



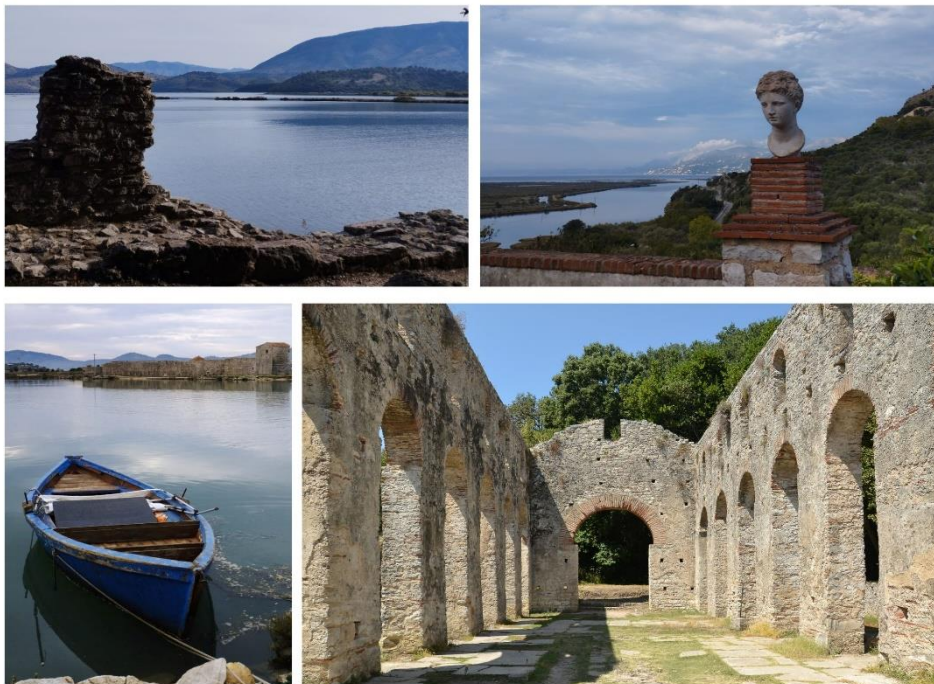
SAPIENZA
UNIVERSITÀ DI ROMA

PhD Program in Earth
Sciences

Curriculum in
Environment and
Cultural Heritage

XXXIX cycle

DIACHRONIC RECONSTRUCTION OF HUMAN-ENVIRONMENTAL RELATIONSHIP: ARCHAEOBOTANY AT THE UNESCO WORLD HERITAGE SITE OF BUTRINT (ALBANIA)



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Co-tutors (suggested): Prof. Richard Hodges; Dr. Claudia Moricca

INTRODUCTION AND STATE OF ART

The site of Butrint, ancient *Buthrotum*, located 3 km from the straits of Corfu on the Vivari Channel (Albania) at the southern end of the lake of the same name, is part of the UNESCO World Heritage List since 1992. It is placed in a strategic position, surrounded by the waters of the lagoon (Morellon et al., 2019 *Environment and Society in the Long Late Antiquity*, 185-199). The earliest evidence of human presence in the surrounding area is dated to the Paleolithic. The Butrint Peninsula was sporadically occupied during the Bronze Age and the Archaic period (8th c. BC). The first major transformation occurred in the 4th c. BC when Butrint became a Hellenistic port city. During the 1st c. BC *Buthrotum* was colonized by Rome in 44 BC and later re-founded under Augustus as *colonia Augusta Buthrotum* (Hernandez et al., 2018 *L'Illyrie méridionale et l'Épire dans l'antiquité VI*, 629-645).

Around the mid-4th c., Butrint suffered from a catastrophic seismic event and was the epicenter of a tectonic paroxysm in early Byzantine age (4th-6th c. AD) which implied the variation of the waterfront of the city (Bowden, 2011 *Butrint 3: Excavations at the Triconch Palace. During the 5th century*, 303-318). This is a key period not only for the social decline, characterized by the abandonment of the public area and the reorganization of urban planning and society toward a more artisanal/agricultural activities (Hodges, 2016 *Adriatico altomedievale (VI-XI secolo)*, 1-22), but also for the coincidence with the Justinian plague (541-542 AD) (Sabbatani et al., 2012 *Le Infezioni in Medicina*, 2, 125-139).

From the 7th c., Butrint was reduced to a small, fortified town and was conquered by the Bulgarian Empire first and then by the Byzantines in the 9th c. The settlement contraction lasted until the 10th c. (Hodges, 2016). Butrint was continuously occupied until the 16th c. (Crowson, 2007 *Butrint Foundation*).

The site has been archaeologically investigated since 1928. The excavations have involved different areas and periods, such as the Roman Forum which gave back material evidence spanning from the 7th c. BC to the 16th c. AD (Hernandez et al., 2018), or the medieval towers of the Western Defenses (Hodges, 2016). In 2022 and 2023 I performed archaeobotanical sampling of these contexts, which were characterized by a rich concentration of materials (seeds/fruits and wood) preserved by waterlogging/carbonization, coherently with past archaeobotanical studies (Livarda and Giorgi, 2019 *Butrint 5: life and death at a Mediterranean Port: the non-ceramic finds from the Triconch Palace*, 15-24; Sabato et al., 2013, *IWGP Thessaloniki 2013*; Sabato et al., 2023, *Veget Hist Archaeobot*). Waterlogged/charred remains examined in these studies, dated to Roman, pre-Roman and Venetian periods, showed consistent assemblage of crop and wild species that provide insight into the economy/diet in Butrint. Only one pollen study in the lagoon has been done so far (Morellón et al., 2016, *Quat Sci Rev*). It was aimed at reconstructing the environmental changes that occurred around the Butrint lagoon during the Late Antiquity and the Early Middle Ages (600 BC to 1300 AD), highlighting the strict connection with dramatic changes in the landscape with climate variability and socio-economic transformation, especially during the 7th c. and after ca. 900 AD.

Given the wide variety of well-preserved plant materials from different contexts, chronologically distributed over a long period of occupation, Butrint is a perfect case study for a diachronic reconstruction of human-environmental interaction and vegetation changes through archaeobotanical analysis. Furthermore, the archaeobotanical data in Albania are scarce, mainly related to the important basin of Ohrid Lake (<https://www.jcu.cz/en/university/news/summer-school-of-archaeobotany-in-ohrid-macedonia-participates-in-an-international-project>). Butrint, as port city strategically positioned, represent an excellent starting point to extend such knowledge.

To get a broader spectrum of information I plan not only to perform traditional archaeobotanical analyses based on taxonomic recognition, but also modern techniques such as isotopic analyses, when possible. As studies in the Near East (Vignola et al., 2017 *Rev Palaeobot Palyno*, 247: 164–174; Vignola et al., 2018 *Rapid Commun Mass Spectrom*, 32: 1149–1162) have shown, stable isotopes of carbon and nitrogen on archaeobotanical macro remains are very useful to obtain information on climatic fluctuations, soil drought conditions, and agronomic management of crops. This innovative approach would be applied for the first time. The reconstruction of landscape changes and vegetation dynamics is always complex and for this reason a multi-proxy approach is essential. It allows to cross-reference and check data derived from different disciplines, as well as to complement them.

RESEARCH OBJECTIVES

Overall objectives

Diachronic reconstruction of the relationship between human impact and vegetation dynamics at Butrint over the centuries, as a starting point for archaeobotanical studies along the Ionian coast.

Specific objectives

- Subsistence strategies adopted by the population of Butrint through classical archaeobotanical analysis on plant macro remains.
- Human-plant relationship between the 4th and 6th c. AD, a significant decline period at Butrint.
- Agronomic practices (fertilization/irrigation) at Butrint through stable isotope analysis on plant macro remains.

IMPLICATIONS AND/OR APPLICATIONS

- Achieving a broader multidisciplinary and diachronic view of the human-environment relationship at Butrint and surroundings.
- Increasing knowledge about the climatic conditions that have influenced vegetation over the centuries in and around Butrint.
- Focusing on a critical period (4th-6th c. AD) of Butrint.
- Providing for the first time in-depth archaeobotanical and palaeoenvironmental data for an Albanian archaeological site.
- Providing evidence of past landscape changes and environmental risk.
- Raising awareness in tourists about environmental changes around the site.

WORK PLAN

- *Bibliographic research* - this part will last all for the entire duration of PhD program as continuous updates are necessary for the quality of research. At the very beginning of the project, bibliographic research will be my main activity due to the multidisciplinary aspects covered by my research. In fact, not only archaeobotanical information, but also, palynological, ecological, archaeological, and historical sources will be taken in consideration.
- *Sampling and processing of sediment* – processing of already available archaeobotanical materials, collected during previous archaeological campaigns, and recovery of new samples throughout my PhD program. I will participate in recurring excavation campaigns to collect additional soil samples from as many contexts as possible. The presence of contexts such as the Roman Forum and Western defenses, which have so far return waterlogged/charred remains, will assure me to have enough material to study. Sample processing will be mostly carried out on-site. Separation of seeds, fruits, and wood remains from the sediment according to the modality of preservation, will be carried out. For charred remains, flotation suffices based on Hillman's prototype (Renfrew and Bahn, 2000). For waterlogged remains, the "wash-over" technique will be used (Sabato et al., 2013). Part of these processes will also be carried out, along with identification, at the laboratory of Archaeobotany and Palynology of the Department of Environmental Biology at Sapienza University of Rome. Sample processing is very time-consuming and will take up several months.
- *Carpological analysis* - taxonomic identification of seeds/fruits remains using a stereomicroscope and reference atlases. The repetition of the process will be necessary due to the possibility of collecting new samples throughout my PhD. Expected results: **obtain information on the main species cultivated and collected by the Butrint population during the different occupation periods of the site. This will also help me to select the most suitable carpological remains for isotopic analysis.**
- *Xylological and anthracological analysis* - analysis and identification of charred wood remains using a Normaski microscope (differential interference contrast), while the preparation of thin sections, analyzed through a transmitted light microscope, will be necessary for waterlogged remains. This process will be repeated after each sampling campaign. Expected results: **overview of the wood taxa available for different purposes of exploitation by the Butrint population as well as insight on the environmental condition of the area. This will also help me to select the most suitable wood remains for isotopic analysis.**
- *Pre-treatment of samples for stable isotope analysis* - depending on the depositional conditions in which they were buried, archaeobotanical samples may have been exposed to various contaminants (carbonates, nitrates, humic acids) that need to be removed by chemical pretreatment. This does not affect the material. Seeds/fruits and wood need different chemical pretreatments.
- *Carbon ($\delta^{13}\text{C}$)/Nitrogen ($\delta^{15}\text{N}$) stable isotope analysis and data interpretation* – this activity will be concentrated in the second half of the PhD program.
 - **Carpological remains** - nitrogen and carbon stable isotope analyses will be carried out. The results will be evaluated taking into account ecology and physiology of the plant, in order to detect any differences in the management of each taxon, and will be

compared with already published studies (e.g. Fraser et al., 2011 *Ecol Soc*, 16: 01; Wallace et al., 2013 *World Archaeology*, 45: 388-409).

- **Anthracological remains (charred wood)** – stable carbon isotope analysis will be carried out on taxa selected on the base of the ecological characteristics to observe changes in atmospheric humidity and, consequently, in climatic conditions at regional scale. They will be interpreted in according to the chronological framework that will be established together with archaeologists.

- *Multidisciplinary interpretation of results and writing of articles/final thesis* - the multidisciplinary comparison of results aims to provide a broad and comprehensive view of the human-environment relationship, agronomic and subsistence strategies, and climatic variations which Butrint has undergone throughout its history. This will be obtained from the diachronic combination of classical taxonomic recognition of carpological, xylological and anthracological remains and isotopic analyses. This precious data will obtain an additional value once interpreted using cultural-historical and anthropological sources. This will be the conclusive part of the PhD program. I intend to publish selected results in indexed scientific journals as soon as they will be available.

MILESTONES

- Identification of the main cultivars among the carpological and xylological/anthracological remains found in the investigated areas – End of 1st year.
- First results for stable isotope analysis performed on archaeobotanical remains – Middle of the 2nd year.
- End of stable isotope analysis – Middle of the 3rd year
- Interpretation and merging of the archaeobotanical data and isotopic analysis to reconstruct a diachronic image of the human-environment relationship of Butrint population – 3rd year.

These could be subjected to changes according to the typology of materials retrieved during the excavation campaigns.

DISSEMINATION PLAN

- Presentation of the results of the various phases of research during workshops/congresses/courses:
 - 15th IPC (International Palynological Congress) - 11th IOPC (International Organization of Paleobotany Conference) Prague, Czech Republic May 2024.
 - EAA (European Association of Archeologists) Annual Meeting, Rome August 2024.
 - 20th IWGP (International Working Group for Paleoethnobotany) Conference, University of Groningen, Netherlands, June 2025.
 - Presentation within courses of the master's degree program in "*Science and Technology for the Conservation of Cultural Heritage*":
 - Introduction to thesis and practical seminars
 - Plant biology
- Publications on scientific journal, popular magazines and archaeological books. I would like my thesis to be a collection of scientific articles that I plan to publish during my PhD course.

LIST OF TRAINING ACTIVITY

Carpological analysis training at the Department of Prehistory, Archaeology and Ancient History, Universitat de Valencia under the supervision of Dr. Guillem Pérez Jordà.

Seminar: “*Quaternary Paleoenvironments and Paleoclimate in the Mediterranean area*”, Dept. of Earth Sciences, University of Florence. (December, to be confirmed).

Winter school: 2nd International School, Dept. of Agricultural Sciences, University of Naples Federico II. “Wood and charcoals in Mediterranean forest ecology: anatomical investigation and cultural traits to interpret past and current climate change.”, Portici (Naples), Italy, 19-23/02/2024.

DETAILS OF RESEARCH/TRAINING PERIODS ABROAD

3 months of carpological analysis training at the Department of Prehistory, Archaeology and Ancient History, Universitat de Valencia under the supervision of Dr. Guillem Pérez-Jordà during the 2nd year of my PhD.

GAANT CHART

	Nov	Dic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Activities planned for the 1st year												
Bibliographic research												
Seminars, workshop, conferences (when available)												
On-site sampling												
Separation of macro-remains												
Carpological analysis												
Wood analysis												
Activities planned for the 2nd year												
Bibliographic research												
Seminars, workshop, conferences (when available)												
Separation of macro-remains												
On-site sampling												
Carpological analysis												
Wood analysis												
Stable isotope analysis												
Writing article(s)												
International mobility - Valencia												
Activities planned for the 3rd year												
Bibliographic research												
Seminars, workshop, conferences (when available)												
Last archeobotanical analyses												
Stable isotope analysis												
Diachronic analysis and regional framing												
Writing article(s) and final thesis												