

17 UNDERWATER MAYA: NEW FINDS FROM PAYNES CREEK NATIONAL PARK IN 2004

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In this paper I report the 2004 discovery of 33 Late Classic Maya salt works (A. D. 600-900) in Paynes Creek National Park on the south coast of Belize, including one with the first-known ancient Maya canoe paddle. Sea-level rise submerged the salt works, which are now underwater in Punta Ycacos Lagoon. Twenty-three of the salt works have wooden buildings preserved below the sea floor. The discoveries add important empirical information for evaluating the extent of surplus salt production and river transport during the height of Late Classic civilization in the southern Maya lowlands. The discovery of a wooden canoe paddle from one of the Paynes Creek salt works, Ka'k' Naab, ties the production of salt to its inland transport by rivers and documents the importance of canoe trade between the coast and the interior during the Late Classic.

Introduction

How did the ancient Maya at cities in the interior of the Yucatan peninsula of Mexico, Belize, and Guatemala obtain quantities of salt in an area where salt is scarce? The traditional interpretation of salt supply was massive import of this basic daily necessity from the salt flats on the north coast of the Yucatan (Andrews 1983). Although other pre-industrial complex societies have transported bulk resources over long-distances, such as salt over the Sahara Desert, Maya archaeologists typically regard that long-distance trade was focused on small quantities of status goods and resources for the dynastic and other elite Maya (Inomata 2001). Following this model, shorter distance trade focused on exchange of food and other subsistence related goods and resources for the bulk of society (McKillop 2004a). The previous discovery and excavation of four salt works in Paynes Creek National Park, including three in Punta Ycacos Lagoon and one in the adjacent mangroves, suggested the possibility that salt was transported in bulk from the coast of Belize by rivers to inland cities during the height of the Classic Maya civilization (A. D. 600-900; McKillop 2002). The coast of Belize is closer than the north

Yucatan coast salt flats to the inland cities that formed the core of Late Classic civilization in Belize, Guatemala, and Mexico. That the bowls and jars used to boil brine or seawater in pots over fires were standardized in their dimensions indicated mass-production of the product, salt. But with only four salt works, even mass-production would only supply the salt needs of some of the inland urban Maya. We needed to search for more salt works to test the hypothesis of bulk export of salt from the coast of Belize to Late Classic inland cities.

Methods

A comprehensive underwater search began in April 2004 to locate for salt works in Paynes Creek National Park. Beginning at the eastern arm of Punta Ycacos Lagoon, a large salt-water lagoon in the park, the sea floor was systematically searched for the discarded remains of the salt works. We searched for the fragmentary remains of jars and bowls along with their vessel supports used to hold pots over fires to boil brine to make salt. Previously, we had found sites by looking over the side of the dories for artifacts or walking on the seafloor and looking for artifacts, but this search was not

systematic. For the 2004 survey, we adapted the pedestrian survey method used commonly by archaeologists on dry land: We walked at arms' length in a line, traversing the lagoon back and forth, resulting in the complete surface inspection of the seafloor by visual observation or by stepping on artifacts. While this time-consuming method of underwater pedestrian survey resulted in complete coverage of the seafloor, silt stirred up by walking reduced visibility of artifacts on the seafloor. Moreover, gaping holes were left in the seafloor as we sunk with each footstep, making progress difficult, destroying the integrity of ancient sites we discovered, and breaking artifacts on which we walked. Furthermore, with zero visibility in the sea, we found it difficult to avoid accidentally stepping on stingrays, attracted by the silt.



Figure 1. Team of snorkeling archaeologists traverse the lagoon shoulder to shoulder on Research Flotation Devices (RFDs), without stirring the bottom silt or damaging sites. (Photo by Heather McKillop).

We eliminated these problems later in the field season, by further modifying pedestrian survey, using Research Flotation Devices (RFDs) to float on the surface of the water and observe the seafloor using masks and snorkels (Figure 1). Teams of snorkeling archaeologists traversed the lagoon shoulder to shoulder on RFDs without stirring the

bottom silt or damaging sites. A datum was established at each underwater site, with a GPS location recorded. The datum was marked by a ½" pvc pipe about 24" in length driven into the sea floor, with the site number written in permanent black marker along the sides of the pipe. The pvc pipes protruded above the sea during fieldwork, but were submerged at the end of the field season so they were not easily located by others. The site numbers were preserved where the pvc extended below the sea floor. We placed flags to mark the locations of artifacts at each site. At the end of the field season, the flags were replaced with plastic straws driven into the sea floor, with one end protruding about 10cm so our team could relocate them the next field season.

Results

We found 33 new sites in 2004 (Figure 2). With eight sites found in 2003, and four from earlier research, we had a total of 45 salt works in Paynes Creek National Park. They were marked by concentrations of broken jars and bowls, the cylinder vessel supports, and charcoal on the sea floor. A sample of measurable rims and vessel supports was collected from the sea floor at each salt works to evaluate inter-workshop variability in standardization of production of salt.

In addition to pottery and a few obsidian and chert stone tools, there was an unexpected discovery; wooden posts protruded from the seafloor through the loose silt. Wooden objects are rarely preserved in the tropical rainforest setting of Maya sites, so the discovery of these posts at the Paynes Creek salt works was unexpected. Wooden objects have been preserved at a few dry caves (Pendergast 1974; Prufer et al. 2004), the oxygen-free mud at the bottom of the Cenote of Sacrifice

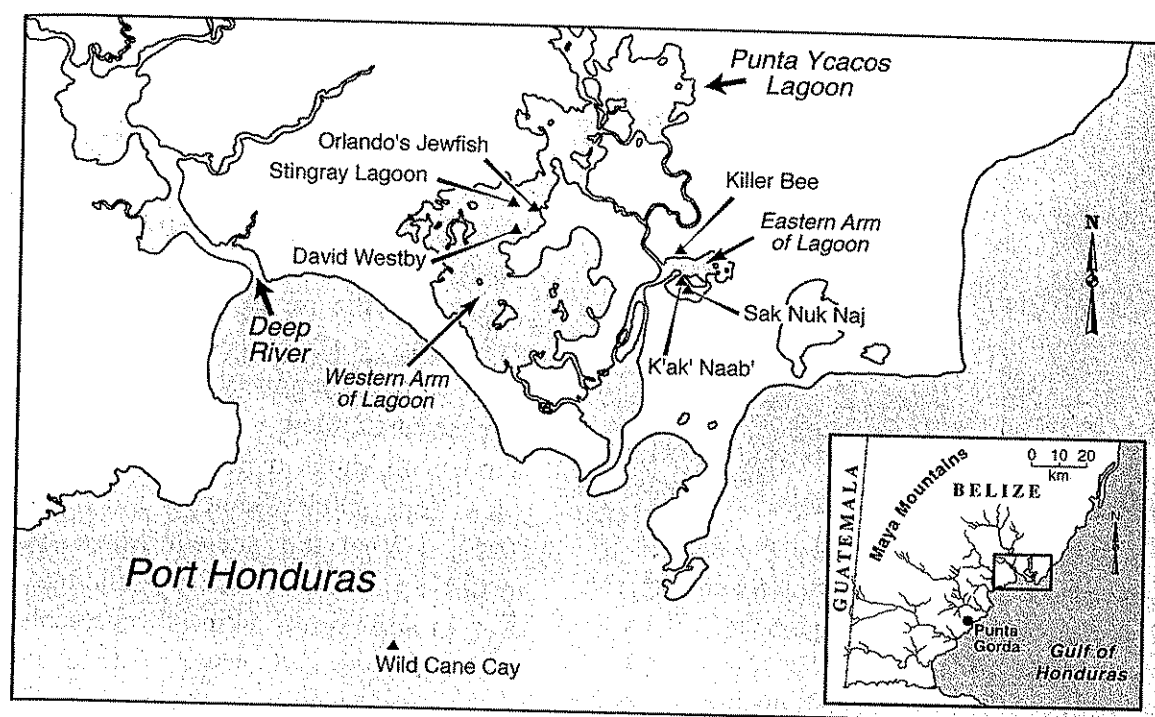


Figure 2. Map of Punta Ycacos Lagoon, Belize. (Drawing by Mary Lee Eggart).

at Chichen Itza (Coggins and Ladd 1992), under the volcanic tephra at Ceren (Sheets 2002), and in dry temple rooms such as Tikal's temple 1. Had we found ancient posts or were they part of the natural landscape of inundated coastal lagoons? Were the posts old, perhaps contemporary with the ancient salt works?

Several "posts" were excavated from the seafloor in Punta Ycacos Lagoon in order to determine if they were culturally modified as structural posts or were just relics of trees that had grown prior to inundation of the lagoon. Excavation of the first post at site 15, Sak Nuk Naj, demonstrated it was modified and not a tree. The post was worm-eaten and black, barely visible as a round stick protruding from the sea floor into the overlying loose silt. However, once below the silt, everything changed. The post extended about one meter below the sea floor, was straight, and sharpened at the lower end. Flake scars were clearly visible on the chipped end of the post. We excavated several more posts, discovering each was straight with

chipped lower ends where the post was driven into the ground (Figure 3). Below the silt in the mangrove peat, the wooden posts were unaffected by worms and retained the color and appearance of fresh wood. Some still had bark. Although waterlogged, the wood structure was perfectly preserved.

With the discovery of wooden posts at Site 15, we returned to other sites we'd found in the eastern arm of the lagoon to see if there were wooden posts in addition to pottery. They all had wooden posts. By the end of the field season, we had discovered wooden posts at 12 sites, with the possibility that posts would be discovered at some or all of the others when we were able to return to them for further underwater survey.

What preserved the wooden posts in Paynes Creek National Park? The posts were preserved where they were in the mangrove peat that underlay the silt on the sea floor. The peat provided an anaerobic matrix devoid of sea worms and other animal life that act to decay wood. The mangrove peat was created by living red mangrove trees (*Rhizophora mangle*) that

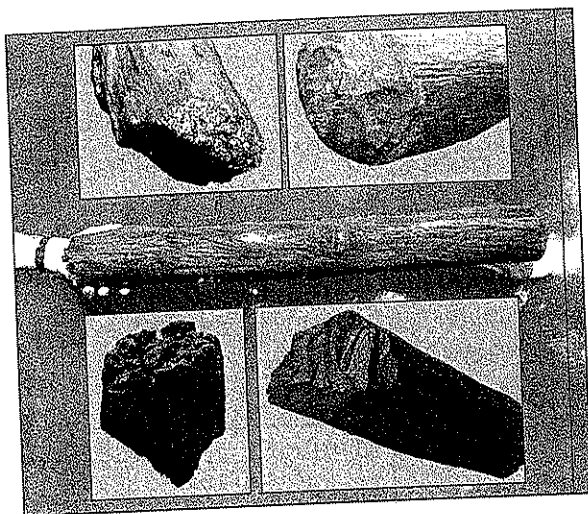


Figure 3. Classic Maya wooden posts used to form walls of buildings at the Paynes Creek salt works. The Sak Nuk Naj post was radiocarbon dated to the Late Classic period, A.D. 670 to 960 (calibrated to 2 sigma, based on a date of 1300 B.P. \pm 60). (Photos by Heather McKillop).

had grown upwards to keep pace with sea-level rise, trapping mangrove leaf matter, sediment and other detritus in their roots. The accumulation of mangrove peat is a good indicator of actual sea level rise worldwide. The inshore lagoon between the Belize barrier reef and the mainland has up to 9 meters of mangrove peat below the sea floor resulting from actual sea level rise since the end of the last ice age, the Pleistocene (Macintyre et al. 1995; McKillop 2002). The posts in Paynes Creek were preserved either because they were sunk into the peat or the peat grew rapidly over them to engulf and preserve them. These possibilities are under investigation as part of the ongoing research on the inundated salt works. The posts formed lines. The concentration of pottery and wooden posts suggested structures for salt production. Preliminary examination of the ceramics indicated they were Late Classic in age. Samples from nine posts were taken for radiocarbon dating.

Construction of Ancient Maya Wooden Buildings

Apart from stone temples and palaces in the centers of Maya cities, wooden buildings dominated the ancient Maya landscape. Ancient Maya buildings with pole walls and thatched roofs decayed. In some cases, the houses left the mounded remains of their earth floors, earth or stone foundations with the discarded remains of household garbage. In other cases, there is no visible evidence of wooden buildings in the modern landscape (McKillop 2005; Somers and McKillop 2005). What did ancient Maya wooden houses and other wooden buildings look like? In addition to pictorial representations on painted pots and carved in stone, and the remnants of buildings preserved in volcanic tephra at Ceren (Sheets 2002), traditional modern Maya buildings provide information on construction techniques, wood used, and length of occupation, for example (Ochoa-Winemiller 2004; Wauchope 1938). The Paynes Creek structures can be compared with modern Maya buildings to see if it is appropriate to use modern buildings as analogues for ancient buildings.

Buildings Used at Salt Works

The wooden architecture at the Paynes Creek sites is defined by wooden posts, beams, and other construction wood. The largest structure found in 2004 is at Chak Sak Ha Nal (Site 23), where 112 wooden posts define the exterior walls of a rectangular wooden building measuring approximately 21 X 12 m. Inside the structure there are posts forming interior rooms, as well as other construction wood, to be mapped with a survey instrument in 2006. Late Classic salt making pottery is abundant inside the structure, indicating that the structure was used in salt production, storage, or transportation. We observed large pieces of pots preserved on the

seafloor indicating lack of re-use of the salt works or post-abandonment trampling by animals or people (Figure 4). Clearly, rising seas contributed to in situ preservation of materials at the salt works. Many of the pottery sherds include rims, walls, and bases, which will allow reconstruction of the size and shape of the complete vessels, often only possible from complete vessels found in burials and offerings. The size and layout of the structure at Chak Sak Ha Nal and other salt works will be clarified by mapping the distribution of posts and artifacts beginning in 2005 with a 3-year National Science Foundation project.

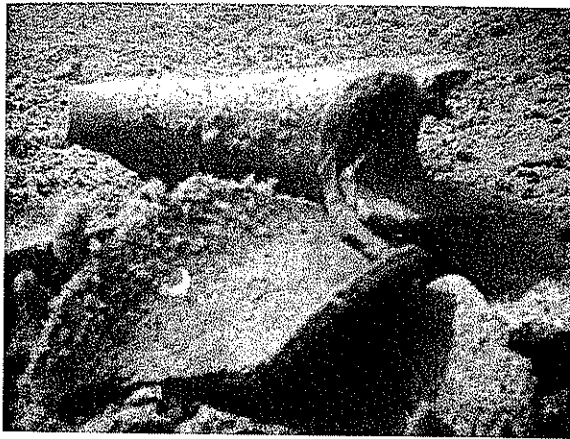


Figure 4. The pottery, although broken, consists of large pieces of pots preserved on the seafloor where there was no further use of the salt works or trampling by animals or people after the sites were submerged by rising seas. (Photo by Heather McKillop).

K'ak' Naab' Paddle

The recovery of a full-sized, wooden canoe paddle from the K'ak' Naab' salt works (site 14) ties the production of salt in Paynes Creek to its transportation by canoe. Since no ancient Maya wooden canoes have been discovered, the K'ak' Naab' paddle is the first primary evidence of prehistoric Maya boat travel and navigation. Wooden posts and the paddle were discovered after returning to

the site upon the discovery of wooden posts at Sak Nuk Naj, site 15. The paddle blade protruded from the mangrove peat into the overlying silt. The edge of the paddle blade in the silt was worm-eaten, but the remainder of the paddle was undamaged.

The K'ak' Naab' paddle shows the actual size of paddles used by the Late Classic Maya; carved from a single piece of wood, the paddle is 1.43 m in length with a round shaft that is 5 cm in diameter (Figure 5). The grip is rounded and smooth, with flaking scars visible, such as could have been produced by a chert adze recovered from the site. The upper edge of the blade flares at a 90-degree angle to the shaft. The blade extends 8 cm from the shaft on one side, but only 2 cm on the other side. The blade of the paddle is rounded at the tip. A raised area on one side of the blade, 1.40 cm in height, continues the shape of the shaft.

The K'ak' Naab' paddle is similar in shape to paddles in ancient Maya art, which show paddles and their use in canoes. Images incised on long bones from Late Classic Burial 116 in Temple 1 at Tikal show the Stingray Paddler god and the Jaguar Paddler god paddling a canoe (Trik 1963; Figure 5). Like the K'ak' Naab' paddle, their paddles have a straight handle without an expanded grip. The blades are straight along the upper side, rounded at the sides and at the tip. The scene indicates that Classic Maya held paddles by the shaft, with one hand near the top and the other hand above the blade. Similar paddles are depicted in a scene on a painted mural dated to the Postclassic at Chichen Itza (Thompson 1951). Other artistic depictions of canoeists paddling are known from Piedras Negras, recording a Yaxchilan emissary's trip downstream to attend a ruler's accession to the throne.

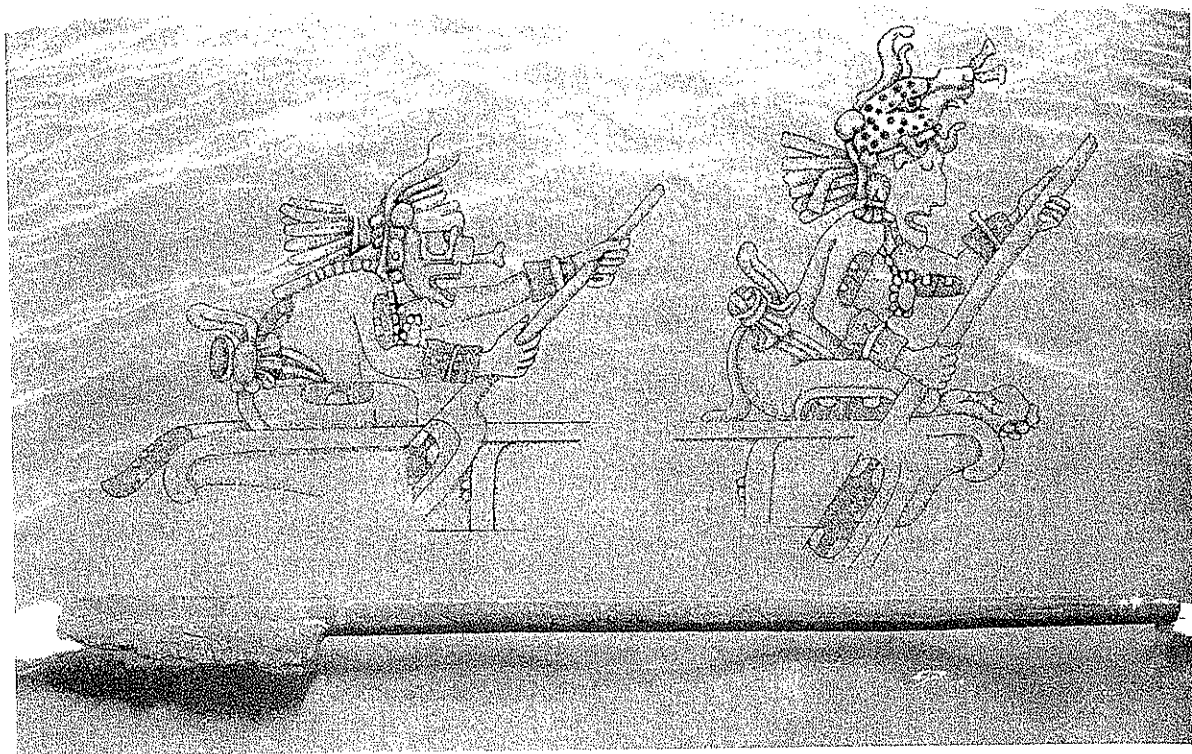


Figure 5. Late Classic Maya wooden canoe paddle from K'ak' Naab' underwater salt, radiocarbon dated to A.D. 680 to 880 (calibrated to 2 sigma, based on a date of 1300 ± 40 B.P.). The drawing shows the same type of paddle depicted on a Late Classic bone carving from Tikal. (Photo by Heather McKillop; drawing by Mary Lee Eggart from Trik 1963: Figure 5).

Since the K'ak' Naab' paddle so closely resembles ancient artistic depictions of paddles, perhaps images of canoes in the same depictions also provide accurate analogues. Artistic depictions of canoes are similar to boat models from several Classic Maya sites, including Altun Ha and Moho Cay, where the boat models were carved from manatee ribs (McKillop 2004b; Pendergast 1982). There are clay boat models from Orlando's Jewfish and Stingray Lagoon, other salt works in Punta Ycacos Lagoon (McKillop 2002).

The K'ak' Naab' paddle was carved from a species of *Manilkara*, probably *M. sapote* in the family Sapotaceae. Although waterlogged, the wood is fresh in appearance, preserving the original light brown color of the wood. Sapotaceae wood also was identified from Late Classic midden deposits at the nearby island community of Wild Cane Cay (McKillop 1994). A wooden spear from Actun Polbilche cave, Belize was

made from *M. sapote* (Pendergast 1974). Although *M. sapote* is better known for its sap that provided chicle for chewing gum, the wood is a durable hardwood. Deciduous hardwoods do not grow in the mangrove ecosystem surrounding the lagoon, or on the adjacent pine savannah. However, they form the rainforest south of Punta Ycacos Lagoon, along the Deep River.

Radiocarbon dating and analysis of associated ceramics date Belize salt production and canoe travel to the height of Late Classic Maya civilization when the demand for salt was greatest in the interior cities. Wood from the K'ak' Naab' paddle was radiocarbon dated to 1300 ± 40 B.P. A post from the nearby Sak Nuk Naj salt works was radiocarbon dated to $1300 \text{ B.P.} \pm 60$ (McKillop 2005b). After calibrating the raw dates and correcting them by carbon 13/12 isotope analysis, the calibrated dates fall within the Late Classic, with A.D. 680

to 880 for the K'ak' Naab' paddle and A.D. 670 to 960 for the *Sak Nuk Naj* post (McKillop 2005b). Both dates fall in the range of a radiocarbon date of A.D. 670-870 from wood charcoal from the nearby Stingray Lagoon site (McKillop 1995, 2002). The ceramics from K'ak' Naab' and *Sak Nuk Naj* resemble the Late Classic ceramics identified at Stingray Lagoon (McKillop 2002).

Infrastructure of Salt Production

The discovery of more than the original four salt works (McKillop 2002) meant production of this basic resource was mass-produced, as indicated by studies of standardization of the vessels suggesting mass production of the product. Moreover, production was extensive, as indicated by the number of additional sites discovered. With a high density of salt works in the part of the lagoon recently surveyed, the possibility of extensive salt production was staggering.

The discovery of ancient wooden posts indicated that the artifacts and wooden posts were the intact remains of salt workshops and that the infrastructure involved in production was far more extensive than previously thought. My working model of production was that each workshop included a group of salt workers, perhaps a kin group, boiling seawater or brine in a couple of dozen or more pots over fires and this activity was an outdoor activity carried out seasonally in the dry season at many salt workshops in the area. Instead, I surmise now that production was indoors. Like modern and historic salt production elsewhere in many parts of the world (Adshead 1992), buildings were used for the boiling process, and also for storing pots, fuel, the loose salt and salt cakes, furniture, and other equipment used by the salt workers (Reina and Monaghan 1981). There was an extensive infrastructure

involved in the construction of buildings, storage of materials and goods for the production process, production of salt by boiling, and storage of salt prior to transport elsewhere for use. Salt production at the Paynes Creek salt works was more than boiling brine or seawater over pots and over fires to produce salt.

The Implications for Understanding of Classic Maya Economy and Trade

Archaeological discovery of multiple salt works on the Belizean coast represents surplus production of salt destined largely for the inland Maya during their Late Classic peak, underscoring the importance of non-state controlled workshop production in pre-industrial societies (McKillop 2005b). The discovery of 45 salt works and an ancient wooden canoe paddle demonstrate there was extensive, non-state controlled salt production and the means of transport by canoe to inland Maya cities. In general, the subsistence economy of the Late Classic Maya was more complex than previously considered and included mass production of goods outside urban areas and beyond state control (McKillop 2005b). This finding is important because it furthers our understanding of pre-modern, indigenous systems of production and exchange, in particular the extent of political control of the economy. The Punta Ycacos research indicates salt production on the coast of Belize was extensive, dated to the height of Maya civilization when inland demand for salt was at its greatest, and that production and canoe transportation of salt were locally controlled by the coastal Maya instead of the geographically distant Maya state at cities in the interior. In addition to the Paynes Creek salt works, salt production is documented elsewhere along the coast of Belize suggesting the Belize coast provided a closer source of salt than that produced on the north coast of the Yucatan (Andrews and

Mock 2002). The discovery of the canoe paddle from *K'ak' Naab'* documents that the transportation of salt was by water, a viable option for moving bulky resources up nearby rivers to supply the large populations of the Late Classic cities in the southern Maya lowlands.

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