REPORTS

A FIRST REPORT OF VARISCITE TAIRONA ARTIFACTS (A.D. 1100–1600) FROM THE SIERRA NEVADA DE SANTA MARTA, COLOMBIA, AND ITS IMPLICATIONS FOR PRECOLUMBIAN EXCHANGE NETWORKS IN THE REGION

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Archaeometric analyses (Raman Spectroscopy Analysis, X-Ray Diffraction, and Electron Microprobe Analysis) of greenstone beads of the precolumbian Tairona culture (A.D. 1100–1600) of the Sierra Nevada de Santa Marta, Colombia, have revealed that they are made of variscite-group minerals. These beads were curated at the Museo del Oro, Bogotá, and the Archaeology Laboratory of the Universidad del Norte, Barranquilla. Variscite minerals of the variscite-strengite series are rare in nature, and therefore provenance data of source material are useful for the development of intercultural influence models. The abundance of this rare material in prehistoric Colombian collections strongly indicates not only that this material had important symbolic and prestige value for ancient Tairona societies (Nahuange and Tairona periods) but also that these societies participated in ancient trade routes, including, at least, the Andes of present-day Colombia and Venezuela, and the southern Caribbean coast.

Se realizaron análisis arqueométricos (espectroscopía Raman, difracción de rayos-X y microsonda electrónica de barrido) sobre cuentas pertenecientes a la sociedad precolombina Tairona (1100–1600 d.C.) (Sierra Nevada de Santa Marta, Colombia), procedentes de las colecciones del Museo del Oro (Bogotá) y el Laboratorio de Arqueología de la Universidad del Norte (Barranquilla). Los resultados muestran que estas cuentas fueron elaboradas sobre minerales del grupo de la variscita, de la serie variscita-strengita, los cuales son minerales escasos útiles para el desarrollo de modelos de influencia intercultural a través del análisis de la procedencia del material de origen. La variscita es muy frecuente en las colecciones precolombinas del Museo del Oro y otros museos arqueológicos de Colombia. Por este motivo, la abundancia de este material es una evidencia contundente no sólo de su valor simbólico y de prestigio para las antiguas sociedades Tairona (períodos Nahuange y Tairona), sino también de la participación de dichas sociedades en las rutas de comercio precolombinas que cubren, al menos actualmente, los Andes de Colombia y Venezuela y las costas del Sur del Caribe.

Variscite is a hydrated aluminum phosphate, the sources of which are relatively rare (Odriozola et al. 2010). The mineral group comprises phosphates with the general formula MPO_4 $2H_2O$ (where M = Al^{3+}, Fe^{3+}, Cr^{3+}, or V^{3+}). The most common minerals of this mineral group are orthorhombic variscite (based on Al) and strengite (based on Fe), and their monoclinic chemical equivalents metavariscite and phosphosiderite (or metastrengite). The latter is less common.

Variscite is formed at low temperatures by the direct deposition of phosphate-bearing groundwater moving down fissures and reacting with aluminum-rich bedrock material either at or near the surface of the earth (Larsen 1942; Mykietiuk

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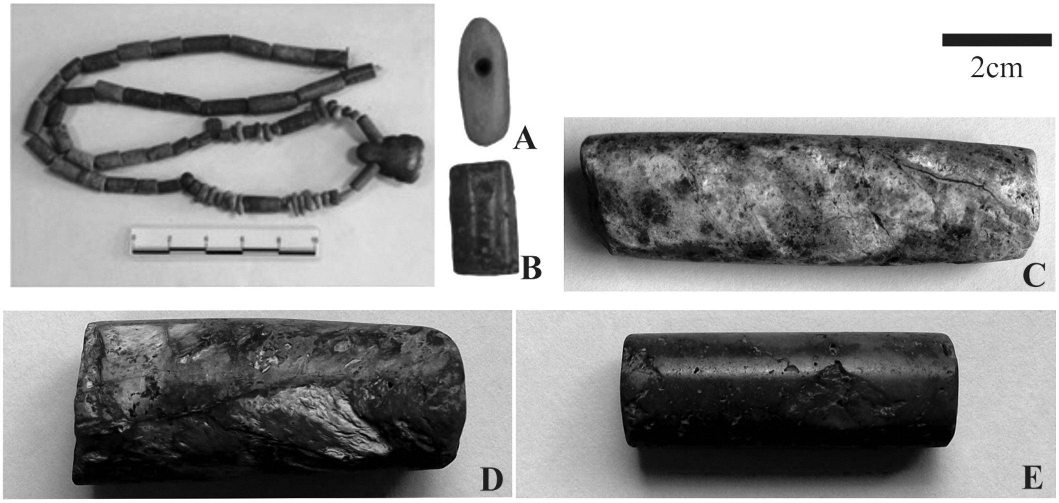

Figure 1. Precolumbian Tairona beads made from variscite, Sierra Nevada de Santa Marta: (a) L00854-1, (b) L00854-2, (c) un1, (d) un3, and (e) un5.

et al. 2005). In general, sources of phosphorous and, hence, of variscite are associated with coastal and marine deposits rich in phosphates from bird droppings (guano) or other sources of biological phosphorus (e.g., skeletal fish fragments), and from chemical precipitation phenomena that occur in shallow-water environments (Larsen 1942; Mykietiuk et al. 2005). Variscite commonly occurs in the form of microcrystalline fibrous-radiated aggregates, massive forms, nodules, and concretions, typically filling fissures and cavities in rocks. Its specific gravity is 2.5, and its hardness ranges from 4 or 5 on the Mohs scale, which makes it amenable to abrasion. In addition, it has a waxy luster and a color varying from green-blue to emerald green, but it may also be white and transparent in the most pure phases (e.g., $AlPO_4 2H_2O$). Emerald green is the most common color, probably caused by chromium impurities that substitute for aluminum (Calas et al. 2005:984).

Prehistoric societies appreciated variscite for its symbolic value. It was exploited mainly to make jewelry, which was believed to have magical and religious value (e.g., in prehistoric Europe) and to signal social and economic differentiation in the form of prestige ornaments (e.g., Camprubí et al. 2003; Kuhn et al. 2001; Noain 1999; Vanhaeren and d'Errico 2006). Because variscite sources are relatively rare, this mineral is well suited for studies of trade and exchange patterns in precolumbian societies.

In this paper, we report the initial identification of five prehispanic variscite beads from archaeological museum collections (Museo de Oro, Bogotá, and the Universidad del Norte, Barranquilla) in Colombia using Raman Spectroscopy Analysis, X-Ray Diffraction and Electron Microprobe Analysis (Figure 1). After our discovery, we noted the potential abundance of this mineral in other archaeological collections (Instituto Colombiano de Antropología e Historia [ICANH], Bogotá) and Archeology Laboratory at the Universidad de Antioquia in Medellín), whose variscite ornaments include mainly tabular and oval beads and some zoomorphic or anthropomorphic beads. They all originate from archaeological sites located in the Sierra Nevada de Santa Marta, Colombia (Figure 2), and are considered an important part of the legacy of the prehispanic societies that lived in this region during the Tairona period (A.D. 1100–1600).

Archaeological Context

For many years, the mountainous area of the Sierra Nevada de Santa Marta (ca. 5,800 m asl at its highest point) in Colombia was of great scientific interest for botanists, zoologists, and geographers because of its particular geological and ecological conditions (e.g., Mason 1936; Oyuela-Caycedo 2008). Prior to the European colonization of the Americas in the sixteenth century A.D., the Sierra

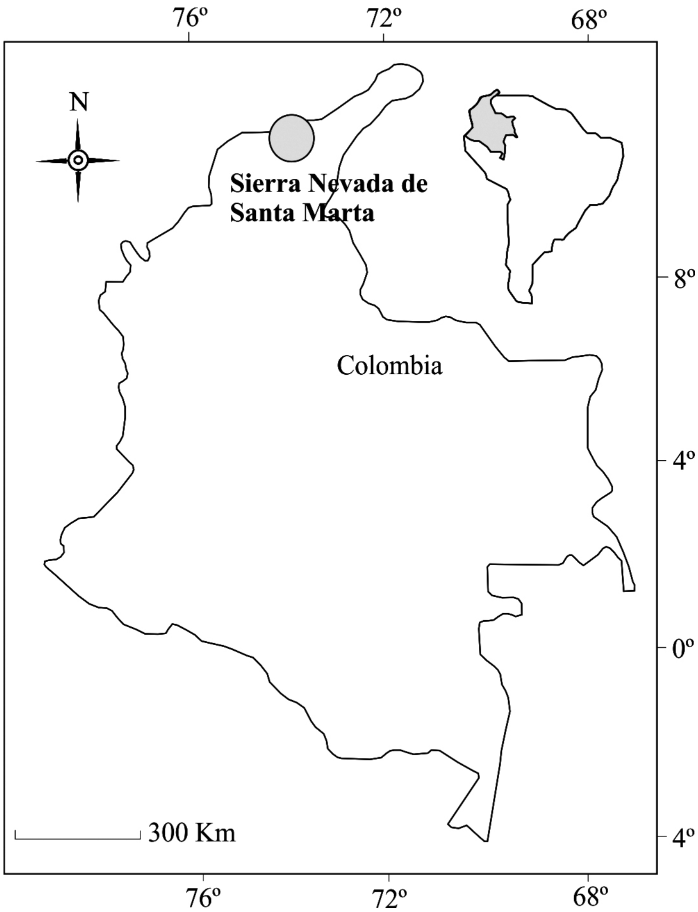

Figure 2. Location of the Sierra Nevada de Santa Marta, Colombia.

Nevada was home to a number of precolumbian cultures that inhabited the region during the Nahuange (A.D. 200–1100) and Tairona (A.D. 1100–1600) periods (Giraldo 2010; Langebaek 2005; Oyuela-Caycedo 2008; Reichel-Dolmatoff 1997; Sáenz 2010). Located near the Caribbean coast of Colombia, the Sierra Nevada connects the Caribbean region, Central America, and the Colombian and Venezuelan Andes and presents a key locus for understanding the social changes that occurred during the precolumbian period, as shown by archaeological investigations (e.g., Bischof 1983; Cadavid y Herrera 1985; Dever 2007; Giraldo 2010; Langebaek 2005; Oyuela-Caycedo 2008; Reichel-Dolmatoff 1951; Sáenz 2007, 2010). These studies include multiple ethnohistorical investigations of Tairona social, economic, and political organization (e.g., Giraldo 2010; Oyuela-Caycedo 2005), which are reflected, in turn, in prehispanic exchange patterns.

Archaeological research in the Sierra Nevada region began in 1922 with J. Alden Mason's expedition and excavations (Mason 1931, 1936, 1939). Near Nahuange Bay (Figure 3), Mason discovered a tomb that contained various artifacts with unusual stylistic characteristics. He suggested that they were of a previously unidentified cultural or chronological affiliation (Mason 1939:360). In the coastal and piedmont regions between Santa Marta and the Cabo de San Juan (Figure 3), Mason identified remnants of the Tairona culture. Throughout his excavations, Mason recovered many ornaments made of greenstone and gold, including earrings, nose rings, pectorals, bracelets, breast covers, and

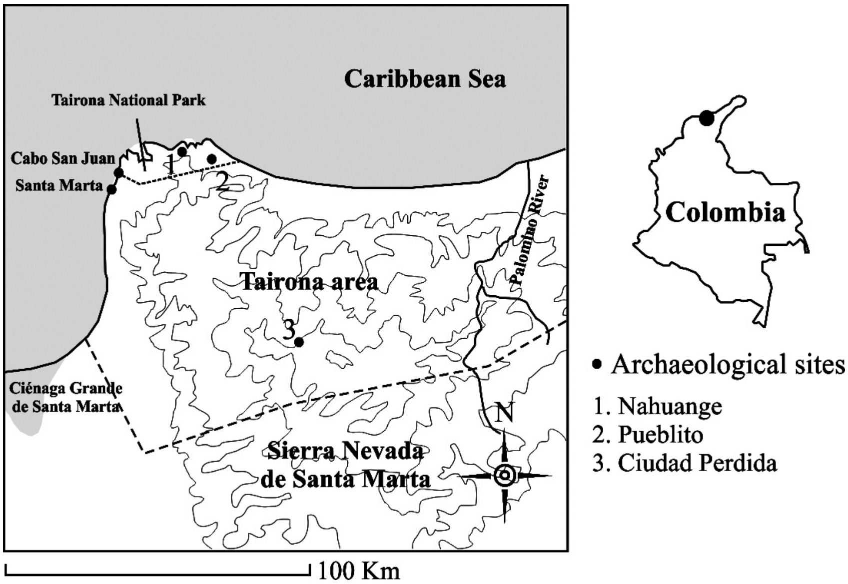

Figure 3. Location of Nahuange and Tairona archaeological sites. Sierra Nevada de Santa Marta. Modified from Giraldo (2010:Figure 1.2).

a variety of pendants representing wildlife or mythical beings of symbolic importance.

Subsequent archaeological excavations in the area led to the designation of a pre-Tairona period known as Nahuange (Bischof 1968). The chronological division was based primarily on subtle differences in the stratigraphic position of different archaeological sites and on the stylistic attributes of jadeite objects and peculiar gold work found in coastal sites. Few radiocarbon dates exist for these periods. A date associated with Tairona metal work (uncalibrated A.D. 565 ± 50) indicates an approximate date of 1385 B.P. (Groot 1980:29). Dates obtained from Nahuange-period gold objects at the Field Museum in Chicago and the Museo de Oro in Bogotá ranged from cal. A.D. 130 ± 40 to cal. A.D. 480 ± 40 (Bray 2003:324).

Nahuange people were settled along the coast in river valleys from the Ciénaga Grande de Santa Marta to the Palomino River (Figure 3) in small and isolated towns lacking a settlement hierarchy (Giraldo 2010:181). Their architecture did not include stone foundations or any sign of social differentiation. Around the beginning of the tenth century A.D., an increase in population led to colonization of the upper mountain slopes. By the end of the tenth century, flagstone pathways connected towns and cities with buildings constructed on stone foundations. These were inhabited by the Tairona, members of a society with a longstanding religious tradition (Cadavid y Herrera 1985; Groot 1985; Langebaek 2003, 2005; Oyuela-Caycedo 1986, 1987; Reichel-Dolmatoff 1997; Serje 1987; Wynn 1975). Research conducted by Dever (2007) shows continuous occupation of the region from A.D. 200 to A.D. 1600. Excavations conducted at the sites of Pueblito and Ciudad Perdida (Figure 3) revealed that dwellings and structures belonging to the Nahuange period are buried beneath the Tairona-period occupation.

Giraldo (2010) recently described Nahuange dwellings as having round foundations and noted that, at Pueblito and Ciudad Perdida, the archaeological evidence shows a sequence of growth and permanent occupation, beginning around the sixth or seventh century A.D. with Nahuange populations who used basic stone architecture. Social and political changes and a population increase around A.D. 1100/1200 spurred architectural development and the construction of large urban centers that were in use until the sixteenth century, when the Spanish arrived.

Material and Methods

Our study began with an optical binocular microscopy inspection of 450 artifacts. This was used to classify artifact material by color and surface texture. We then selected for detailed study two unprovenienced beads from the Museo del Oro, Bogotá (L00854-1 and L00854-2), and three beads of known archaeological context from the Archaeology Laboratory of the Universidad del Norte, Barranquilla (un1, un3 and un5). All five beads are assigned stylistically to the Tairona culture.

The beads were examined using Raman Spectroscopy Analysis, X-Ray Diffraction (XRD), and Electron Microprobe Analysis (EPMA). The mineralogical and chemical analysis was conducted on polished thin sections. Given the archaeological value of the beads and the destructive nature of the EPMA and XRD techniques, only two beads (L00854-1 and L00854-2) with characteristics representative of the larger sample were selected for these types of analysis.

Micro-Raman Spectroscopy analyses were conducted with a HORIBA Jobin Yvon LabRam HR 800 dispersive spectrometer equipped with an Olympus BXFM optical microscope in the Centres Científics i Tecnológics of the Universitat de Barcelona (CCiT-UB) and the Centro de Investigación, Innovación y Desarrollo de Materiales (CIDEMAT) at the Universidad de Antioquia in Medellín. Non-polarized Raman spectra were obtained by applying a 532-nm laser and 784-nm laser respectively, using a 100x objective (beam size around 2 μm), with 10 measurement repetitions for 15 seconds each. The instrument was calibrated by checking the position of the metallic Si band at ~520 cm^{-1}.

XRD analyses were performed on an X' Pert PRO diffractometer (X-ray equipment Radioactive EXEMPT) at the Department of Mineralogy and Petrology at the University of Granada, Spain. XRD analyses were conducted on the unground samples, with an amplitude (diffractograms) 2Θ angle between 2° and 70°, Cu anode, a speed of .4-second integration, 45-kV voltage, and a current of 40 mA.

EPMA analyses were performed on a CAMECA SX100 electron microprobe at the Scientific Instrumentation Center, University of Granada, Spain. We used five wavelength dispersive XR spectrometers equipped with crystal analyzers LCF2, LPC0, LTAP, LPET, and LLIF, an energy dispersive X-ray (EDS) spectrometer, visible light microscope (transmitted and reflected), and detectors for absorbed, secondary, and backscattered electrons (the conditions used were acceleration voltage of 20 kV, probe current of 15 nA, and beam diameter of 5 μm).

The calibration standards used were albite (Na), periclase (Mg), SiO_2 (Si), Al_2O_3 (Al), Fe_2O_3 (Fe), $MnTiO_3$ (Mn), vanadinite (Cl), diopside (Ca), TiO_2 (Ti), Cr_2O_3 (Cr), fluorite (F), vandinite (V), and apatite (P).

Results

Bead L00854-1 (Figure 1a) has a dark-green color, resinous luster, irregular texture, and a rough surface. Bead L00854-2 (Figure 1b) has a bright-green color, resinous luster, homogeneous texture, and compact appearance. Bead un1 (Figure 1c) has a light-green color with shades of white, resinous luster, and irregular texture, and it shows abundant veins of wyllieite with a thickness less than 1 mm. Bead un3 (Figure 1d) has a bright-green color with white and brown areas, resinous luster, and irregular texture, showing a porous surface. Bead un5 (Figure 1e) has a dark and bright-green color, resinous luster, and homogeneous texture.

Micro-Raman spectroscopy represents a fast and nondestructive method for distinguishing the phosphates of the variscite mineral group (e.g., Frost et al. 2004). The micro-Raman spectra of the five beads were compared with the reference spectra of the variscite group minerals (variscite, metavariscite, strengite, and phosphosiderite) of the database RRUFF (http://rruff.info/) using the same laser of 532 nm. The spectra show that they are composed dominantly of phosphates of the variscite-strengite series (Figure 4). Samples L00854-1, un1, and un2 display a Raman spectrum similar to that of variscite (the most intense bands in the stretching vibrations region of the PO_4^{3-} units are at 1020 cm^{-1} and 1060 cm^{-1}, with less defined bands for other components). According to Frost et al. (2004:1049), the most intense band in the region 900–1200 cm^{-1} of variscite is at 1023 cm^{-1}.

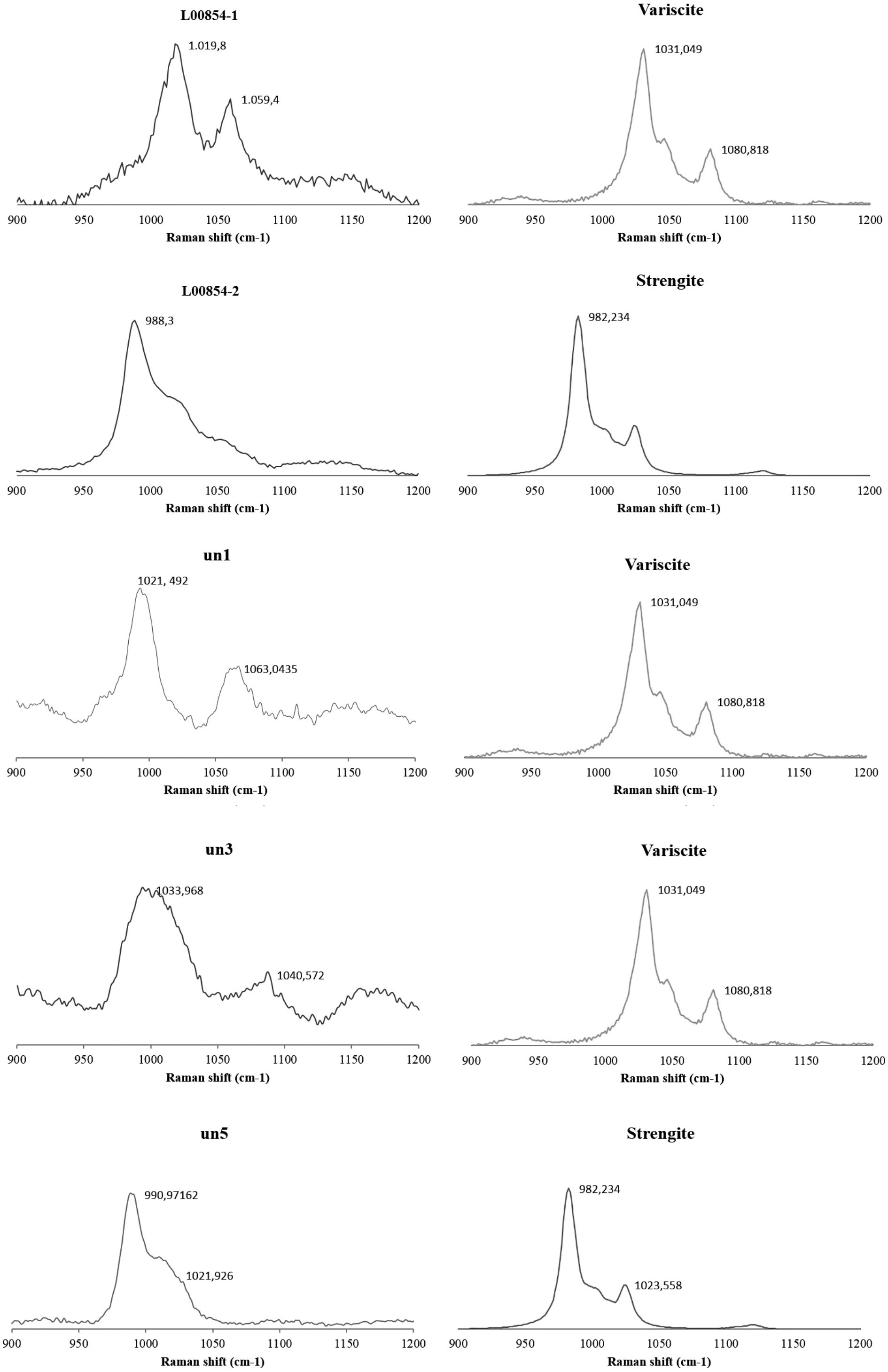

Figure 4. Micro-Raman spectra of beads L00854-1, L00854-2, un1, un3, and un5, and two reference analyses from RRUFF database (http://rruff.info/; Frost et al. 2004).

Table 1. Representative EPMA Analysis of Taironavariscite (Oxides in wt%). Beads L00854-1 and L00854-2. Cations Calculated Based on Four Oxygens.

	L00854-1						L00854-2					
SiO_2	.317	.238	.272	.325	.270	.243	.020	.029	.048	.009	.017	.015
TiO_2	.046	.046	.040	.035	.029	.022	.632	.538	.310	.685	.352	.586
Al_2O_3	30.262	30.110	30.323	30.294	30.408	30.197	19.688	19.641	20.318	18.436	20.588	19.178
Fe_2O_3	.486	.447	.490	.487	.460	.479	12.063	12.889	12.568	13.759	12.084	12.975
MnO	.000	.000	.000	.000	.002	.000	.016	.020	.010	.023	.022	.019
MgO	.004	.007	.007	.003	.008	.011	.005	.000	.015	.003	.014	.005
CaO	.037	.029	.030	.028	.030	.036	.021	.028	.014	.019	.013	.024
Na_2O	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Cr_2O_3	.166	.144	.172	.179	.161	.146	1.075	1.078	.730	1.254	.602	1.119
V_2O_3	.399	.373	.369	.388	.396	.383	.021	.021	.034	.008	.004	.005
P_20_5	49.092	48.699	48.849	47.902	48.317	48.615	46.674	45.910	46.334	45.930	46.432	46.241
F	.000	.027	.000	.000	.000	.000	.045	.000	.035	.101	.118	.045
Cl	.030	.024	.038	.036	.012	.003	.000	.012	.035	.009	.000	.027
Total	80.839	80.142	80.590	79.678	80.092	80.134	80.259	80.166	80.449	80.236	80.245	80.239
Si	.008	.006	.007	.008	.007	.006	.001	.001	.001	.000	.000	.000
Ti	.001	.001	.001	.001	.001	.000	.013	.011	.006	.014	.007	.012
Al	.895	.898	.900	.910	.908	.901	.636	.639	.656	.604	.664	.624
Fe^{3+}	.010	.009	.010	.010	.010	.010	.276	.298	.288	.320	.277	.299
Mn	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.001	.000
Mg	.000	.000	.000	.000	.000	.000	.000	.000	.001	.000	.001	.000
Ca	.001	.001	.001	.001	.001	.001	.001	.001	.000	.001	.000	.001
Na	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Cr	.003	.003	.003	.004	.003	.003	.023	.024	.016	.028	.013	.024
V	.007	.006	.006	.007	.007	.006	.000	.000	.001	.000	.000	.000
P	1.043	1.043	1.041	1.034	1.036	1.042	1.082	1.073	1.075	1.081	1.076	1.081
F	.000	.002	.000	.000	.000	.000	.004	.000	.003	.009	.010	.004
Cl	.001	.001	.002	.002	.000	.000	.000	.001	.002	.000	.000	.001
P/Al	1.165	1.162	1.157	1.136	1.141	1.156	1.703	1.679	1.638	1.790	1.620	1.732

Samples L00854-2 and un5 are more similar to strengite. The only intense band in the stretching vibrations region of the PO_4^{3-} units is at 988 cm^{-1}, with less defined bands for other components. According to Frost et al. (2004:1048), the Raman spectrum of strengite shows a strong band at 985 cm^{-1}, assigned to the v1 symmetric stretching vibration of the PO_4 units. The number of bands observed in stretching regions of the PO_4 units is an indication of multiple PO_4 species (Frost et al. 2004:1048).

A shift in the position of the main peaks of the analyzed samples probably corresponds with variations in the Al-Fe contents. In general, the Raman spectra of the analyzed samples have wide bands and low-intensity peaks.

Figure 5 displays the XRD results. Sample L00854-1 shows the presence of one crystalline phase consistent with variscite, while L00854-2 shows two crystalline phases consistent with variscite and intergrown variscite and quartz.

The electron microprobe analyses (Table 1) from both beads are plotted in molar proportions as a ternary diagram of P_2O_5, $(Al, V)_2O_3$, and $(Fe, Cr)_2O_3$. Both beads have similar phosphorus content, although L00854-2 shows considerable compositional variation in terms of Fe_2O_3, with values ranging between .276 to .320 weight percent (wt%; Figure 6).

Representative compositions of variscite from both beads are presented in Table 1. They show high values of Cr_2O_3 and V_2O_3. L00854-1 has values of Cr_2O_3 and V_2O_3 in the ranges of .14–.18 and .37–.40 wt%, respectively. Similarly, L00854-2 has values of Cr_2O_3 and V_2O_3 in the ranges of .60–1.25 and .01–.03 wt%, respectively.

The atomic ratio P/Al obtained for L00854-1 is about 1.2, which is close to the value of pure stoichiometric variscite represented by the formula $AlPO_42H_2O$. Nonetheless, substitutions of other ions, such as Fe^{3+}, Cr^{3+}, and V^{3+}, increase this ratio. For example, it is about 1.7 for L00854-2.

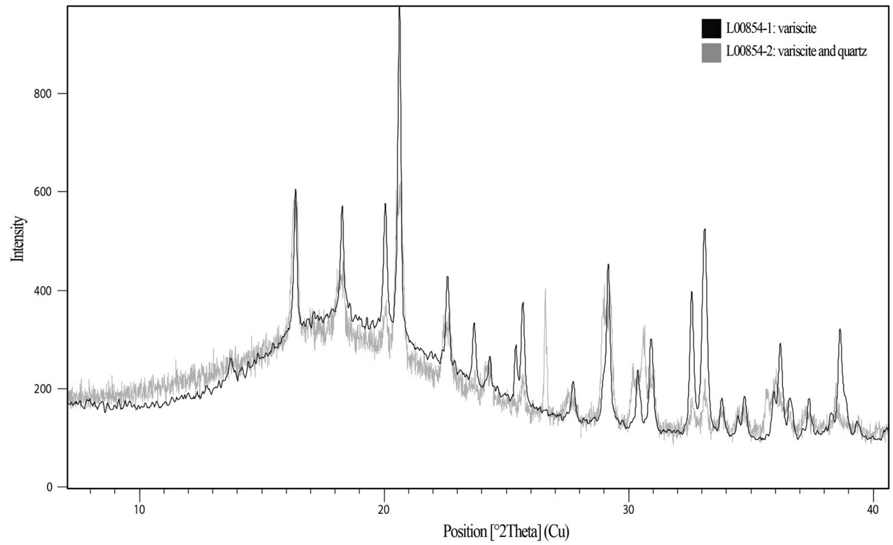

Figure 5. Diffractograms of beads L00854-1 (variscite) and L00854-2 (variscite and quartz).

Discussion

Two sources of phosphatic minerals are known in Colombia. Phosphate deposits are found in the Upper Cretaceous continental margin sedimentary sequences of the Eastern Cordillera (INGEOMINAS 1978; McConnell 1943), some of which are currently exploited for fertilizer, but reports of variscite are lacking to date. The second location, alpelo Island (Figure 7), contains variscite and metavariscite deposits as the result of the alteration of volcanic rocks during interaction with aqueous solutions rich in phosphoric acid derived from the decomposition of guano (McConnell 1943).

At a greater distance from the Sierra Nevada de Santa Marta, geological formations containing phosphates also occur on the island of Gran Roque, northeast of the archipelago of Los Roques,

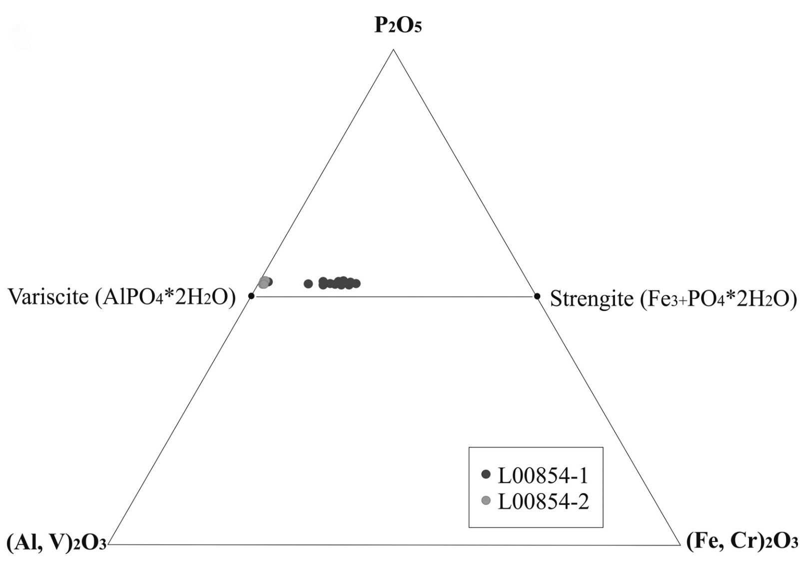

Figure 6. Ternary diagram with the projection of EPMA analyses of the two variscite beads (L00854-1 and L00854-2) (atomic proportions). Values shown in Table 1.

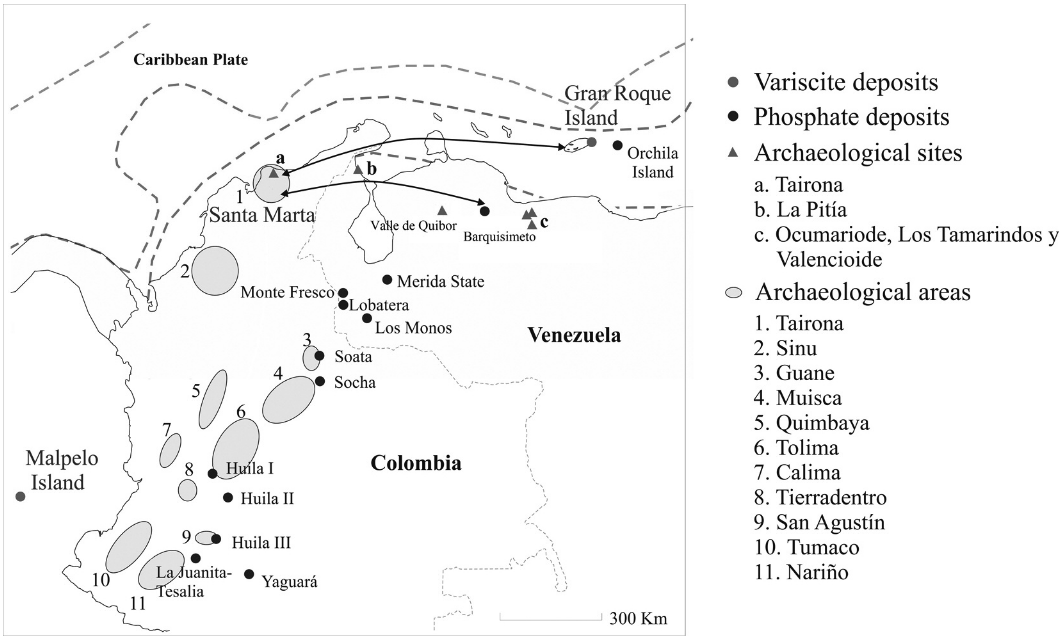

Figure 7. Possible routes of variscite exchange in the southern Caribbean region (modified after Langebaek 2003:Figure 1) with indication of location of variscite and phosphate deposits (Appleton and Notholt 2002; INGEOMINAS 1978).

Venezuela (Figure 7). At this location, Cretaceous igneous and metamorphic rocks have been altered to phosphates, variscite being the most characteristic mineral (Aguerrevere and López 1938; McConnell 1941; Ostos 1990; Urbani 2005). Similar deposits have been reported in mainland Venezuela to the north of Barquisimeto, where Urbani et al. (2012) describe aheylite phosphate ($(Fe^{2+}, Zn) Al_6(PO_4) 4(OH)_8 4(H_2O))$, a rare mineral belonging to the turquoise group and associated with other phosphates, including variscite (Foord and Taggart 1998). The onshore geology of the Caribbean Basin, including Colombia, Venezuela, the Antilles, and Central America, is suitable for the formation of variscite. Cretaceous to Tertiary magmatic, metamorphic, and sedimentary rocks anywhere in this large region may have been exposed to guano deposition and, therefore, to phosphoritization by means of rock-phosphoric solution interaction. Thus, other potential sources of variscite may exist. Nonetheless, we favor the view that the studied Tairona variscite beads came from relatively close variscite deposits, either those two mentioned above or others not yet discovered in Colombia or Venezuela.

Of the known sources of variscite, the Malpelo Island of Colombia can be excluded. This is a small (1.2 km^2) uninhabited island in the East Pacific Ocean located about 500 km west of the Colombian mainland, with a rough seashore (steep cliffs), strong marine currents, and no indications of human settlements until 1986 by the Colombian Army.

There is no evidence to suggest that precolumbian populations permanently inhabited Gran Roque Island. Nevertheless, groups from the central coast of Venezuela (Ocumaroide style, A.D. 850–1600) and the Valencia Lake (Los Tamarindos style, A.D. 200–900, and Valencioide Style, A.D. 900–1500) visited the island to exploit its resources (Antczak and Antczak 2006; Kidder 1944). These cultural groups built up complex and dynamic mobility and interaction patterns with important sociopolitical implications in the Venezuelan region (Navarrete 2005).

The occupation sequence for the La Pitía archaeological site (Figure 7; Acosta 1953; Cruxent and Rouse 1958; Gallagher 1976), located in the Gulf of Venezuela, serves as a starting point to propose an outline for the ancient settlement of Venezuela and their interregional interactions; the inhabitants of La Pitía may have had connections with Central America, as indicated by the discovery of jade beads at the site (Acosta 1953). Furthermore, similarities have been found between artifacts from the La Pitía archaeological site and artifacts from the Rancheria region, Colombia, and the Valencia Lake, central Venezuela (Acosta 1953:7). Winged ornaments from Venezuela (Antczak and Antczak 2006; Perera 1979; Wirz 1948) are similar to those associated with the Tairona culture (i.e., winged plates made of serpentinite with similar stylistic forms). Variscite beads similar to the ones described here from the Sierra Nevada have been found at archaeological sites (La Pura y Limpia and Pueblo Nuevo) on the central coast of Venezuela in the Quibor Valley (Franco Urbani and Luis E. Molina, personal communication 2016). Together, this evidence strongly supports connections linking the northern part of South America during the prehispanic period.

These networks probably connected the Caribbean Colombian and Venezuelan coasts mostly via coastal trade (but river and land routes are not excluded). This may be considered as part of a network of broader precolumbian interactions that connected the southern margin of the circum-Caribbean region with the Colombian Andes (Figure 7). In fact, a connection with the communities of the upper Magdalena River through land routes would have been possible.

The discovery of variscite artifacts in the archaeological collections of the Museo del Oro and the Universidad del Norte opens new opportunities for research on the mobility of raw materials during precolumbian times, similar to obsidian (Jiménez-Reyes et al. 2001). The green color is an important characteristic that would have made variscite a desirable resource for precolumbian communities, which associated greenstone with prestige, such as they also did with jadite (García-Casco et al. 2013; Mason 1936; Reichel-Dolmatoff 1997; Rodríguez-Ramos 2011). Precolumbian demand for variscite and the central geographic location of the Sierra Nevada favor the hypothesis of an exchange network between the precolumbian Tairona society and other communities farther away, such as mainland Venezuela or Gran Roque Island. This exchange network was most like established by means of coastal trade (Fitzpatrick 2013).

The variscite artifacts that we examined in the first stage of this study—from which our analyzed sample of five was drawn—constitute a significant number of ornaments from the Tairona period. They could easily be misidentified as turquoise, jade, or malachite. We suspect that other archaeological ornaments from the Sierra Nevada de Santa Marta region, which Mason (1936) described as being made from malachite and turquoise, may in fact represent artifacts made of variscite.

Conclusion

Our analyses have identified five precolumbian Tairona ornamental artifacts from the Sierra Nevada de Santa Marta as having been made of variscite. We therefore hypothesize that this mineral may have been used for the production of many more of these types of artifacts. Artifacts made from variscite have not been reported previously in prehistoric collections from Colombia. This finding is of great importance for archeological and geological research in the South Caribbean and Colombian-Venezuelan Andean region because the initial identification of this small sample raises two questions. First, how important was this material for trade during the precolumbian period? Second, do other unknown variscite deposits exist? We propose that exchange took place and other relations existed between groups living in the Sierra Nevada de Santa Marta and communities in distant areas, such as Venezuela. Nonetheless, more research is needed to understand exchange dynamics in this region.

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