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Butrint (Albania) between eastern and western Mediterranean glass production: EMPA and LA-ICP-MS of late antique and early medieval finds

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ABSTRACT

In the Late Roman period, the city of Butrint (SW Albania) was one of the most important seaports of the eastern Mediterranean due to its very favourable position and an extended presence of human settlements (from the 5th century BC to the modern age). The city seems to have particularly flourished after being declared a Roman colony under Augustus in 31 BC, but even after the Roman period, Butrint remained a central node in eastern trade routes.

During the archaeological campaign of 2011 directed by David Hernandez (University of Notre Dame – US), aimed at identifying the eastern border of the Butrint Roman Forum, several glass artifacts were recovered and dated to the late antique and early medieval period.

In this study 33 fragments of glass (32 transparent, 1 opaque) were analysed from different objects (drinking glasses, bowls, etc) mostly dated from the 5th to the 6th centuries AD.

The aims of this work are: i) understanding the raw materials, the manufacturing techniques employed for glass production, and their evolution through the time; ii) correctly classifying items of uncertain date; iii) interpreting the economic development and trade models of the area.

Chemical analyses were performed by electron microprobe (EMPA) for major and minor elements and by ICP mass spectroscopy (LA-ICP-MS) for trace elements.

The chemical results indicate that the samples were produced with natron as fluxing agent. They can be divided, on the basis of the concentrations of Fe, Ti, and Mn, between the two main compositional groups widespread in the Mediterranean from the 4th century onward: HIMT (23 samples), and Levantine I (10 samples). Among the HIMT samples, both "weak" HIMT (13 samples), and "strong" HIMT (10 samples) were identified. This variety of compositions indicates that in Butrint, between the end of the 4th and the end of the 6th century, the glass materials were probably imported from different suppliers.

1. Introduction

Set on a small hill, facing the Vivari Channel, between the Butrint swampland and the Mediterranean Sea, the ancient *Buthrotum* was one of the strongholds of the main Hellenistic and Roman trade routes.

The origins of the site are not easily traceable, but the finding of some lithic tools has led to the hypothesis of a Neanderthal settlement (Hodges and Hansen, 2007). The few data traceable to the Hellenistic period seem to indicate a first nucleus dated to the 8th–7th century BC, linked to the presence of some Trojan exiles (as testified by Virgil). The construction of an important temple dedicated to Asclepius is possibly dated to the 3rd century BC, a period in which Butrint assumed a significant administrative role in the *koinon* of the Praesebes tribe (Hodges and Hansen, 2007).

In 44 BC, Julius Caesar proposed transforming Butrint into a colony (Hodges and Hansen, 2007; Hernandez and Çondi, 2008), but only in 31 BC Augustus decreed this status. From that time onwards, Butrint flourished progressively and several infrastructures were realized, including an imposing aqueduct

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(Ugolini, 1937; Hodges and Hansen, 2007; Hernandez and Çondi, 2008). The town entered a crisis starting from the end of the 4th to the beginning of the 5th century AD, when the ancient Roman buildings started to be ransacked and the area of the forum was occupied by common houses (Hodges and Hansen, 2007). After that, the history of Butrint is again uncertain with the archaeological stratifications providing little information for the 6th century AD, and even less for the period between the 7th and the 9th century AD (Hodges et al., 2000).

The following centuries were characterized by Byzantine dominion over the area, with Butrint being recognized as a strategic geographical position of primary importance for the control of the Aegean Sea. Subsequent rapid changes of dominion confirm the great instability of the area in medieval times (Hodges et al., 2000) and in the 16th century AD, the city of Butrint was definitively abandoned.

Butrint was rediscovered by an Italian archaeologist, Luigi Maria Ugolini, who excavated the ancient town in the years 1928–1936. Italian teams (until 1940), the Albanian Archaeological Institute and the Butrint Foundation (from 1993) gave continuity to the archaeological investigations in the area (Ugolini, 1937; Hodges et al., 1997; Hodges and Hansen, 2007; Hernandez and Çondi, 2008).

In 2004 a new research project was started with the aim of redefining Butrint's historical phases, directed by Richard Hodges (The American University of Rome), David Hernandez (University of Notre Dame du Lac, Indian–USA), and Dhimitër Çondi (Albanian Archaeological Institute), and co-sponsored by the American Philosophical Society. The archaeologists managed to locate the northeastern boundary of the Roman forum (dated at the 2nd half of the 1st century AD), built with remarkably large limestone slabs, with estimated dimensions of 20 × 70 m, much wider than expected (Hernandez, 2011). During the 4th century AD, possibly after a violent earthquake, the forum floor was covered with a raised layer (Hernandez, 2007). Around the 5th–6th century AD, new buildings were erected in the area providing evidence of the endurance of the site until at least the end of the 6th century AD. During the 7th century, erosion layers from the adjacent acropolis accumulated on the forum area and some necropolises were constructed. The area was again occupied between the 10th and the 16th century, with new buildings and a cemeterial area, possibly connected to a Byzantine settlement (Hernandez, 2007).

The excavation campaign in 2011 in the area of the Roman Forum (Hernandez, 2011), substantiated the chronological stratification of the area and the persistence of commercial activity. Among the various materials (coins, ceramics, etc.), several glass finds were recovered and analysed.

Typological studies of the glass material dated around 800 AD ca. from Butrint (tower 1 and 2 of the Western defence) were conducted by Jennings (Jennings, 2010; Jennings and Stark, 2013). In these studies, the large group of objects is represented by wine glasses classifiable as: a) short stem, b) long stem and c) hollow stem. A previous study by Schibille (2011) represents the first attempt to investigate the chemical complexity of the glass types found in Butrint. Schibille presents data for different types of glass artifacts (tesserae, windows, vessels, debris), variably dated and of different provenance within the Butrint area, leading to the confirmation of regional and temporal variations in glass composition, as is well attested in the Mediterranean area, indicating the existence of primary glass production groups. The marked complexity that emerged and subsequent difficulty in systematizing the range of glass production data is possibly due to the great variety of the finds (types, colours, chronology, provenance) considered.

In the present study the materials – mostly well dated (on the basis of precise archaeological data), and including different types of glass – were selected from a single provenance (the Roman Forum). Most of the material analysed in the present work is dated between the 5th and the 6th century, on the basis of archaeological and typological criteria. Obtaining chemical features of a number of selected diagnostic fragments (i.e. attributable to recognized forms) will allow to define compositional groups, to establish relation of each group to the form and/or chronology of the glass, and to compare the glass varieties from Butrint with the coeval scenario of glass production in the Mediterranean. In some cases, the chemical composition could also confirm or support an archaeological hypothesis. This is achieved by establishing the major and minor chemical component fingerprints for a certain type or chronology, but fundamental support is also provided by the analysis of trace elements, extremely helpful for identifying glass production types of the Mediterranean area in the first millennium CE (Arletti et al., 2010a,b; Freestone et al., 2002; Šmit et al., 2013).

2. Glass chemical composition of Late Roman period: the state of the art

The Late Roman period is perceived to be a period of transition in many field, from the new political organisation of the Empire – which was formally divided into Eastern and Western in the 4th century AD- to the general social, cultural and economic changes, that are reflected in the material records. As observed by Foster and Jackson (2009), also the glass of the Late Roman period differs from that produced in the previous centuries: while the 1st–3rd the glass was commonly blue–green, in the 4th century it was characterized by a yellowish-green colour. This change in colour was coupled with a general decline in the quality of the glass, the later glass showing more bubbles and unaesthetic inclusions. A number of recent publications (Freestone et al., 2000, 2002; Foy et al., 2003) have suggested that at least two new glass compositions were introduced in the 4th century AD and continued to be produced until the 8th century AD: Levantine I glass and HIMT (High Iron Manganese Titanium). Freestone (1994) named HIMT a glass (previously identified by Sanderson et al., 1984) characterized by high level of iron, manganese and titanium, with a positive strong correlation between iron and titanium and a less strong positive correlation between iron and manganese. Subsequently (2005) he stressed also the positive correlation between iron and alumina. Moreover, Foster and Jackson (2009) observed for this glass the presence of higher soda (Na_2O ~18–19%), magnesia (usually MgO ≥0.8%), and lower lime (CaO ~6%) with respect to that normally found in the earlier Roman glass. Glass of the same composition was recognized also by Foy et al. (2003) in Late Roman glass from France (Group 1 and 2). The other glass type introduced in the 4th century – called Levantine I by Freestone et al. (2000) and matching the 'Group 3' identified by Foy et al. (2003) – contains lower soda (Na_2O ~15%), higher lime (CaO ~9%), and often lower levels of iron (FeO ~0.4%) than HIMT glass (Foster and Jackson, 2009).

These chemical features have been recognized in many other studies, relative to the Levantine I (e.g. Freestone et al., 2002; Foster and Jackson, 2009; Schibille et al., 2008) and to the HIMT glass (e.g. Arletti et al., 2010a,b; Freestone et al., 2002; Foster and Jackson, 2009; Mirti et al., 1993; Šmit et al., 2013). Table 1 reports the minimum, maximum and the average of Al_2O_3, FeO, MgO, CaO, Na_2O, K_2O, TiO_2 and MnO (oxide weight %), relative to the samples analysed in the aforementioned papers (and also this work). Foy et al. (2003) observed a sub-division of HIMT glass into "strong" (Group 1) and "weak" (Group 2) on the basis of their Fe, Ti, and Mn concentrations. A similar subdivision was found by Foster and Jackson (2009), whose sub-group HIMT1 corresponds to Group 2 Foy et al. (2003), while the sub-group HIMT2 is characterized by the