular of Caracol community members. Noteworthy is

the prevalence of architectural modifications made to the interiors of caves, showing a degree of labor investment and the repeated use of these important spaces. The varied geomorphological forms of caves with evidence of prehispanic use documented in this survey caution archaeologists to be aware of our own, biased notion of what constitutes "caves." A third of all the subterranean features located were depressions filled with debris; their cultural significance can only be unveiled through actual excavation. Even should these prove to be chultuns or reservoirs, the ubiquity of caves throughout Caracol's landscape would have permitted a large part of the population to engage in underground rituals.



Fig. 8. Photo of limestone slab, which may have been a plain monument, Cueva Tabano.

Acknowledgements

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References Cited

- Anderson, A. H.
1962 Cave sites in British Honduras. In: Herbert Baldus (ed.), *Akten des XXXIV internationalen Amerikanistenkongresses*: 326–331, Horn and Vienna.
- Awe, Jaime J.
1992 Dawn in the land between the rivers: formative occupation at Cahal Pech, Belize and its implication for Preclassic developments in the Maya lowlands. Ph.D. dissertation, Inst. of Archaeology, University of London.
- Awe, Jaime J. (Ed.)
1998 The Western Belize Regional Cave Project: a report of the 1997 field season. Dept. of Anthropology, Occasional Paper No.1, University of New Hampshire, Durham.
1999 The Western Belize Regional Cave Project: a report of the 1998 field season. Dept. of Anthropology, Occasional Paper No. 2, University of New Hampshire, Durham.

- Awe, Jaime J. and Cameron S. Griffith (Eds.)
2002 The Belize Valley Archaeological Reconnaissance Project: a report of the 2001 field season—volume 1. Dept. of Archaeology, Ministry of Tourism, Belmopan, Belize.
- Awe, Jaime J., Cameron S. Griffith, and Sherry A. Gibbs
2005 Cave stelae and megalithic monuments in western Belize. In: James E. Brady and Keith M. Prufer (eds.), *In the maw of the earth monster: Mesoamerican ritual cave use*: 223–248, Austin.
- Bonor Villarejo, Juan Luis
1989 *Las cuevas mayas: simbolismo y ritual*. Madrid.
2002 Caves Branch caves: archaeological field report. Report submitted to the Foundation for the Advancement of Mesoamerican Studies, Inc., Crystal River, Florida.
- Bonor Villarejo, Juan Luis and Ismael Sanchez y Pinto
1991 Las cavernas del municipio de Oxkutzcab, Yucatán, México: nuevas aportaciones. In: *Mayab* 7: 36–52.
- Brady, James E.
1989 An investigation of Maya ritual cave use with special reference to Naj Tunich, Peten, Guatemala. Ph.D. dissertation, Dept. of Anthropology, University of California, Los Angeles.
1995 A reassessment of the chronology and function of Gordon's Cave #3, Copan, Honduras. *Ancient Mesoamerica* 6: 29–38.
1997 Settlement configuration and cosmology: the role of caves at Dos Pilas. *American Anthropologist* 99: 602–618.
- Brady, James E., and Pierre R. Colas
2005 Nikte Mo' scattered fire in the cave of K'ab Chante': epigraphic and archaeological evidence for cave desecration in ancient Maya warfare. In: Keith M. Prufer and James E. Brady (eds.), *Stone houses and earth lords: Maya religion in the cave context*: 149–166, Boulder.
- Brady, James E., and Keith M. Prufer (Eds.)
2005 *In the maw of the earth monster: Mesoamerican ritual cave use*. Austin.
- Brown, Clifford T.
2005 Caves, karst, and settlement at Mayapán, Yucatán. In: James E. Brady and Keith M. Prufer (eds.), *In the maw of the earth monster: Mesoamerican ritual cave use*: 373–402, Austin.
- Chase, Arlen F., and Diane Z. Chase
1994 Maya veneration of the dead at Caracol, Belize. In: Merle Green Robertson and Virginia M. Fields (eds.), *Seventh Palenque Round Table, 1989*: 55–62. San Francisco.
2010 The context of ritual: examining the archaeological record at Caracol, Belize. *Research reports in Belizean archaeology* 7: 3–15.
- Chase, Diane Z. and Arlen F. Chase
1998 The architectural context of caches, burials, and other ritual activities for the Classic period Maya (as reflected at Caracol, Belize). In: Stephen Houston (ed.), *Function and meaning in Classic Maya architecture*: 299–332. Washington, D.C.
2009 Changes in Maya religious worldview: liminality and the archaeological record. In: Cecil, L. G. and Timothy W. Pugh (eds.), *Maya worldviews at conquest*: 219–237. Boulder.
- Colas, Pierre Robert
1998 Ritual and politics in the underworld. *Mexicon* 20: 99–104.
- Feld, William A.
1994 The caves of Caracol: initial impressions. In: Diane Z. Chase and Arlen F. Chase, (eds.), *Studies in the archaeology of Caracol, Belize*: 76–82. Monograph 7. San Francisco.
- Ferguson, Josalyn
1998 The ballcourts at Baking Pot, Belize. M.A. thesis, Dept. of Anthropology, Trent University, Peterborough, Ontario.
- Field, Malcolm S.
2002 A lexicon of cave and karst terminology with special reference to environmental karst hydrology. 2nd ed. Washington, D. C.
- Gordon, George Byron
1898 Caverns of Copan, Honduras. In: *Peabody Museum of Archaeology and Ethnology Memoir* 1: 137–148. Cambridge, Mass.
- Griffith, Cameron S., Reiko Ishihara, and Jaime J. Awe (Eds.)
2000 The Western Belize Regional Cave Project: a report of the 1999 field season. Dept. of Anthropology, Occasional Paper No.3, University of New Hampshire, Durham.
- Guerra, Jenny and Reiko Ishihara
2007 Ventanas sagradas: un estudio etnoarqueológico de las creencias y rituales relacionados con las cuevas en Chocóla, Suchitepéquez. In: Juan Pedro Laporte, Bárbara Arroyo, and Héctor Mejía (eds.), *XX simposio de investigaciones arqueológicas en Guatemala, 2006*: 951–958. Guatemala City.
- Halperin, Christina T., Jon Spenard, and Andrés Brizuela Casimir
2003 Contemporary and ancient use of space at Cueva Deolja. Paper presented at the 68th Annual Meeting of the Society for American Archaeology.
- Helmke, Christophe G. B.
2009 Ancient Maya cave usage as attested in the glyphic corpus of the Maya lowlands and the caves of the Roaring Creek Valley, Belize. Ph.D. dissertation, Inst. of Archaeology, University College London.
- Helmke, Christophe G. B., Jaime J. Awe, and Cameron S. Griffith
2003 El arte rupestre de Belice. In: Martin Künnle and Matthias Strecker (eds.), *Arte rupestre de México oriental y Centro América*: 97–117. Berlin.
- Helmke, Christophe G. B., and James E. Brady
2010 Epigraphic and archaeological evidence for cave desecration in ancient Maya warfare. Paper presented at the Colas Symposium, Vanderbilt University, Nashville, Tenn.
- Ishihara, Reiko
2003 Are there any holes around here?: A preliminary report on the Caracol Regional Cave Survey. In: Jaime J. Awe and Carolyn Audet (eds.), *The Belize Valley Archaeological Reconnaissance: a report of the 2002 field season*: 64–82. Dept. of Archaeology, Belmopan, Belize.
2008 Rising clouds, blowing winds: Late Classic Maya rain rituals in the Main Chasm, Aguateca, Guatemala. *World Archaeology* 40(2): 169–189.
2009 Bridging the chasm between religion and politics: archaeological investigations of the grietas (chasms) at the Late Classic Maya site of Aguateca, Peten, Guatemala. Saarbrücken.
- Ishihara, Reiko, and Cameron S. Griffith
2004 Construction of sacred spaces in Stela Cave, Cayo District, Belize. Paper presented at the Paper presented at the 69th Annual Meeting of the Society for American Archaeology, Montreal.
- Ishihara, Reiko, Cameron S. Griffith, and Jaime J. Awe (Eds.)
2001 Belize Valley Archaeological Reconnaissance Project: a report of the 2000 field season. Dept. of Anthropology, Occasional Paper No.4, University of New Hampshire, Durham.
- Joyce, Thomas A.
1929 Report on the British Museum Expedition to British Honduras, 1929. In: *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 59: 439–459.
1928 Report on the British Museum Expedition to British Honduras, 1928. In: *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 58: 323–350.
- McAnany, Patricia A.
1995 *Living with the Ancestors: Kinship and Kingship in Ancient Maya Society*. Austin.
- Morehart, Christopher
2002 Ancient Maya ritual cave utilization: a paleoethnobotanical perspective. M.A. thesis, Dept. of Anthropology, Florida State University, Tallahassee, Florida.
- Moyes, Holley
2001 The cave as a cosmogram: the use of GIS in an intrasite spatial analysis of the Main Chamber of Actun Tunichil Muknal, a ceremonial cave in Western Belize. M.A. thesis, Florida Atlantic University, Boca Raton, Florida.
2006 The sacred landscape as a political resource: a case study of ancient Maya cave use at Chechem Ha Cave, Belize, Central America. Ph.D. dissertation, State University of New York, Buffalo.
- Moyes, Holley, Jaime J. Awe, George A. Brook, and James W. Webster
2009 The ancient Maya drought cult: Late Classic cave use in Belize. *Latin American Antiquity* 20: 175–206.
- Peterson, Polly A.
2006 Ancient Maya ritual cave use in the Sibun River Valley, Belize. Ph.D. dissertation, Dept. of Archaeology, Boston University, Boston.
- Peterson, Polly A., Patricia A. McAnany, and Allan B. Cobb
2005 De-fanging the earth monster: speleothem transport to surface sites in the Sibun Valley. In: Keith M. Prufer and James E. Brady (eds.), *Stone houses and earth lords: Maya religion in the cave context*: 227–248. Boulder.
- Prufer, Keith M.
2002 Communities, caves, and ritual specialists: a study of sacred space in the Maya Mountains of southern Belize. Ph.D. dissertation, Dept. of Anthropology, Southern Illinois University, Carbondale.
- Prufer, Keith M. and James E. Brady (Eds.)
2005 *Stone houses and earth lords: Maya religion in the cave context*. Boulder.
- Rissolo, Dominique
2003 Ancient Maya cave use in the Yalahau region, northern Quintana Roo, Mexico. Association for Mexican Cave Studies, Austin.
- Scott, Ann M.
2009 Communicating with the sacred earthscape: an ethnoarchaeological investigation of Kaqchikel Maya ceremonies in Highland Guatemala. Ph.D. dissertation, Latin American Studies, University of Texas, Austin.
- Scott, Ann M., and James E. Brady
2005 Human remains in lowland Maya caves: problems of interpretation. In: Keith M.

- Prufer and James E. Brady, (eds.), *Stone houses and earth lords: Maya religion in the cave context*: 263–284. Boulder.
- Smith, Philip E.
1954 Excavations in ceremonial structures at Mayapan. In: *Carnegie Institution of Washington Yearbook* 53: 273–276.
1955 Excavations in three ceremonial structures at Mayapan. In: *Current reports (Carnegie Institution of Washington)* 21: 109–126.
- Smith, Robert E.
1953 Cenote X-Coton at Mayapan. In: *Current reports (Carnegie Institution of Washington)* 5: 67–81.
1954 Cenote exploration at Mayapan and Telchaquillo. In: *Current reports (Carnegie Institution of Washington)* 12: 222–233.
- Stone, Andrea
2003 *Arte rupestre de Guatemala*. In: Martin Künne and Matthias Strecker (eds.), *Arte rupestre de México oriental y Centro América*: 119–141, Berlin.
- Vogt, Evon Z.
1981 Some aspects of the sacred geography of Highland Chiapas. In: Elizabeth P. Benson (ed.), *Mesoamerican sites and world views*: 119–142. Washington, D.C.
- Vogt, Evon Z., and David Stuart
2005 Some notes on ritual caves among the ancient and modern Maya. In: James E. Brady and Keith M. Prufer (eds.), *In the maw of the earth monster: Mesoamerican ritual cave use*: 155–185. Austin.
- Weishampel, John F., Jessica Hightower, Arlen F. Chase, Diane Z. Chase, and Ryan A. Patrick
2011 Detection and morphologic analysis of potential below-canopy cave openings in the karst landscape around the Maya polity of Caracol using airborne LiDAR. In: *Journal of cave and karst studies*, in press.
- Weishampel, John F., Ryan A. Patrick, Jessica Hightower, Arlen F. Chase, and Diane Z. Chase
2010 Lidar detection and morphologic analysis of potential below-canopy cave openings in the karst landscape around the ancient Maya polity of Caracol. Poster presented at IGARSS 2010 (IEEE Geoscience and Remote Sensing Society 2010), Honolulu, Hawaii.
- Willey, Gordon R., William R. Bullard, Jr., John B. Glass, and James C. Gifford
1965 *Prehistoric Maya settlements in the Belize Valley*. Papers of the Peabody Museum 54. Cambridge, Mass.
- Woodfill, Brent
2007 *Shrines of the Pasión-Verapaz region, Guatemala: ritual and exchange along an ancient trade route*. Ph.D. dissertation, Dept. of Anthropology, Vanderbilt University, Nashville, Tenn.

RESUMEN: Investigaciones por el Proyecto Regional de Cuevas de Caracol ha revelado la presencia de una serie de cuevas y cenotes en los alrededores del epicentro de este sitio principal. Varios materiales arqueológicos como cerámica, lítica, restos de fauna, y los huesos humanos fueron documentado en las cuevas. Modificaciones estructurales también fueron observadas, incluyendo la construcción de pequeñas estructuras arquitectónicas, la obstrucción de los pasajes y las entradas, la ruptura de espeleotemas y petroglifos. Características subterráneas pudieron haber sido integradas en diseño de edificios y otras estructuras como parte del paisaje sagrado. La ubicuidad de las cuevas a través del panorama de Caracol, además de evidencia de uso prehispánico de algunas de las cuevas, hubiera permitido que gran parte de la población lleve a cabo rituales subterráneos.

ZUSAMMENFASSUNG: Die Forschungen des Caracol Regional Cave Survey Projektes haben zur Entdeckung zahlreicher Höhlen und Einsturzdolinen in der Umgebung von Caracol geführt. Zu den Artefakten, die in den Höhlen gefunden wurden, gehören Keramik, lithisches Material, Tierreste und menschliche Knochen. Es konnten strukturelle Modifikationen der Höhlen beobachtet werden. Dazu gehören kleine architektonische Elemente, die Blockade von Passagen und Eingängen, das Abbrechen von Stalagmiten und Stalagtiten und das Anbringen von Petroglyphen. Unterirdische Strukturen wurden vermutlich in das Layout von Bauwerken als Teil der sakralen Landschaft integriert. Die weite Verbreitung von Höhlen in der gesamten Umgebung von Caracol und die Hinweise auf vorspanische Nutzung zahlreicher dieser Höhlen deutet darauf hin, dass ein Großteil der Bevölkerung an unterirdischen Ritualen teilnahm.

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- Aguilera Madrigal, Sabina
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- Araiza, Elizabeth
2010 *Las artes del ritual: nuevas propuestas para la antropología del arte desde el occidente de México*. El Colegio de Michoacan, México, D.F. y Zamora, México. 338 pp., ISBN 978-6077764595.
- Asselbergs, Florine
2010 *Los conquistadores conquistados. El Lienzo de Quahquechollan: una visión nahua de la conquista de Guatemala*. Plumsock Mesoamerican Studies; Secretaría de Cultura de Puebla, Wellfleet, USA; Puebla, México. ISBN 978-0910443258.
- Bello Baltazar, Eduardo and Erin I. J. Estada Lugo (eds.)
2011 *Cultivar el territorio maya: conocimiento y organización social en el uso de la selva*. ECOSUR, San Christobal de las Casas, México. 310 pp., ISBN 978-6077637400.
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2010 *Fieldwork and linguistic analysis in indigenous languages of the Americas*. Language Documentation and Conservation Special Publication, No. 2. University of Hawai'i Press, Honolulu, Hawai'i. ISBN 978-0824835309
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