

EAC Occasional Paper No. 18

Archaeology and the Natural Environment



Edited by Andreas Picker

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Edited by Andreas Picker

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Edited by **Andreas Picker**

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Back cover image: Pike perch at the UNESCO World Heritage site of Keutschacher See
in Carinthia / Austria (©Kuratorium Pfahlbauten)

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Foreword

EAC Occasional Papers – 23rd Annual Symposium, Museum of Natural History, Vienna, March 2022 Archaeology and the Natural Environment

BARNEY SLOANE

Outgoing President of EAC, December 2022

The relationship between the cultural history of the human race and the natural history of our planet is indivisible. For hundreds of thousands of years, we have depended upon, been shaped by, and in turn shaped the natural environment which we occupy. It is therefore perhaps a little surprising that the European Archaeological Council has only just turned its attention to this subject.

The timing is excellent however. The papers in this volume were first presented in the stunning venue that is the Museum of Natural History in Vienna, itself a host of some fabulous archaeological exhibits, at a time when strict divisions between cultural heritage management and natural environment management are beginning to dissolve. As states and communities wake up to the need for climate action, how we manage our land, water and ecosystems in an integrated way is profoundly affecting our approaches to archaeology.

Our symposium, and the papers contained in this volume, reflect three key aspects of archaeological heritage management as it relates to the natural environment. First, archaeological remains are a vital source of information about past ecosystems, providing first-class evidence of the changing nature of landscapes over time, the introduction and extinction of species and the way in which people valued the natural environment in the past. How can we as heritage managers making the most of this potential? Second, archaeological sites and monuments are themselves increasingly seen also as contributors to biodiversity with additional value to the visiting public. What lessons can we learn and share about successes in this area? And third, there are occasionally tensions between the laws and policies of archaeological heritage management and those of natural environmental management. Can we explore and learn from examples where compromise or balance has been successfully accommodated?

These papers represent the starting point for many important conversations, and I commend their quality and scope. The symposium organisers and especially the scientific committee deserve considerable thanks.

Archaeology and the natural environment.

An Introduction

ANDREAS PICKER

Archaeological sites and monuments are defined as spatial entities and are, therefore, an intrinsic part of any environment as humans perceive it. Landscape archaeology and concepts such as “landscape biography” have taught us that our environment has developed in millennia of interaction between humans and nature. Human societies adapt to and change their environments in co-evolutionary feedback loops – and archaeological sites also reflect this principle.

Obviously, human activities impact the natural environment. However, archaeologists and heritage managers rarely take a step further and view their sites and monuments from nature conservation point of view. To some extent, archaeologists tend to view their findings as isolated from the natural environment. The perception of the “naturalness” of places or landscapes varies on a broad spectrum. Still, people have always tended to differ strongly between the concept of a supposedly pristine natural environment and the perceived cultivated landscape.

Dealing with archaeological findings (and ultimately archaeological sites and monuments) can help us improve our understanding of how environments evolve and develop. This “historical” view of natural environments has been the main objective of environmental archaeology for decades. The research agendas of zooarchaeology, archaeobotany, and geoarchaeology have produced an invaluable basis for understanding past environments.

Beyond this, the relationship between archaeological heritage and the *present* environment should be brought into focus. Archaeological sites, monuments, and built environments require protection and conservation, which is part of heritage management plans in many countries. When a buried element of the archaeological heritage becomes excavated, preserved, and presented to the public, it begins to play a particular role in the management of our present environment and as a (new) habitat for plants and animals. This aspect has not been studied sufficiently so far.

EAC’s 23rd Heritage Management Symposium took place on 24–25 March 2022 at the Natural History Museum in Vienna, co-hosted by the Austrian Federal Monuments Authority (Bundesdenkmalamt). The choice of venue and cooperating institution attests to the symposium’s interdisciplinary approach. In the following 15 papers, the authors explore three general themes:



Figure 1. Habitation turned into habitat: the new look of preserved Roman buildings in Aguntum (Austria) following the planting of wildflowers typical to the Alpine Region. (©Oliver Stöhr, REVITAL Integrative Naturraumplanung)

1. Archaeological heritage as a habitat – monuments and sites as habitats

This theme focuses on currently preserved sites and monuments as habitats for flora and fauna but also on questions about how these archaeological environments can be physically protected. Best practical examples, like the partially excavated site of Aguntum in East-Tyrol (Austria) or large archaeological parks like Butrint (Albania), show how nature and cultural heritage management plans can be integrated successfully. In some places, biodiversity has not only been preserved but increased. The choice and management of vegetation are significant issues. The case study of Birka (Sweden) shows how the concept of the “wildness” of nature has changed in recent times. Natural calamities, like the bark beetle infestation, have also had a significant impact on archaeological sites, as several examples from the Czech Republic illustrate. Natural and human threats appear on land and underwater, even to the extent that an *in situ* preservation might be compromised. The Mazarrón II shipwreck (Spain) is an example of such a development.

2. Archaeology and biodiversity – understanding species introductions, distributions, and extinctions over time

Looking beyond today's preserved monuments, archaeological research has contributed greatly to understanding past habitats that underwent significant changes, especially from the middle to the late Holocene. Conclusions can be drawn on co-evolutionary dynamics and the effects of human activities on species extinctions and introductions, as the case studies from Belgium show. While habitats can be identified in the natural environment, archaeobotanical assemblages, like the findings from Voditza (Bulgaria), may be seen as a “secondary environment” for the utilised plant resources and archives for the reconstruction of agricultural practices and local vegetation. Besides, in-depth landscape archaeological analyses, like the one of a region in northern Westphalia (Germany), illustrate the development of the cultural landscape. What might appear as basic archaeological research at first can provide ecologists and policymakers alike with invaluable information.

3. Archaeological heritage and natural heritage management – conflict or collaboration in protecting nature and archaeology?

While the protection and conservation of archaeological sites and natural heritage have a lot in common, both issues are usually viewed separately on an organizational and legal level. However, before the bureaucratic framework becomes effective, the topic of collecting and managing data should be addressed. The international team of the ipaast-czo project has utilised remote sensing data from an agricultural background for heritage-related decision-making. Once more, the conceptions of “natural” or “artificial” environments collide, e. g., among the old water systems of Southern Hessen (Germany), where oxbow lakes and silted-up watercourses form significant archives for nature conservation as well as archaeology, but renaturation projects might threaten archaeological remains. An integrated view or even “double” protection may occur when significant sites (by chance or not) coincide with protected natural environments. The stone of St. Lawrence in Kuusalu (Estonia), with its two

different labels marking the site, may stand as one of many examples. Large-scale conservation projects, like in the Rhine-Sieg District (Germany), or the highly valued nature reserves and national parks, like in northwest Latvia, show high potential for integrating nature and heritage conservation policies and practices.

Finally, looking beyond the crucial case studies and invaluable individual experiences, there are opportunities to be seized from the realm of international law. The framework of international and European agreements and treaties still holds much potential for integrated approaches to nature and heritage conservation on a national level. As for archaeology and the natural environment (of which it is a part), ultimately – and with some efforts – “the twain shall meet”.

The Archaeological Landscape Park of Aguntum, an Alpine Roman town in East Tyrol. Synergy between cultural heritage, landscape protection, and biodiversity

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Keywords: Austria, Tyrol, Roman town, archaeological heritage, excavation, landscape park, tourism, biodiversity

The archaeological site of Aguntum, the only Roman town in the state of Tyrol, is located in East Tyrol, near the city of Lienz. It is managed by the “Curatorium pro Agunto” association, has its own museum, an excavation building, and an archaeological landscape park. The total area of the site is approximately three hectares, of which about two hectares belong to the archaeological landscape park (Figure 1).

Figure 1. Aerial view of the Roman Town and Landscape Park of Aguntum (©Oberrainer)



About ten years ago, the archaeological site of Aguntum was characterised by a lack of attractiveness to visitors, inconsistent appearance, and no clear line for future development. Therefore, in 2014, a broad-based project was initiated to define a mission statement for Aguntum in cooperation with the Tyrolean company, “REVITAL Integrative Environmental planning”, the “Curatorium pro Agunto” association and other institutions, including the Federal Monuments Authority Austria. The goal was to create a shared, comprehensive strategy that would serve as a future “big picture” for all decision-makers to orientate themselves by.

After a year of discussions and workshops, the jointly developed mission statement, still valid today, was defined like this:

“Visitors enter an Arcadian landscape where, between the ruins of the Roman city, a flourishing archaeological park opens up. The sometimes lush, sometimes sparse vegetation symbolizes past life in the diverse districts of the one-time city. Today, the historic site presents itself as a large, extraordinary archaeological landscape and experience space.”

In accordance with the mission statement, measures were taken to increase the attractiveness of the archaeological site. Development-related tasks were clustered around three distinct focal points: **design, restoration and conservation**, and **maintenance** to reduce the complexity of implementation.

The **design** has aimed to increase the attractiveness (elegance and ecology) of the outdoor area. The Tyrolean company REVITAL Environmental Planning has been responsible for the coordination and local construction supervision. In the last years, a visitor guidance and information system has been set up, and diverse spectacles like the *Macellum* viewing platform, the city gate, the side city gate, or the forum entrance were constructed. Small infrastructure, including resting areas and outdoor furniture and plants to provide shade, were also set up. Furthermore, the works included extended landscaping, for example, removing a dam at the city gate/entry to get a better view inside Aguntum.

Restoration and conservation works take place in Aguntum every summer. The work is done according to urgency, schedule, and the results of a prospection done in 2014. Urgent acute damage has to be treated as well. Walls and buildings restored many years ago are in danger of collapse due to weather damage. New and innovative ways had to be developed to conserve these elements in a way that also gives visitors an idea of the former buildings’ dimensions. Several solutions – all of which follow the same strategy – were tested and implemented to protect irreplaceable archaeological features with soil and reproduce their layout with newly built low walls, hedges, and small hills.

The third group of tasks is related to the **maintenance** of the archaeological site of Aguntum. In daily work, maintenance is mainly done considering the ecological aspects of extensive care, for example, choosing the right time and frequency to cut the grass. A general maintenance concept was created to support the people doing this

Figure 2. The different districts of Aguntum
(©REVITAL)



work in Aguntum. This concept has defined both overall measures and separate ones for different areas in the park, considering their particular characteristics (Figure 2). In order to increase the attractiveness of Aguntum, different plants were planted in each district of the one-time city. For example, the area of the marketplace was planted with herbs, while the thermal baths, with water-loving plants.

Figure 3. New vegetation and restored walls (©REVITAL)



In 2019, the NAGO association (www.nago-osttirol.at) conducted a biological study in Aguntum to get an overview of the actual situation of the natural environment and measure the effects of the introduction of the master plan (Figure 3). The study revealed the presence of numerous valuable, specially protected and/or endangered animal and plant species, as well as a widespread occurrence of drought-loving plants. The endangered low-nutrient and dry open habitats are also of particular importance. Biodiversity is very high compared to the available relatively small space: NAGO documented almost 1,000 different animal and plant species in Aguntum. Conclusively, Aguntum shows much potential for an even greater diversity of species and habitats.

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Butrint National Park “Integrated Management Plan”. Combining a nature park with cultural heritage

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Keywords: Butrint, national park, archaeological park, nature park, management, RAMSAR Convention, UNESCO, tourism, combination, strategic location

Butrint is the most important national park in Albania, with a wonderful and particular duality being both a nature and an archaeological park. Besides its magnificent and monumental setting, it is also a most attractive site, surrounded by several other natural and cultural resources. Butrint is located in the very south of Albania and occupies a total area of 16 hectares that matches the ancient city of Butrint and is protected by UNESCO. The area comprises a rich combination of hills, lakes, wetlands, open plains, reed beds, and coastal islands (Figure 1).

The remains of Butrint are dated from the Bronze Age to the Ottoman Era. It has particularly well-preserved features from the Roman and Byzantine periods, including beautiful mosaic floors. The archaeological site represents each period in the city's development (Figures 2–3).

In recent times, significant changes have occurred, all aimed at expanding the boundaries of the protected areas. Nowadays, we should be more aware of cultural and natural values and update and set the ways of management according to the applicable law.

Before the introduction of an Integrated Management Plan (IMP), it had been difficult for the Ministry of Culture or any other archaeologist to undertake any archaeological intervention or research in the area, as a bundle of permissions was required by the Ministry of Environment and Tourism (and vice versa). The problem was not only that two authorities controlled the area, the Ministry of Culture and the Ministry of Environment and Tourism, but also that these two authorities had opposing criteria for and interests in safeguarding the assets.

For many years, Butrint has been a number-one destination for both foreign and local tourism. It has been known and described by the best historians and archaeologists worldwide as a distinct small world in the Mediterranean, with a unique character owed



Figure 1. Overview of the National Park of Butrint (<https://www.butrint.al/rreth-nesh/historia>)

to over three millennia of continuous history. Also, the place – in the middle of nature, surrounded by lavish flora and fauna – gives visitors an unforgettable experience.

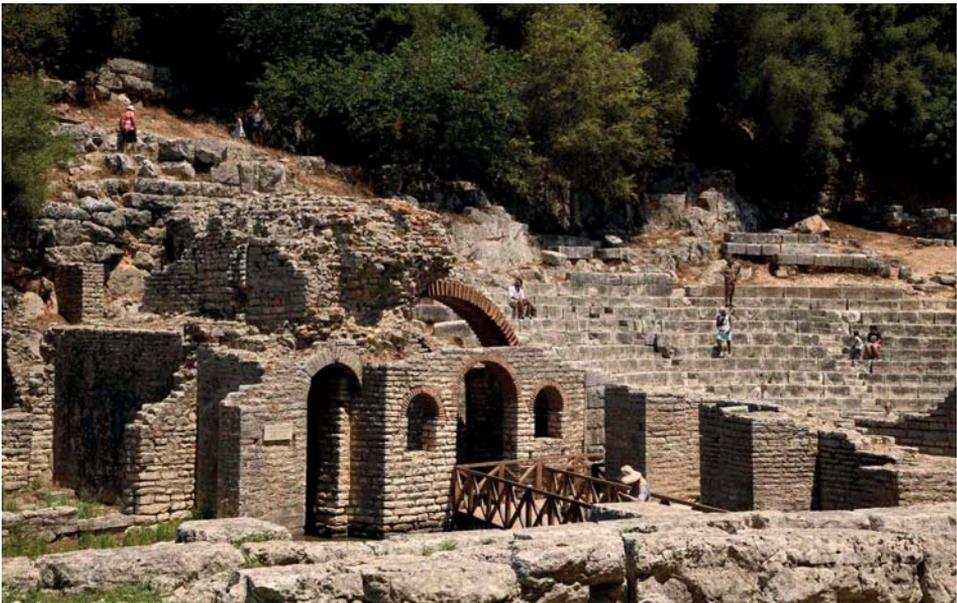
In 2021, the IMP for 2020–2030 got finally approved. An “Integrated Management Draft Plan of the National Park of Butrint 2020–2030” was prepared for the Albanian-American Development Foundation by Prince+Pearce Ltd. (UK) in 2019, in association with the Centre for Applied Archaeology, Institute of Archaeology, University College London, and the Cultural Heritage without Borders, Albania, with the contribution of the staff of Butrint Park, and, most importantly, the Ministry of Culture as initiator and beneficiary.

It is important to mention that the government owns the land today, bearing responsibility for all its natural and cultural assets. The IMP has foreseen that, in this case, a **foundation** will be the optimal form to generate income, with its own financing and responsibility for investments. Its actions must be evaluated and decided by **the board**, responsible for all activities in the park, the members of which shall be delegated by the Ministry of Culture, the Ministry of Environment and Tourism, and also include other specialists (in a balanced way). The board shall undertake any decision concerning the park, such as interventions in cultural heritage, environment assets, tourism, financing management, etc. The IMP has aimed to offer visitors a safe and wonderful experience with no harm to the site and to make the public more aware of Butrint National Park’s values.



Figure 2. Roman relics in the National Park of Butrint. Photo taken during the EAC conference in 2013 (photo by Mariglen Meshini)

Figure 3. The ancient Roman theatre in the National Park in Butrint. Photo taken during the EAC conference in 2013 (©National Institute of Cultural Heritage, Albania)



The Ministry of Culture manages and is responsible for all related cultural heritage assets, specifically divided into sub-areas called *A3 zones*. Such zones are the peninsula where the ancient city of Butrint is located, the Roman quarter outside the city in the Vrinva area, and Malathrea. This area, in a natural setting full of environmental assets in addition to the archaeological relics, is co-managed by the Ministry of Tourism and Environment and the Ministry of Culture. The *A3 zone* around Butrint covers 615 hectares; the foundation carries out its activity only there.

In ten years, the local community will hopefully be even more involved and become aware of its key role in maintaining a sustainable economy and tourism. Investment opportunities have already opened for local communities, and their activity in tourism is going to be promoted and integrated. Thus, stakeholders can now associate with a unified, sustainable development strategy.

As a result of the implemented changes, it has become easier today to carry out archaeological intervention and research in this cultural heritage site. The generated income will be allocated for the restoration and maintenance of cultural assets. The measures determined in the IMP answered three primary demands:

- A clear and well-defined strategy regarding the planning of archaeological excavations within the *A3 areas*;
- a specialised treatment of relics and their presentation;
- a direct and easy intervention protocol for restoration, conservation, and archaeological excavations.

Finally, all these components have come together in harmony and balance. In accordance with the IMP, necessary research was carried out, and, as a result, the actual values of the site became the focus. As a positive and sustainable solution in cultural heritage management, IMP Butrint can be an example for other archaeological parks with similar features.

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The Mazarrón II wreck (Murcia, Spain). Mitigating human and natural threats

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Keywords: Mediterranean, Phoenician Era, underwater ecosystem, underwater sites, shipwrecks, museum conservation, in situ conservation

Mazarrón is a town southeast of Murcia. Its coast stretches between two capes: Tiñoso and Cope, around a Miocene coastal plain, between the Almenara and Algarrobo sierras. During the 20th century, this coast suffered different alterations that have modified its morphology, resulting in changes in the traditional activities of people living there. The construction of a leisure port altered the currents and the seabed's morphology; as a result, new sand deposits emerged that have affected both the ecosystem and underwater archaeological sites.

Mazarrón has an array of diverse archaeological heritage elements from various historical periods, which indicate it has always been a strategic place, exposed to human activity from prehistory to the present. The sites in the area include, for example, Cueva Pernerás (Upper and Middle Paleolithic), El Faro, La Peñica (underwater, lithic remains), Cueva de las Palomas (Upper Paleolithic and Neolithic), Cueva de Percheles (Neolithic), Cabezo de Plomo (Chalcolithic), La Ciñuela (Bronze Age), Canal de las Salinas (underwater, ivory finds from the 4th–2nd centuries BC), Coto Fortuna (Roman Period), a Roman salt workshop (4th–5th centuries AD), Castillo de Carlantín (Andalusian Period), Torre Vieja del Puerto (16th century AD), and Cotos San Cristóbal and Los Perules (industrial heritage).

Undoubtedly, two of the most extraordinary relics in the area are Mazarrón I and Mazarrón II, two shipwrecks from the Phoenician Era. They were excavated in the summer of 1988 by a team from the National Museum of Underwater Archaeology. The “Phoenician Ship Project”, aimed at conducting a thorough prospection of the bay bottom, was carried out on Isla Beach from 1993 to 1995. During this project, Mazarrón I was excavated and transferred to the local museum. The second Phoenician ship, Mazarrón II, was discovered in the spring of 1994. It is eight metres long and two metres wide; upon sinking, it was carrying a load of amphorae and metal ingots. During excavation, a special crate was designed first to shield the ship from natural influences and human actions. Next, movable archaeological findings were located on the wreck, taken – to avoid looting –, and transferred to the National Museum of Underwater Archaeology (Cartagena, Murcia) between 1999 and the early 2000s.



Figure 1. Overview of the wreck (©Archaeology Area of the Ministry of Culture and Sports, Spain)

Figure 2. Preservation works on the wreck (©Archaeology Area of the Ministry of Culture and Sports, Spain)



Different actions were carried out by Mazarrón's City Council concerning Mazarrón II, the wreck that has remained underwater (Figures 1–2). An Interpretation Centre was created in 2009, and in 2013, a conference with the ship in focus was held. As a result, a proposal arose to create a commission for finding management solutions for this archaeological relic. Professionals from Mazarrón City Council, Región de Murcia, and the Ministry of Culture and Sports have been working together in this commission since its establishment in 2014. In 2019, based on available information, the National Plan for the Protection of Underwater Cultural Heritage Monitoring Commission did not approve the removal of the wreck from the seabed and recommended exploring other possibilities to enable *in situ* conservation instead. However, the scientific commission created by Región de Murcia (Autonomous Community under the Spanish competence distribution) disagreed with this decision. Both commissions were summoned to meet and to seek an agreement.

Between 23 August and 3 September 2019, Región de Murcia, in association with ARQUA (heir to the Research Centre and National Museum of Underwater Archaeology), launched a scientific mission to determine the wreck's condition, as there were signs that the metal structure protecting it has lost its stability and could collapse onto the wreck. The conclusions were clear: the wreck must be extracted as soon as possible because environmental conditions and human activity endanger it. The Ministry of Culture and Sport and Región de Murcia organised an international conference with only one item on the agenda: to find the best solution to safely remove the wreck and display it in the ARQUA Museum in the future.

The last works related to the Mazarrón II wreck were carried out by field technicians hired by Región de Murcia and ARQUA Museum in December 2021. These works consisted of:

- Documentation of the site's topographic and bathymetric characteristics, and
- documentation of the protective structure's condition.

The survey revealed that the protective metal structure is rusting. The sacks that helped fix the structure deteriorated, probably due to human activity, and the protective meshes placed on the sediment have become uncovered.

The survey concluded that the site is exposed to climatic and human effects in different sectors, as shown by the degradation of the protective structure and the sacks securing its perimeters. Moreover, the area has been subject to strong marine currents that increase exponentially during heavy storms or cold drops.

Therefore, a special conference took place in the ARQUA Museum on 5–7 May 2021, with the participation of UNESCO's General Director, Mr. Xing Qu, Managing Director, Audrey Azoulay, Miquel Iceta from the Spanish Ministry of Culture and Sport, the Flooded Organic Archaeological Materials Workgroup (WOAM), a world-leading organisation in wreck extraction, and the ICOM Preservation Committee (Figure 3). These experts contributed with their experience and developed a project to extract



Figure 3. High-ranking guests at the conference in the ARQUA Museum
(©Archaeology Area of the Ministry of Culture and Sports, Spain)

the ship and move it to the museum as quickly as possible for conservation, restoration, and presentation.

The extraction has begun. The project is fully aligned with the 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage, progressing under the monitoring of a committee of experts. It includes all relevant aspects defined by current legislation, including safeguarding, prevention, scientific contribution, and social return.

ARQUA Museum has specific facilities adapted for this work. Arquatec is a diaphanous warehouse equipped with treatment or desalination tanks for impregnation and electrolysis, washing tables, a freeze dryer, cranes and elements for handling large loads, and other specific equipment. Also, it has ample space (260 m²) for training and work seminars.

The remains of the first boat (its keel length 3.98 m) located at La Isla beach in Mazarrón are currently exhibited in the museum. Undoubtedly, the recovery of Mazarrón II and its exhibition will also contribute to the study of Phoenician navigation in the Mediterranean Sea.

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Sweden's first restoration of an ancient monument. The burial ground Hemlanden on Birka

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Keywords: Sweden, Viking Age sites, land management, agricultural use, biological cultural heritage

At the end of the 19th century, the ideal image of a prehistoric landscape was wild and abandoned. This applied to both natural areas and cultural heritage. An area left in peace from human influence for a long time was sought. In nature conservation, the concept of “free development” or “non-intervention management” was born, a concept that also came to be applied to the management of cultural environments and ancient monuments. It went so far in 1874 that The Royal Swedish Academy of Letters, History, and Antiquities awarded a landowner a medal for having “protected” a prehistoric burial ground by planting trees on it, arguing that the trees would help to emphasize the image of the abandoned and the wild (Danielsson 2006, 12).

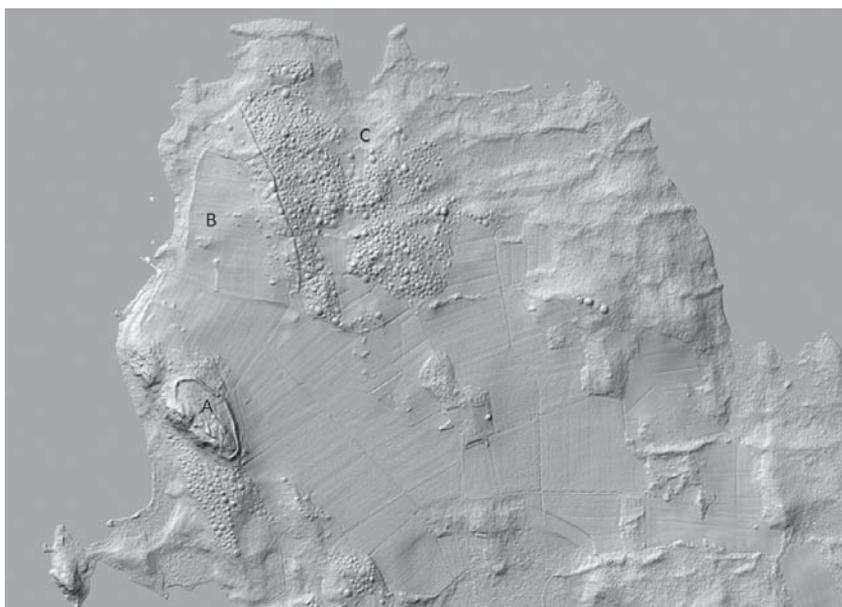
Areas that had previously been open and claimed by management or grazing for hundreds of years would be reforested. This view – that nature should be left “undisturbed” – appeared in nature conservation as a form of protection until the beginning of the 21st century and then transitioned to a simple and, above all, cheap form of management.

Birka, on the island of Björkö in Lake Mälaren, was an important Viking Age trading centre, founded around AD 750 and abandoned around AD 975 (Figure 1). Today, Birka is one of Sweden's fifteen UNESCO World Heritage Sites. The first scientific archaeological investigations at Birka were carried out by Associate Professor Hjalmar Stolpe during the 1870s and 1880s (Arbman 1941, 146). The results attracted a great deal of attention (Stolpe 1889). Preceding the plans to implement a comprehensive land reform (*Laga skifte*), the farmers of Björkö started to cut down the small forests on the island. There were also plans to sell off land within the Black Earth (main settlement area) and on the large adjacent burial ground Hemlanden to construct holiday homes (Figure 2). With this, the question arose whether the state should buy Björkö to protect the ancient monuments. Following a parliamentary decision in 1912, the state purchased the northern part of Björkö, where most of the ancient monuments are concentrated (Gustawsson 1977, 87).



Figure 1. The island of Björkö, located in Lake Mälaren (Lantmäteriet CCo)

Figure 2. A hillshade (elevation model) of the north part of Björkö. A—the Borg (hillfort), B—the Black Earth, where the village, bounded on the east by a rampart, once stood, C—the burial ground Hemlanden (source: the digital Antiquities Register “Fornsök” <https://app.raa.se/open/fornsok/>)



The area covers about 150 hectares, of which about 50 hectares are cultivated, while the rest is meadow and pasture. After the purchase, all grazing and mowing on the Hemlanden burial ground was prohibited – entirely in accordance with nature conservation regulations – and regrowth took off (Gustawsson 1977, 91).

Previously, this land had been open and grazed, and only smaller trees grew there, as seen on older maps. In 1931, the land was so overgrown that it was hardly possible to get around in the area. Trees had damaged several graves, and it was realized that something had to be done. Based on historical maps and the desire to recreate the

Figure 3. Hemlanden in the 1940s: the restoration of Hemlanden is almost complete. After 1940, annual maintenance began, consisting of grazing, clearing of bushes, etc. (photo by Carl Gustaf Rosenberg CCo)



former meadows and pastures by removing trees that grew in and next to the graves and reintroducing grazing animals, deforestation of the area began. The measures first met with strong criticism and poor finances; thus, recreating the area took some time (Gustawsson 1977, 98). After seven years of working in the headwind, criticism turned into cheers and applause. In 1950, Björkö was visited by about 20,000 people; in 1973, by 50,000, and before the pandemic in 2019, about 80,000 visitors came to the island (Figure 3).

The National Heritage Board then let the experiences of the work on Björkö be a guide for the continued work to make cultural heritage visible and cared for in Sweden. For several years, the work was run as a labour market project. In 1996, responsibility for the work was transferred to the country's twenty-one County Administrative Boards.

There are currently more than 2,000 areas of archaeological interest in Sweden that are managed similarly to Birka. However, this care, whether carried out through mowing, clearing, or grazing animals, is not only for the benefit of the cultural heritage but also for the benefit of the biological cultural heritage. Biological cultural heritage is a concept that focuses on the understanding of the connections between nature and humankind's use of nature. These connections can be used to glean historical and biological knowledge and apply it to the conservation of nature and the cultural environment. Most of these areas are also located on privately owned land – private, municipal, or owned by the church. Through long-term agreements between the state and landowners, the management is carried out either by the landowner himself, by tenants, or through contractors or local associations. Most maintenance and information efforts' costs are paid for through annual state cultural environmental conservation grants or Europe's common agricultural policy.

The experiment, which was started by the Swedish National Heritage Board more than 100 years ago because nature conservation had a target image of what "real nature" should look like, has saved not only a number of the country's unique ancient monuments but also several areas with a high degree of biodiversity.

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Sunken landscapes and settlement areas. On the reconquest of underwater archaeological sites

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Keywords: underwater sites, serial transnational UNESCO sites, Austria, heritage management, heritage conservation, human impact, climate change

Prehistoric lake dwellings around the Alps play an important role in researching and understanding the past because of their special location underwater or in water-saturated environments, such as bogs. This is reflected in the fact that since 2011, they have been on the UNESCO World Heritage List as outstanding archaeological sites (Figure 1). The lakes offered favourable, but also challenging, building sites on their shores. As the highly complex stratigraphies of many sites show, constantly changing water levels, floods and debris flows resulted in a dynamic settlement environment even in prehistoric times, which probably resulted in a constant coming and going of people and nature (Swiecinsky *et al.* 2013). After the disappearance of the lake dwellings on the shores of the lake in the 1st millennium BC, when the water level rose steadily and the village ruins sank under thick layers of lake marl, aquatic plants and animals reclaimed the shallow water zones. The old settlements were finally left to nature and new underwater habitats emerged.

Long protected by sediments and natural shore vegetation, modern development around the lakes is increasingly threatening the preservation of the underwater cultural heritage. Since the mid-20th century at the latest, intensive building activity on the lakeshores and the disappearance of the reed beds have resulted in shallow water zones being almost completely cleared in some places. This had an enormous impact on the archaeological sites. The high pressure of development and rampant tourism compete with the preservation of the cultural heritage hidden under water and, therefore, invisible. Additional changes in the flora and fauna make the situation even more dramatic. The shallow water zones, which also contain remains of Neolithic and Bronze Age settlements, have become the preferred habitat for various invasive species that cause considerable damage.

Meanwhile, we have to consider a multitude of neozoa and neophytes as potential enemies of our underwater heritage. Depending on the local conditions, different animals and plants conquer a new habitat. In the maritime field, shipwrecks are well

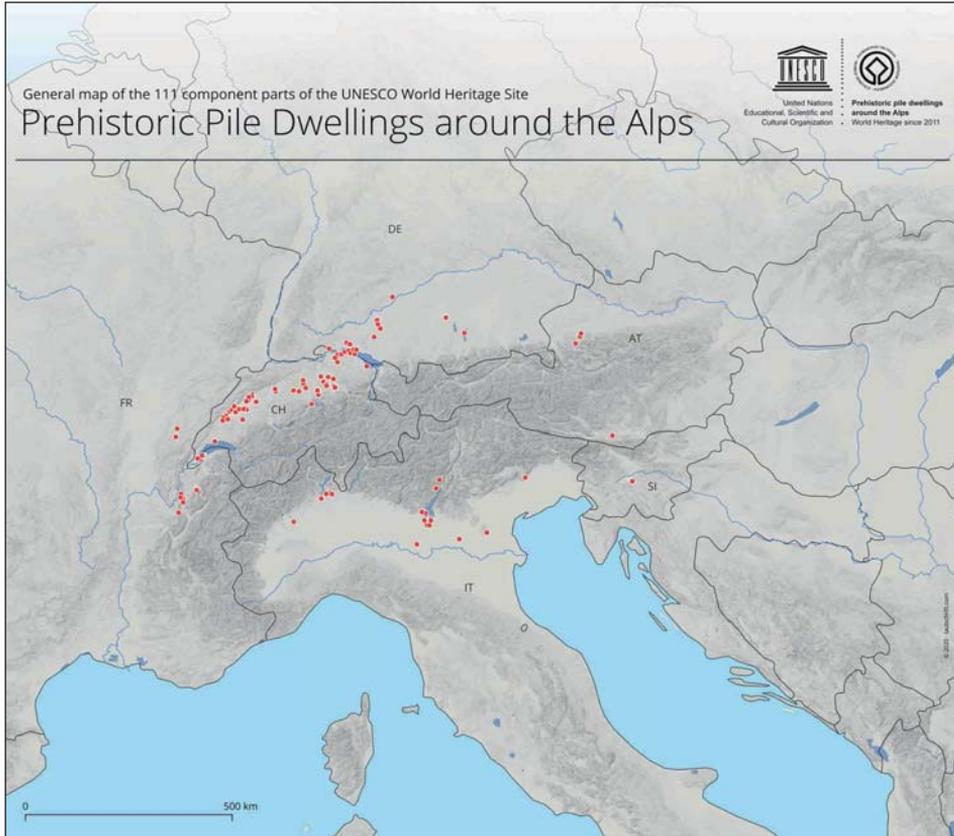


Figure 1. Map of the 111 sites inscribed as serial, transnational property at the UNESCO World Heritage list (©International Coordination Group Palafittes)

known to serve as artificial reefs for fish and plants (Asner *et al.* 2022). Archaeological relics are also used in inland waters, e. g., at eroded pile fields, where wooden remains protrude from the seabed. In the UNESCO World Heritage Site Keutschach am See, the pike perch (*Sander lucioperca*) finds a refuge between the piles in the middle of the lake (Figure 2) (Poppenwimmer 2020; Billaud 2021). However, due to the legal situation – the water is privately owned – and the economic importance and popularity of the pike perch as a food fish among sport anglers, the originally non-native pike perch cannot simply be removed. In Keutschach, too, the native European noble crayfish (*Astacus astacus*) felt at home in the lake dwellings until recently (Petutschnig 2001). There are numerous crayfish dens and corridors in the settlement area, eroding the site in places and, above all, creating leverage points for erosion. However, the constructions seem to have been abandoned due to the crab plague. Fortunately, the resistant-invasive signal crayfish (*Pacifastacus leniusculus*) and spiny-cheeked crayfish (*Faxonius limosus*)



Figure 2. Pike perch at the UNESCO World Heritage site of Keutschacher See in Carinthia / Austria
(©Kuratorium Pfahlbauten)

have not yet been able to establish themselves here. These two species are a serious threat to the lake dwellings in France and are widespread in Lake Constance (Hagmann & Köninger 2022).

Invasive mussels are also a growing problem. Native mussel species that have disappeared due to poor water quality and other factors, such as the great swan mussel (*Anodonta cygnea*) or the thick-shelled river mussel (*Unio crassus*), which has already been consumed by lake dwellers, have not yet been able to establish new populations or have disappeared altogether (Patzner 2019). Instead, species from the robust triangular mussel family *Dreissenidae* (e. g., the quagga mussel), which are thought to originate from the Black Sea region, are increasingly being found. They sometimes adhere to the lake bottom over large areas and in some places directly to archaeological finds such as wooden piles (Figure 3) (Hagmann & Köninger 2022). Also, formerly autochthonous species, such as beavers, which are returning to their natural habitats along the riverbanks, are contributing to the deterioration of lake dwellings by building their structures in the area of the archaeological reserves (Gschwind 2020).

In addition to neozoa, neophytes are also spreading in the circum-Alpine waters, and the coverage of sites with aquatic macrophytes can have different effects. On the one hand, there is the risk of a destructive effect in the upper layers due to a stronger



Figure 3. Dense coverage of the lake bottom with Zebra Mussels (*Dreissena polymorpha*) at the Iron Age site of Traunkirchen in Upper Austria (©Kuratorium Pfahlbauten)

rooting within the lake sediments. On the other hand, there are also positive effects, as less sediment is removed in the calm area of algal carpets, or the plants can even act as sediment traps. The monitoring of archaeological sites at Lake Constance since 2012 shows, for example, a strong increase in macrophytes such as Swiss pondweed (*Stuckenia helvetica*) and, more recently, stonewort (*Chara globularis*) (Ebersbach *et al.* 2019).

The stonewort itself, which is native to Austrian lakes, is a protected species in the Attersee and Mondsee Natura 2000 sites and, like the beaver, raises the issue of potential conflicts of interest between nature conservation and the protection of cultural heritage. However, in line with the UNESCO World Heritage concept, which considers natural and cultural heritage as whole, joint solutions must be found for the protection of both.

Documenting the spread of neozoa and neophytes and their new habitats is all the more important as they can also be seen as harbingers of climate change. In this context, the rapid establishment of effective and comprehensive monitoring of shallow water zones is urgently needed, as the extent and potential threat in many areas cannot be assessed at present.

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Archaeology and the natural environment in the Czech Republic. Recognition, documentation, and protection in a time of climate change

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Keywords: Czech Republic, bark beetle calamity, archaeological heritage, forestry

The current extreme climate trends impact very severely on the cultural landscape and pose a threat to archaeological sites and finds in their original location, i. e., in the ground. Several adverse impacts of climate change affect the cultural and, therefore, archaeological heritage of the Czech Republic. For example, the increasing pressure to integrate ahistorical greenery into the urban centres of historic towns, accompanied by large-scale excavations or constructing new or restoring old watercourses and waterworks with heavy machinery. Furthermore, cutting down and restoring historic alleyways or parks that are dying or infested by pests also represents a significant challenge. However, as of 2016, the bark beetle calamity has become the greatest of all threats (Figure 1).

The bark beetle, which existed as an organic part of the landscape for centuries, is currently infesting large spruce monocultures, characteristic of Czech commercial forests. The only remedy to a catastrophe of this magnitude lies in immediate logging. However, logging currently poses the greatest threat to the archaeological cultural heritage in forest areas as it is virtually not regulated by law in cases of emergency.

The bark beetle infestation and its extent implied that conservation authorities, together with the whole archaeological community of the Czech Republic, have been challenged with the enormous task of making sure that at least elementary documentation is being made of disturbed sites, as well as continuous monitoring of the condition of already registered archaeological monuments. Open sources enabled, for example, an assessment of logging areas and dead-standing forests in predominantly coniferous stands using differential analysis of satellite data between July and September 2021. Altogether 9,000 hectares of new logging in mainly coniferous stands and 10,500 hectares of dead-standing forests were identified as of September 2021.

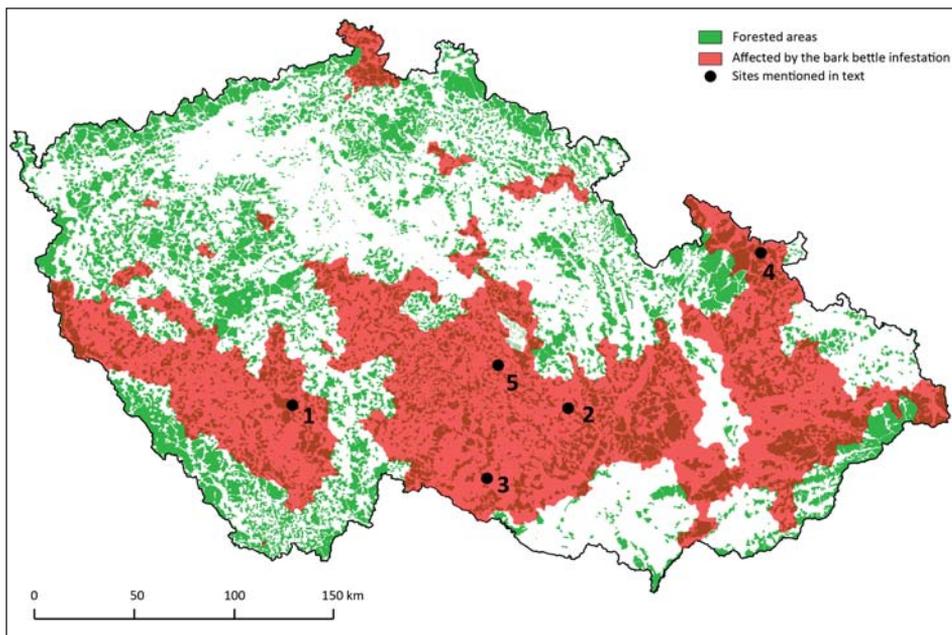


Figure 1. The intensity of bark beetle infestation in Czech forests (open-source map).

1: Údraž (Písek district), 2: Mitrov (Žďár nad Sázavou district), 3: Komárovice (Třebíč district), 4: Petrovice (Bruntál district), 5: Utín (Havlíčkův Brod district) (compiled by the authors)

The Czech Republic consists almost exclusively of cultural landscapes that comprise a varied and fascinating mix of residential, agricultural, forestry and mining areas. It is an environment that naturally combines the interests in protecting, among others, cultural heritage, nature, and landscape conservation values. While both interests, i. e., heritage protection and nature and landscape protection, are considered parts of the public interest and, thus, are defined and regulated by law in the Czech Republic, the respective professional and institutional provisions are separated. The expert organisations responsible for protecting the heritage fund are the National Heritage Institute (NHI) and competent regional or district authorities. The role of the executive state body for protected areas and expert organisation for non-protected areas is performed by the Nature Conservation Agency of the Czech Republic (AOPK ČR).

Within the framework of scientific activities, NHI has also tackled the issue systematically (grant project Memory of the Moravian and Silesian Sudeten Landscape in Danger, NAKI II./DG20Po2OVVoo8). The project involved a field survey of some areas of the border mountains in the North-east Czech Republic, covering an area of about 6,300 km². As part of this project (running 2020–2023), a “Heuristic Map of Archaeological Monuments” (<http://krajinasudet.cz/mapa/heuristicka.html>) was created. Of 1,444 sites in this area, 107 were identified as currently threatened by

logging due to bark beetle infestation based on the intersection of polygons marking archaeological sites with those marking areas affected by logging on aerial photos. Currently, the following number of locations are threatened by logging according to the data collection results completed by field research: urgent threat (i. e., in about 2–5 years)–25 sites, probable threat–97 sites, potential threat–105 sites. Furthermore, the project also assessed the protocol intended for heritage management officers, nature and landscape conservation officers, and owners in particular. To sum up, the project aimed at harmonising the interests of the forests' economic use and the care of the archaeological monuments as much as possible.

The bark beetle infestation has undoubtedly threatened many known and unknown archaeological sites in recent years (approximately since 2016); unfortunately, even sites that have already been protected by law as cultural monuments are at risk. It is obvious that some particular sites have been damaged and destroyed by logging

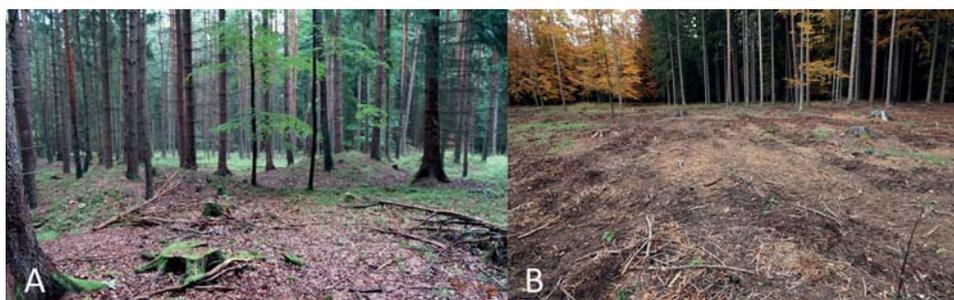
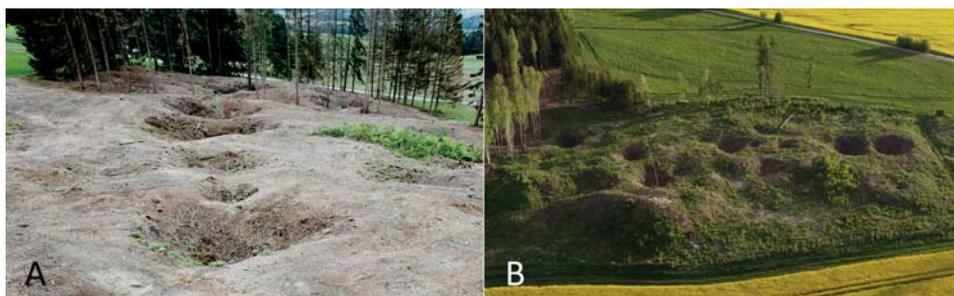


Figure 2. Údraž (Písek district). A—the state of preservation of the barrow site prior to its damage by logging due to bark beetle infestation, B—the visible outline of a completely destroyed barrow, which disappeared in 2020/2021 due to forest management activities related to bark beetle infestation (©NHI, photo by J. Havlice, 2021)

Figure 3. Utín (Havlíčkův Brod district). A—medieval mining area after deforestation, B—medieval mining area after the replanting of new trees, without any visible damage (©IAP, J. Unger, J. Mařík, 2020–2021)



and replanting (Figures 2 and 3), while others are located in areas at risk. All involved professionals strive to minimise the effects of bark beetle infestation on particular sites at various levels and varying degrees according to their capabilities. However, these challenging circumstances can also be seen as an opportunity to set up rules regarding information, communication, and coordination between different institutions having diverse interests and forest owners.

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Faunal remains from archaeological sites document the human impact on the terrestrial and aquatic environment: examples from the last thousand years in Belgium

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Keywords: archaeozoology, zooarchaeology, deforestation, overhunting, overfishing, pollution, extinction, introduction, science communication

Faunal remains can be collected at archaeological sites when preservation conditions are good and adequate recovery techniques are used. Most animal bones usually represent consumption and butchery refuse, but a waste of artisanal activities (bone-, horn-, antler- or hide-working) can also be found. Besides the reconstruction of human subsistence, herding and breeding practices, the exploitation of animals, trade, and other economic activities, faunal remains also allow inferences about the natural environment in which man lived in the past.

This paper focuses on how animal remains can contribute to a better understanding of the human impact on the terrestrial and aquatic environment over time and how this information can be communicated to the general public, the broader scientific community, and stakeholders. Several case studies, mainly from Belgium, illustrate the effects of deforestation, overhunting, overfishing, and water pollution on wildlife. Cases of species extinction and introduction from the last millennium are also discussed. These archaeozoological data allow, amongst other things, to define which species of present-day fauna are indigenous (or not). Different baselines can be reconstructed that illustrate the former natural environment and that can be of use for ecologists and policymakers involved in nature conservation. It has been shown that the exchange of information can be hampered by the fact that most archaeozoological data appear in art and humanities publications and that only a few papers are published in biological journals. A few recent joint research and publication initiatives exist today, showing a gradual awareness of the benefits of collaboration between archaeozoologists and ecologists. By each contributing from their own field, biologists and archaeozoologists can bring a balanced, well-founded message to policymakers that may allow them to define realistic restoration programs. When it comes to decision-making, however, there is no significant practical role to be played by archaeozoologists. However, bringing the message to the general public can only be done by ecologists and

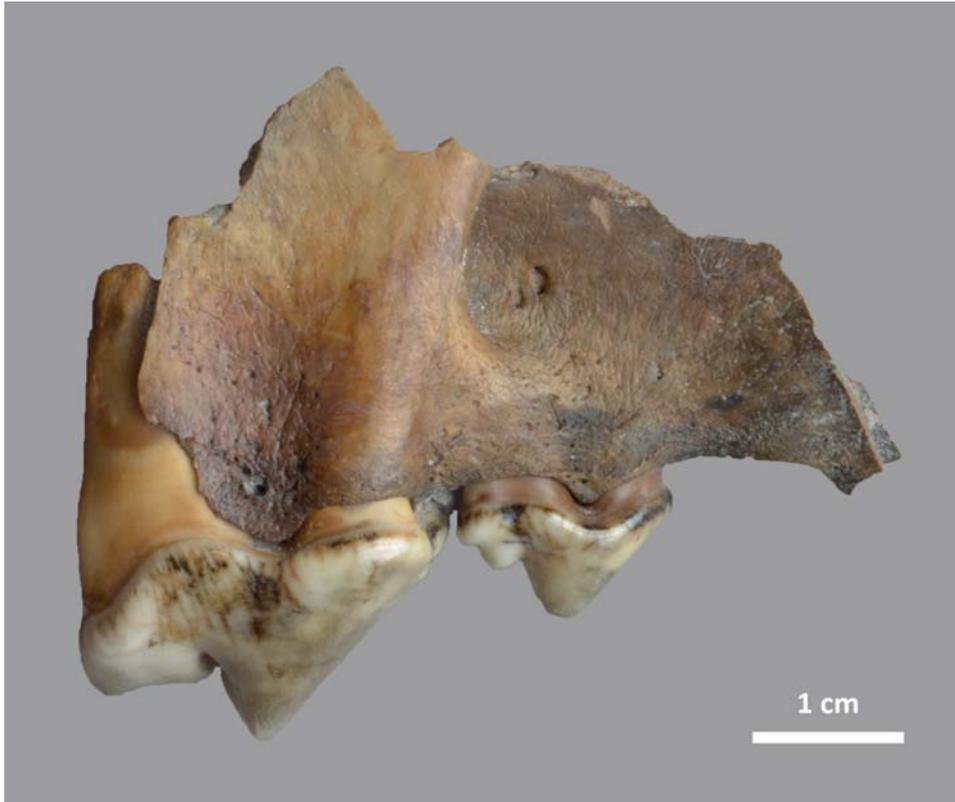


Figure 1. Side view of a right maxilla fragment of a wolf (*Canis lupus*), with third and fourth premolar, found in the historical centre of Brussels (second half of the 13th to first half of the 14th century AD; site Parking 58). It is the only known find for medieval Brussels and, by extension, Flanders (©Royal Belgian Institute of Natural Sciences)

archaeozoologists together through publications, exhibitions, and lectures that focus not only on the paleo-economic aspects (which up to now received the most attention) but also on that of human impact on the environment. Thus far, websites, social media, radio or television interviews, and documentaries are poorly exploited or not at all for disseminating knowledge. We give a few examples of when and how the archaeo(zoo)logical data can contribute to the public debate by actively responding to certain news facts.

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What's down the hole?

Archaeobotanical evidence on plant subsistence and vegetation during the Hellenistic Period at the archaeological site near Voditza village, Northeastern Bulgaria

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Keywords: Voditza, Northeastern Bulgaria, Hellenistic Period, pits, plant remains, archaeobotanical analysis, taphonomy, plant subsistence

Introduction

Data on plant subsistence and natural vegetation in Northeastern Bulgaria during the Hellenistic Period is still limited. Therefore, this paper aims to present the important results of the archaeobotanical investigation of plant remains collected from Hellenistic Period ritual and storage facilities. The collection of samples from specific contexts – storage facilities and pits – allowed one to observe the “secondary environment” of the utilized plant resources and identify possible depositional processes. Thus, taphonomic and contextual analyses gave us important insight into the behavioural factors that affected the composition of the archaeobotanical assemblage at a site near Voditza.

Archaeological background

Archaeological site no. 5012-West in the territory of the village of Voditza, Targovishte Region, Northeastern Bulgaria, is interesting with its features and wide chronological range. On an area of 7,000 m², a total of 116 structures from various historical periods have been excavated (Figures 1–2). However, most pits are dated to the Hellenistic Period (late 3rd – early 1st century BC) and provide invaluable archaeobotanical evidence on the plant subsistence and local vegetation in the era.



Figure 1. Location of the site and aerial photos at the beginning of the rescue excavations in 2020 (compiled by the authors)

Archaeobotanical methods and materials

Altogether 21 soil samples have been collected from two types of negative structures: storage and ritual pits. The volume of each sample was measured prior to flotation. As a result, 510 litres of soil were processed using bucket flotation with a sieve with 1×1 mm mesh. Hand sorting under a stereomicroscope yielded approximately 1,500 charred remains representing 14 different taxa.

The archaeobotanical assemblage comprises carbonized remains of several annual cereal crops – hulled and free-threshing wheat, naked barley (*Hordeum vulgare var. nudum L.*), millet (*Panicum miliaceum L.*), oat (*Avena sativa L.*), and chaff. The weedy flora is represented by annual ruderal and synanthropic species such as goosefoot (*Chenopodium album L.*), bedstraw (*Galium aparine L.*), knotgrass (*Polygonum aviculare L.*), and wild mustard (*Sinapis arvensis L.*) (Figure 3a–k).

Results and discussion

Based on the discovered plant remains, we can only propose a partial reconstruction of the local agricultural practices and vegetation cover. Seven of the analysed samples from Voditza comprise mainly charred fragments of oak (*Quercus sp.*), followed by beech (*Fagus sylvatica L.*) and hornbeam (*Carpinus sp.*). These are among the most common species according to the available archaeobotanical data for the Hellenistic Period in Bulgaria, followed by ash (*Fraxinus sp.*), hazel (*Corylus sp.*), maple (*Acer sp.*) and

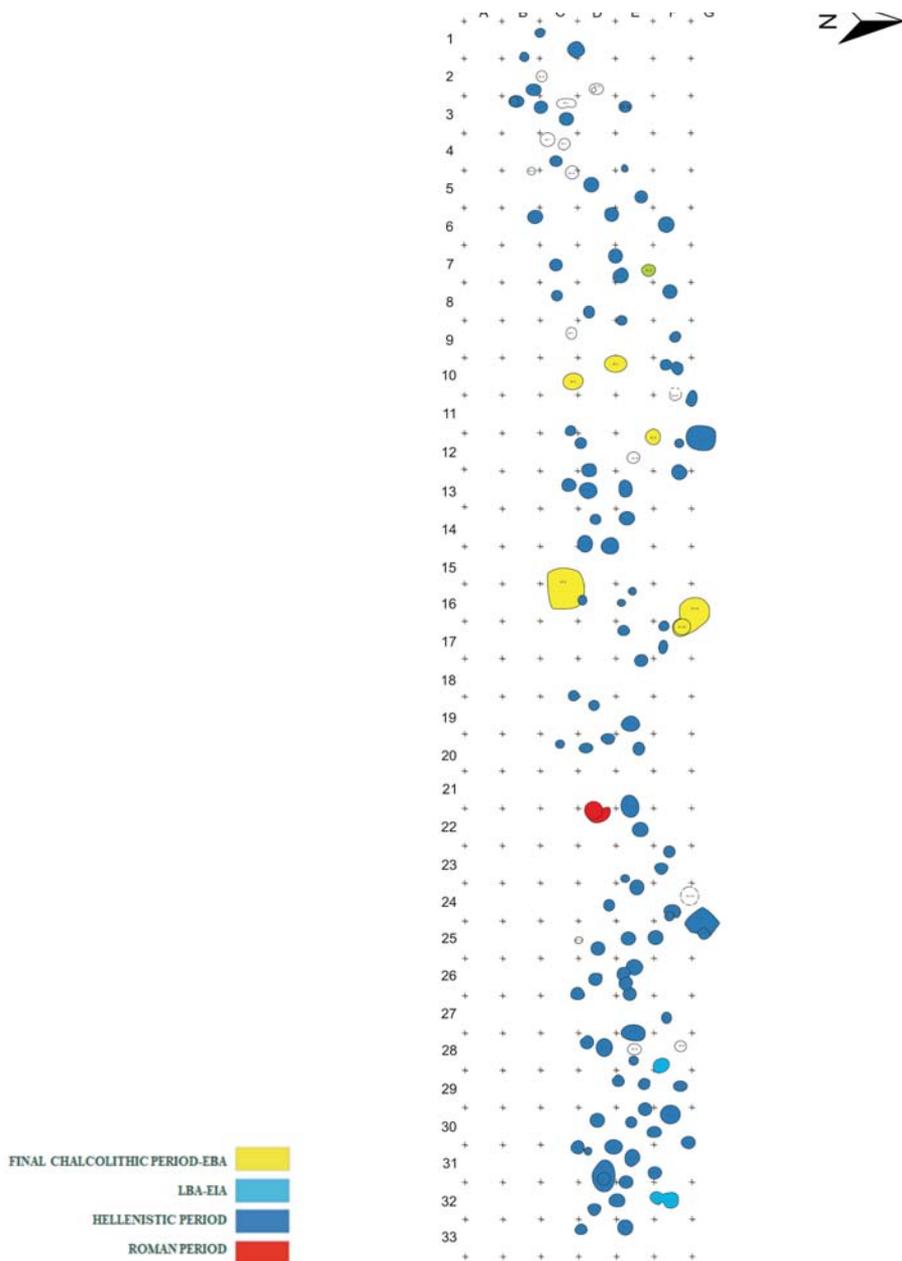


Figure 2. Distribution of structures from different historical periods in the study area (survey map by the authors)

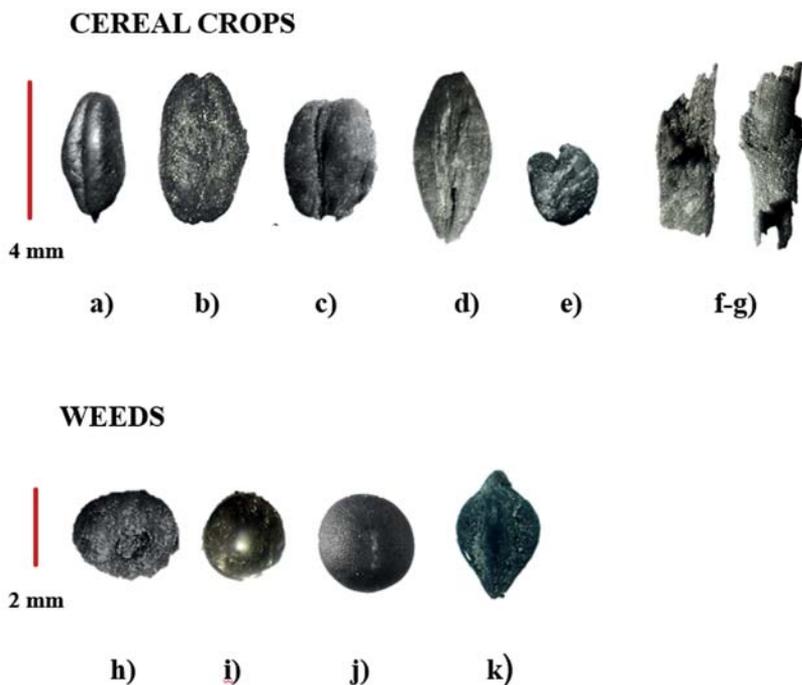


Figure 3. Carbonized remains of several annual cereal crops and weedy flora taxa (photo by the authors)

pine (*Pinus sp.*) (Georgieva 2015; Hristova 2015; Попова 2018). Assuming that the main criteria for wood collection and use might have been availability in the region, the presence of areas in the vicinity of the site occupied by mixed deciduous forests and open lands with ruderal vegetation might rightfully be assumed. The composition of the vegetation cover is similar today.

The crop plant spectrum of Voditza also shows certain similarities to other investigated sites in the territory of Bulgaria and the neighbouring countries like Greece and Romania (see Hristova 2015; Попова 2018; Valamoti *et al.* 2018, 269–290). The presence of glume wheat types and barley suggests the continuation of a long tradition of cultivating these species. However, free-threshing wheat and millet seem to occur more frequently during the Hellenistic Period (Valamoti *et al.* 2018, 278–9). The results of the current study also attest to this phenomenon. The weedy flora is represented by annual ruderal and synanthropic species such as goosefoot (*Chenopodium album L.*), bedstraw (*Galium aparine L.*), knotgrass (*Polygonum aviculare L.*), and wild mustard (*Sinapis arvensis L.*). These wild plants usually colonize areas of already destroyed natural vegetation and enter cultivated fields as weeds so that they can be easily collected during harvest and stored together with the grain stocks.

Conclusions

Although the number of recovered plant remains from Voditza is small, collecting samples from specific contexts provided important information about agricultural and ritual practices in the study area. Despite regional variations in the archaeological and archaeobotanical record, the results presented in the current study show significant similarity with other investigated regions of the country regarding plant subsistence and vegetation.

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Cultural landscape changes from the Late Neolithic to the Late Middle Ages in northern Westphalia

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Keywords: Westphalia, cultural landscape, landscape structuring, visual connections, demarcation, Late Neolithic, Metal Ages, Middle Ages

In a methodologically exemplary study area in northern Westphalia, it was possible to identify a cultural landscape that has existed since the Late Neolithic.¹ It was manifested in the first period by the appearance of slash-and-burn indicators in off-site poll data and erratic blocks (post-glacial boulders) accumulated by humans. Besides clearing arable land, these boulders were also used as a building material for megalithic graves. The complex interplay of landscape relief, visibility and monuments prove that these sepulchral constructions were also structuring the landscape with a visual connection to geological phenomena. Through this, not only the monuments themselves but probably the entire landscape was transcendentally semiotized, i. e., linked with corresponding symbolism.

The Late Neolithic settlement chambers imply landscape-spatial and mental concepts – such as territoriality and demarcation of own and foreign – present in the cognitive realm of the communities inhabiting the area (Figure 1). Nevertheless, it is possible to reconstruct pathways between regional groups through the settlement chambers, via which successive material and mental exchange, as well as a targeted and untargeted dispersal of various plant species, took place.

In the following Metal Ages, the formerly relatively local and regional path networks were replaced by a web of supra-regional connections that evolved into communication corridors over time. Though using completely different locations, Metal Age burial mounds still display visual reference to the older megalithic tombs. What is particularly striking, however, is that there was no intervisibility between the barrows and the arable plots in the first phase of the expansion of the Celtic Fields

¹ This paper summarises the study "L. Klinke, Wahrnehmung vergangener Landschaften. Studien zur Entwicklung einer Kulturlandschaft im nördlichen Münsterland vom Spätneolithikum bis ins Spätmittelalter aus emischer Perspektive. *Veröffentlichungen der Altertumskommission* 23, Münster 2023 [in press]".

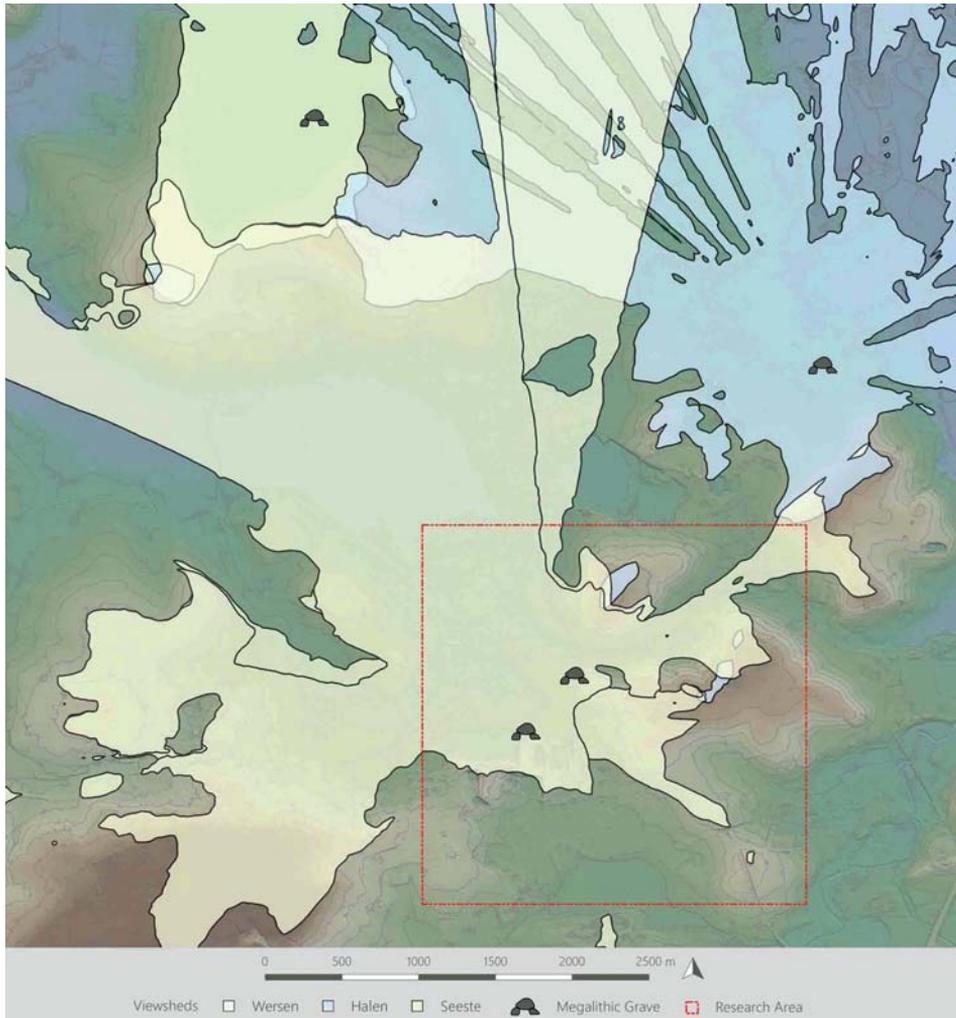


Figure 1. Different Late Neolithic settlement chambers can be detected in the vicinity of the research area (by Leo Klinke)

(Figure 2), consequently, at that time, the everyday world was visually separated from the routes of communication and the world of transit.

Strikingly, two contemporaneous Early to Middle Iron Age barrow cemeteries within a sight distance of less than 1.5 km show no demarcation by any natural factor and no signs of social and ideological acculturation either. Two different burial customs can

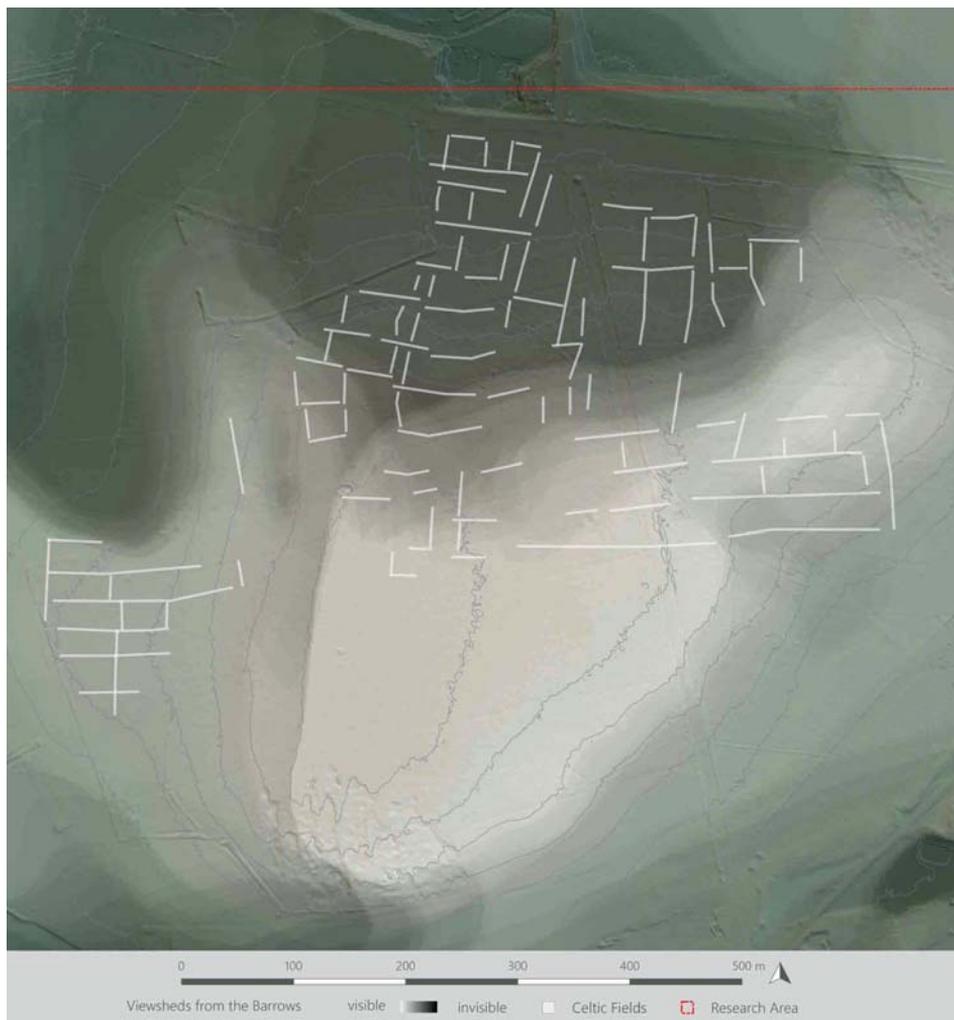


Figure 2. In the first phase, there was no intervisibility between the barrows and the Celtic Fields. In a later phase, the fields could be seen from the barrows and the communication corridors (by Leo Klinke)

be attributed to a socio-cultural distinction demonstrating a regional subdivision and landscape structuring for this era.

This previously immaterial boundary seems to have materialised in the late Middle Ages in the form of a *Landwehr*-like triple rampart section, erected in the study area in context of Osnabrück city's *Landwehr* construction between 1397 and 1399.

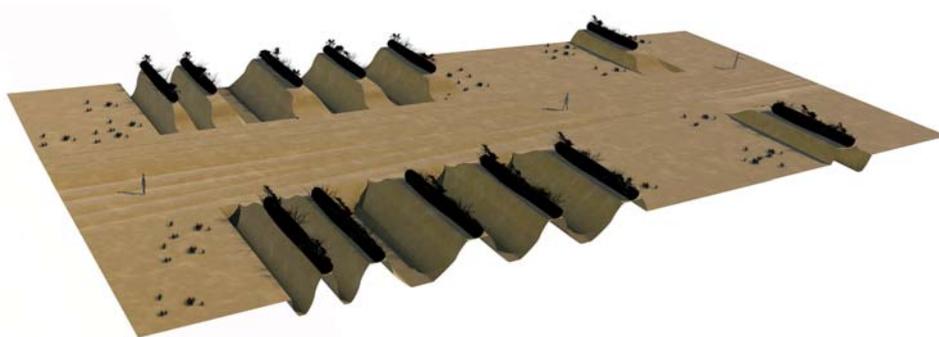


Figure 3. The virtual reconstruction reveals the *Landwehr*-like triple rampart section in the core of the complex, multi-levelled rampart-ditch system that was extended around 1601 (by Louise Tharandt)

Subsequently, around 1600, the barrage was extended to a complex, multi-levelled rampart-ditch system (Figure 3). This barrier monument formed an inescapable element influencing and constituting the perception of the landscape, staged as the climax of a hodological landscape dramaturgy.

The excavation profiles of the neighbouring burial mounds confirmed that the first heathlands gradually expanded from the Late Neolithic until becoming dominant in the landscape by the time of the barrier monuments. Thus, the Late Medieval *Landwehr* section not only formed an administrative boundary between the parishes of Westerkappeln and Wersen but, in the first construction phase, also served as a practical protection for the settlements and the agricultural areas behind, thus making an implicit reference to the agricultural activity and livestock farming of the late medieval population.

In a diachronic synopsis, it is evident that the cultural landscape was created around a geological phenomenon, transformed into a sepulchral landscape from the Late Neolithic onwards, then persisted for at least three millennia and finally became profaned in the Middle Ages. New dating calibrations made it possible to synchronise the changes in the natural environment with those in the anthropogenic material-cultural record in the study area, revealing a continuous, witting but also unwitting influence of humans on their environment. Based on the newly developed method, investigations in the study area have proven that changes in biodiversity can no longer be documented exclusively in off-site poll data but can now also be read from the anthropogenic archaeological record.

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Remote sensing data to support integrated decision making in cultural and natural heritage management.

Impasses and opportunities for collaboration in agricultural areas

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Keywords: precision agriculture, remote sensing, near-surface geophysics, proximal soil sensing, archaeology, sustainability, land management, heritage management, interoperability

Introduction

In the UK and Europe, the desire to promote integrated sustainable land management, balancing a range of economic, environmental, and social factors, underpins the aims and objectives of much agricultural policy and regulation (Moore & Tully 2021; Shahpari *et al.* 2021). Ecosystem services frameworks are now commonly used to describe the diverse functions of land areas and ways in which they are valuable. These frameworks, in addition to addressing how the land is valued in economic and environmental terms, encompass natural and cultural heritage (Cordemans *et al.* 2019; Vogt & Kretschmer 2019), connecting agri-environment land management and heritage management. However, in practice coordinating the acquisition, sharing, analysis and interpretation of data on the character of soils, crops, and topography essential to this work remains difficult (Birner *et al.* 2021; Ali & Dahlhaus 2022; Ingram *et al.* 2022). General regional and national datasets on soil properties, land use, land management, and their change over time are often incomplete, infrequently updated, or insufficiently detailed for current applications. Organisations and groups working

in heritage, environmental and agricultural domains have established their own application-specific data repositories, use different exchange platforms, and have developed methods and ideas of good practice independently.

For agricultural land managers, precision agriculture is viewed as a potentially important data source. Precision agriculture encompasses a range of technologies and techniques which use digital data from sensors, farmers' descriptions of their practices, and analyses of physical samples to inform agricultural decision making and support management. While not yet widely used in environmental or heritage land management, the instrumentation used and proxies measured overlap substantially with those used in precision agriculture. This creates the potential for coordination, bringing together digital sensing data to support the delivery of a range of ecosystem services and enable sustainable integrated land management (Lowenberg-DeBoer & Erickson 2019; Barnes *et al.* 2019). The **ipaast-czo** project is addressing how to collect and manage data which will be useful across this broad range of land management applications by leveraging the technological developments as well as the data producer and user community emerging through the expansion of precision agriculture.

Coordinating data collection

The ipaast project team led a cross-domain prioritisation exercise to identify shared priorities, proxy measurements, and instruments for precision agricultural, environmental and archaeological sensing applications focused on soil systems. This work, carried out through the Soil Health & Soil Heritage Project (<https://doi.org/10.5281/zenodo.7472404>), demonstrated significant overlaps in the properties measured but also important differences in sampling strategies, which should be considered when planning new data acquisitions. For example, the typical spatial resolution for geophysical surveys differs approximately by a factor of ten. Guides to good practice for archaeological geophysical surveys suggest that the sampling rate of the survey should be adjusted to reflect the smallest features it aims to detect. In practice, this means most projects will collect data at a sampling spacing of more than 1 point (measurement) per m² (Schmidt *et al.* 2015). In contrast, agricultural geophysical surveys are commonly conducted with the aim of designing management zones or supporting the use of variable rate application equipment, and the appropriate sample spacing for geophysical surveys is taken to be on the 10–15 m scale (Mulla 2013).

While archaeological data are typically more spatially detailed, precision agricultural data are collected more frequently. Geophysical surveys in archaeology surveys are typically conducted once to detect features, while the effects of management strategies and revision of management zones in precision agriculture may require new soil surveys every few years and surveys of developing crops several times each year. Survey strategies which integrate infrequently collected high spatial resolution data with frequently updated medium spatial resolution applications data can produce datasets which are useful for a broader range of cross-domain applications.

Enhancing workflows with analyses from other land management domains

In addition to developing approaches to coordinating new data acquisitions, the ipaast-czo project is assessing the potential to enhance analytical workflows by integrating data derivatives or methods across domains. For example, monitoring factors such as agricultural management practices and land cover change, which affect the condition of archaeological features, is a long-standing challenge for heritage managers because site visits to large numbers of locations across an extensive area are resource intensive. Similarly, identifying land cover changes and land management events is a key task in agricultural monitoring workflows and doing this at scale through site visits is impractical.

Mowing and ploughing event layers, generated by analysing Sentinel-1 and Sentinel-2 satellite image time series, have been developed by Sen4CAP to automatically identify these key land management events and make extensive monitoring within agricultural applications feasible (De Vroey *et al.* 2022). The same analytical routines and datasets derived from Sentinel imagery can be used to establish new heritage area condition monitoring workflows, based on remote sensing. A scripted workflow can be used to assess time series of mowing and ploughing events and identify when atypical events occur across a region. These automatic detections could be used to signal the need for an assessment in areas containing archaeological features, improving efficiency. In turn, data collected on the ground during a heritage condition assessment could be added to the pool of training data used to improve the Sen4CAP system. In this theoretical example, by connecting the workflows used in agricultural and heritage monitoring, both domains can benefit.

Linking legacy data

Beyond coordinating new data acquisitions and establishing workflows which incorporate data or insights from other domains, improving the discoverability and interoperability of existing data has the potential to improve land management, particularly where information on change over longer timescales is needed. For sensing data, the language used to describe a dataset is particularly important because the data itself is often abstract, either a collection of images or numeric and coded data. The combined use of discipline-specific language in descriptions and vocabularies is inevitably a barrier to cross-disciplinary data discovery. By selecting keywords which are used in multiple domains involved in land management, overall data discoverability can be improved, leading to more cross-domain reuse of sensing data. The ipaast project has provided recommendations for the use of Getty Art and Architecture Thesaurus (AAT) vocabulary terms (Opitz & Štular 2022).

While metadata typically describe the contents and structure of a dataset, the intended applications and limitations on its use are less consistently included in this documentation. As land management, envisaged through the lens of ecosystem services, encompasses a growing number of disciplines and specialisms, formalising these explanations becomes a useful mechanism for avoiding misunderstandings or mistaken uses of data. Examples of scope of application documents for data types

including ground penetrating radar, electro-magnetic induction, agricultural yield, and cropmark records, intentionally written for cross-domain land management audiences, have been developed through the ipaast project (<https://doi.org/10.5281/zenodo.7472497>).

Conclusions – connecting archaeological and precision agricultural sensing

Sharing data and coordinating methods used in heritage, environmental and agricultural remote and near-surface sensing applications can enable integrated sustainable agricultural land management. Overlapping suites of sensing technologies and objects of study provide the basis for integration, but differences in how instruments are deployed, how information is licensed and distributed, and gaps in research on modelling agricultural land systems remain significant challenges (Pricope *et al.* 2019; Webber *et al.* 2019). The reviews and case studies presented here highlight technological, practice-based and conceptual points at which archaeological and precision agricultural sensing intersect, creating a path toward the tighter integration of archaeology and cultural heritage management into sustainable agricultural land management.

Acknowledgements

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Experiences between nature conservation and archaeology in the old water system of Southern Hessen (Germany)

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Keywords: Hessen, Southern Hessen, old water system, nature conservation, double-protected areas, waterway, sacrifice site, synergies, differences

The southern part of the federal state of Hessen is structured by the Odenwald as part of the low mountain range in the east and by the rivers Main, Rhine and Neckar and their tributaries. Today's landscape has been shaped by centuries of use and manipulation.

Figure 1. Protected nature conservation area in the area of old water bodies in southern Hessen (photo by Th. Becker, hessenARCHÄOLOGIE, Darmstadt)



The transformation into today's cultural landscape began with the intensification of use and the associated manipulation of the small rivers from Roman times onwards. Before that, evidence can be found of life on and with the watercourses, including using it in cultic context, as a place of sacrifice (Becker 2019; Becker & Sosnowski 2019; Steffens 2021). The landscape of southern Hessen has the highest density of silted-up old water bodies in Hessen (Figure 1), thus being an outstanding archive for landscape reconstruction and survey on human-water relations.

Monument and nature conservation in Hessen

The institutionalised protection of architectural, archaeological and natural heritage in Hessen are structured in similar ways, although a few apparent differences can also be identified. The legal basis for action is provided by the Federal Nature Conservation Act (BNatSchG) of 29 July 2009 and, for its implementation, the Hessian Implementation Act to the Federal Nature Conservation Act of 20 December 2010 (HAGBNatSchG) and the Hessian Monument Protection Act of 28 November 2016 (HDSchG). The lower level of authority for both monument and nature conservation is the district, independent city, or special city (§ 1 and 2 HAGBNatSchG). There is also an intermediate authorisation level in nature conservation, represented by regional councils (upper nature conservation authority). In Hessen, the highest-level protection authorities are the two line ministries. Specialist offices have been set up for both fields of interest – the Hessian State Office for Nature Conservation, Environment and Geology (HLNUG) in the field of nature conservation and the Hessian State Office for Monuments and Sites (LfDH) in the field of monument protection.

The internal legal relationship is unilaterally regulated in the Hessian Monument Protection Act. Here, section 2, subsection 2 of HDSchG states that “regulations of nature conservation law [...] remain unaffected” in connection with the legal act of monument designation. However, nature conservation is indirectly committed to monument protection when the Federal Nature Conservation Act defines the preservation of “historically grown cultural landscapes, including their cultural, architectural and archaeological monuments” as an objective (section 1, subsection 4, point 1 of BNatSchG). Otherwise, both concerns largely stand side by side, resulting in both synergies and differences in everyday work in the region.

Overlapping areas of interest

The already identified special landscape features of southern Hessen play a role in the work of both fields. The extreme density of completely and partially silted-up old watercourses and their exclusion from intensive agricultural cultivation have led to the inclusion of many areas in various nature conservation protection areas (nature reserves, Geo-Nature Park Bergstraße-Odenwald, FFH, bird protection and Natura 2000 areas, legally protected biotopes, landscape conservation areas). In this context, it is certainly a common goal of nature conservation and monument protection to permanently protect these landscape areas.



Figure 2. Preserved foundation walls of the late Roman *burgus*, Carolingian harbour and medieval castle in the nature reserve “Steiner Wald von Nordheim” near Biblis-Nordheim, Bergstrasse District (photo by Th. Becker, hessenARCHÄOLOGIE, Darmstadt)

However, in the everyday work of archaeological heritage conservation, the parallelism in the management of protected areas not only creates a conservation advantage but, at the same time, also generates an increased administrative expense. In nature conservation areas, monument documentation and monitoring work require the approval of the responsible nature conservation authority with regard to access and methods used. This approval process is time-consuming because associations must be consulted in accordance with their participation rights. This means, for example, that the photographic documentation of a preserved archaeological monument may require statements from 14 associations (Figure 2).

Restrictions due to nature conservation also arise for archaeological fieldwork with the aim of prospection and research-based approaches. Planned excavations are hardly affected by that, as nature conservation – like monument protection – has already been taken into account as a concern in the development plan or concrete approval procedure. The concentration of restricted and protection areas in the area of the old water bodies, in particular, limits current research on the history of water systems in southern Hessen (e. g., Becker *et al.* 2021; Becker *et al.* 2022) to the autumn and winter months (1 October to 28 February) outside the breeding and hatching periods (Figure 3).



Figure 3. Investigation of the old course of the river Weschnitz and its inventory and utilisation history in the area of Bensheim (photo by Th. Becker, hessenARCHÄOLOGIE, Darmstadt)

Discrepancies from the common conservation objectives occur when – in addition to the conservation objective – an objective of improving conservation quality shifts into the foreground. In the area of old water bodies, such issues arise primarily through a “renaturation” of the captured drainage water bodies into a near-natural, artificial water body. This is associated with a change in the historically evolved setting, immanent in the sense of dynamic landscape change. Especially in the area of old water bodies, however, such measures lead to the destruction of areas with a special archival function. The projects are often prompted by the European Water Framework Directive, and, in some cases, are justified by changes in the requirements and protection goals of flood protection on large inland water bodies. But also “valorisation measures” with soil intervention take place directly at the instigation of nature conservation. In the future, the aim must certainly be to steer projects in the interest of both concerns and to make the archival and, thus, monumental character of the oxbow lakes more widely known.

To promote an intensified exchange of information about areas with joint protection and conservation interests is the interest of both concerns. For example, the information offered on-site, especially in the form of explanatory panels is today, with few exceptions, always concentrated on one or the other field’s concern. Implementation by independent players uniting different interests in their work

could be a good solution here; there is such a player, for example, the UNESCO Global Geopark in southern Hessen, the conservation goals of which include preserving both nature and cultural-historical diversity.

However, the situation presented also shows the necessity of networking and regular exchange of information for coordination. The aim there should be to use the information to make clear the public interest in monument conservation and the necessity of the associated measures to identify and safeguard the record. Indeed, there are ways to minimise the administrative burden between different interests to a reasonable extent by establishing an internal relationship based on trust between authorities. However, exchanging information also offers opportunities for strengthening both interests in an interaction. The basis for this is mutual knowledge of the protected areas, which are now accessible on the corresponding portals (www.geoportal.hessen.de; <http://naturreg.hessen.de>) in accord with the requirements of INSPIRE Directive of EU. However, an understanding of the “neighbouring” concern does not come merely from knowing that it exists but solely through an exchange of opportunities and goals, accompanied by a joint development of understanding. It is about the chance to strengthen both concerns.

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Nature management and protection of archaeological sites in Estonia

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Keywords: archaeological heritage, heritage management, heritage conservation, nature conservation, nature management, dual protection

Introduction

Heritage sites are part of the modern-day cultural landscape; several archaeological monuments or their vicinity have been protected by the Nature Conservation Act in addition to the Heritage Conservation Act. Both heritage and nature conservation share the objective of conserving, but the legislation and the means are different. This paper discusses an archaeologist's view on some general possibilities and limitations of nature and heritage conservation co-existing in Estonia.

Overview of protection regimes for Nature and Heritage Conservation Acts

The Nature Conservation Act (NCA) states many different possibilities to list protected natural objects, including protected areas, limited conservation areas, protected species, species protection sites, and individual protected natural objects and different types of valuable landscapes or objects, that can all be protected at local government level (sections 4 and 26–31 of NCA). The numerous diverse nature protection regimes may be combined to ensure the best protection for the specific site.

The Heritage Conservation Act (HCA) determines two types of protected archaeological heritage: archaeological monuments and protected archaeological sites (clause 3 section 11 of HCA). The main difference between archaeological monuments and sites is the obligation to preserve monuments to the greatest extent possible (sections 3 and 25 of HCA; Kadakas 2020, 247–248).

The selection of protection measures for archaeological heritage is more limited than for sites under nature protection; most site-specific decisions are made in project coordinations and permit procedures.

Benefits for the owner of a protected site

Owners get an automatic land tax reduction for nature protection sites (section 4 of the Land Tax Act) and can apply for subsidies established to encourage proper management when it is not the most profitable (e. g., Regulation no. 10 of the Minister of Environment 2014). As for archaeology, one may apply for support to maintain or conserve a site and a (partial) reimbursement of archaeological research costs (Regulation no. 22 of the Minister of Culture 2020 and clause 2, section 48 of HCA).



Figure 1. Stone of St. Lawrence in Kuusalu, a monument under dual protection – protected by both the Nature and the Heritage Conservation Acts – marked with two different information boards (photo by the author)

In some cases, additional nature protection of archaeological monuments may benefit the owners – land management is already limited, and nature protection regimes offer more financial support. But the owners of sites under dual protection have to deal with two different boards, and the involvement of several state agencies is making dual protection expensive for the state (Figure 1).

Nature-centred management of archaeological sites

The state owns many archaeological sites (Kadakas & Lillak 2019); one of the main managers of the land is the State Forest Management Centre (SFMC), a state-owned company managing all state-owned forest lands. Their Visitor Management Department is creating, besides other duties, hiking and environmental education opportunities (RMK management 2022). SFMC has also mapped cultural heritage sites (RMK heritage 2022).

Estonia is interwoven with SFMC hiking trails, all equipped with information about nearby sites. As most archaeological sites and monuments are located in nature, it is very easy to incorporate archaeological heritage in nature trails where possible, as it is quite often considered a part of the natural landscape and advertised as such. The joint management of nature and archaeological heritage is beneficial. Information about archaeological heritage is also displayed on boards along nature trails; thus, even people who did not intend to visit archaeological sites may find themselves learning more about history.

Pros and cons of dual protection (with examples)

It is evident that for some areas, the two different protection regimes complement each other, but some constraints are overlapping and, in some cases, may not work well together.

For example, in 2019, nature protection regulations for the Kavilda nature protection zone – including a fort with medieval castle ruins – were renewed (Regulation no. 56 of the Government of the Republic 2020). The Environmental Board renewing the rules contacted the Heritage Board to discuss the protection rules before their final approval. The rules may have been interpreted so that any archaeological survey would have been forbidden on the site; therefore, an explanatory statement was added, stating that archaeological surveys are allowed as long as no harm is done to the protected species.

Kloodi Pahnimägi hill was partially protected as a landscape conservation area, but some of its parts had been quarried, and in 2015, the Ministry of Environment revoked the protection as there was not enough landscape left to protect (Regulation no. 11 of the Government of the Republic 2015). Not realising at first that revoking natural protection would result in the application of mining rights, the National Heritage Board agreed. In 2017, local authorities adopted the area as a landscape conservation area of local significance (Regulation no. 8 of Rakvere Municipal Council 2017), giving the National Heritage Board more time to adjust the perimeters of the hillfort and determine the boundaries of the settlement (Figure 2).

Conclusions

Nature and heritage conservation have similar goals: to minimise destructive activities on sites and maintain the natural or historical environment. Nature-centred

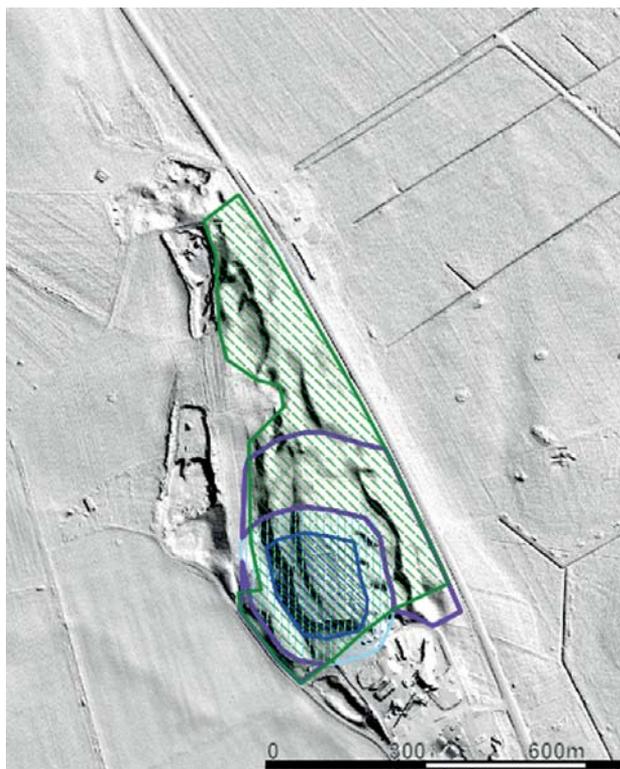


Figure 2. The Pahnimägi Hill on a relief map by the Land Board. Green hatch marks the new landscape conservation area of local significance, blue the existing hillfort with a lighter blue buffer zone, while purple lines mark the archaeologically not-yet-protected dwelling area connecting to the hillfort that either has to be added to the hillfort area or has to be protected as a separate archaeological monument (compiled by the author)

management of archaeological sites works well, as nature trails encourage people to visit archaeological sites.

Different policymakers should certainly enhance their dialogue regarding protecting nationally important sites. Different protection regimes can complement each other, but where a site under dual protection has matching perimeters in both terms, and there is no essential difference in protection rules, it may not need dual protection and management. Nevertheless, establishing or revoking dual protection is not risk-free for the conservation and use of sites.

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Reconciling the protection of nature and monuments. A large-scale nature conservation project between the Siebengebirge and the Sieg

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Introduction

Since December 2010, the Rhine-Sieg district in North-Rhine-Westphalia has been receiving funds from the Federal Environment Ministry for the large-scale nature conservation project "chance.natur: Natural and Cultural Landscape between the Siebengebirge and the Sieg". The LVR-State Service for Archaeological Heritage in the Rhineland has been supporting the district and municipalities with an archaeological heritage project since December 2011 to assert the interests of the protection of cultural assets within the framework of a large-scale nature conservation project funded for two years by DBU, the German Federal Environmental Foundation.

As a first step, the main task of the large-scale nature conservation project concerning more than 10,000 hectares (Figure 1) was to outline a maintenance and development plan until mid-2013. The second step was to use the measures built into this plan determine in detail what exactly has to be carried out in the target area over the following ten years.

This meant setting the course for a sustainable, future-oriented cultural landscape development of the concerned region in the upcoming decades. Since the focus has primarily been set on environmental protection with the aims of biotope networking and spreading site-appropriate plants and animals, it was the task of the LVR Office for the Preservation of Archaeological Monuments to take archaeology into account.

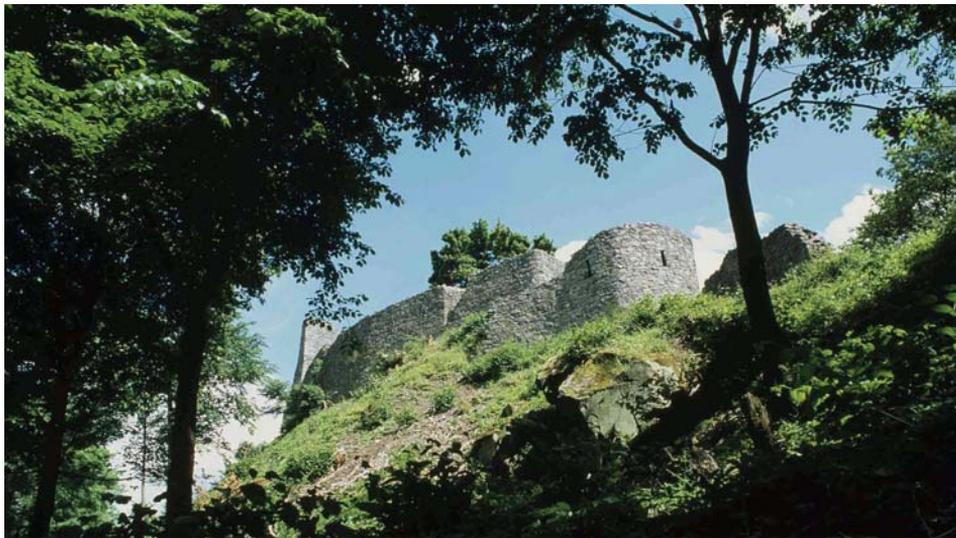
Inclusion of archaeological monuments

The goal of this project is close cooperation between professionals working in nature and cultural heritage preservation to integrate the cultural landscape and, above all,



Figure 1. Project area (red) of the large-scale conservation project in the south of North-Rhine-Westphalia (by Christine Wohlfarth – LVR-ABR, base map: ©Geobasis NRW 2022)

Figure 2. Archaeological monument “Löwenburg”, Siebengebirge (©Siegfried Mentzel, LVR-ABR)



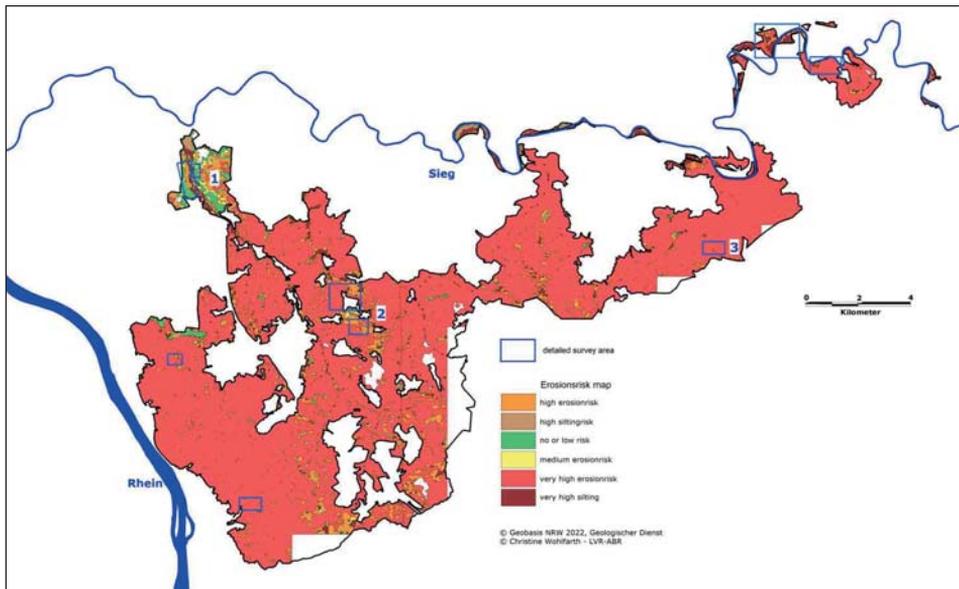
the cultural assets into the overall conservation process to ensure that their valorisation is compatible with nature and monuments and to protect them from environmental impacts. Many of today's well-preserved monuments in forest areas, mainly in the Siebengebirge and Leuscheid, should be included in the planning of measures (Figure 2). These cultural assets are increasingly threatened by wind breakage during storms or heavy rain events, but also by activities inflicting a not yet sufficiently understood impact upon them, like some recreational sports activities and the use of modern deforestation equipment.

Discovering and recording archaeological relics

In addition to these monuments, which are still relatively well-preserved in the forests, there are countless other archaeological sites underground and, therefore, no longer visible, that have been severely damaged and endangered by a wide variety of influences. Most of these are located in the fertile areas of the Pleiser Hügelland and the Windecker Ländchen, where arable land has been intensively cultivated since the Metal Ages, i. e., from around 1,000 BC.

Using two examples from each different management area – forest, arable land, and grassland – various prospection methods have been used to investigate the

Figure 3. Survey map of archaeological monuments and sites threatened by erosion (by Christine Wohlfarth – LVR-ABR, erosion map: Geologischer Dienst NRW, base map: ©Geobasis NRW 2022)



increasing risk of erosion to cultural assets. Erosion is a joint result of climate change and management practices, human impact, and interference in the project area.

Supplementary evaluations and surveys of cultural landscape relics in the forest and grassland zones, as well as archaeological surveys, soil research, geophysical investigations, and small trial trenches have been conducted to specify the risk of erosion and the preservation of monument substance in various landscape areas with different forms of use and cultivation (Figure 3).

Integration of the monuments and cultural heritage into the maintenance and development plan

The recorded data have been processed in a geographical information system, and interesting cultural assets have been made accessible to the public via KuLaDig (an acronym for “culture, landscape, digital”), an Internet-based information system. Particular recommendations for integrating cultural assets into the maintenance and development plan of the large-scale nature conservation project have been continuously exchanged between stakeholders in the sense of environmental communication and to reduce obstacles in cooperation.

Based on criteria corresponding to utilisation and protection requirements, holistic, sustainable guidelines have been developed for conserving cultural assets. These guidelines have been created to reconcile the interests of farmers and foresters working in the project area in particular, as well as those of nature conservation and cultural asset protection, and optimising the path towards an integrated cultural landscape management.

Since 2015, the maintenance and development plan measures have been put into effect, and a man-made transformation and redesign of the cultural landscape have begun.

For further information, a project report, and the detailed Guidelines, see https://bodendenkmalpflege.lvr.de/de/projekte/chance_natur_1/chance_natur.html

https://www.dbu.de/projekt_29729/_db_799.html

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Preservation of archaeological and natural values. A case study from the North-western part of Latvia

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Introduction

The north-western part of Latvia is a culturally and historically important coastal region with diverse protected natural areas, a unique coastal landscape, and significant archaeological sites (Figure 1). It is a territory where the cultures of two ethno-linguistic groups – Baltic Finns and *Balts* or Baltic people – have interacted for centuries. Such a set of natural, historical, and cultural values in the region creates a unique cultural and historical environment.

Legal framework

The relatively small territory of Latvia comprises 690 specially protected nature territories and almost 2,500 archaeological monuments protected by the state. Environmental protection policy in Latvia is the responsibility of the Ministry of Environmental Protection and Regional Development of the Republic of Latvia. Specially protected nature territories are under general regulation defined by the “Law On Specially Protected Nature Territories” (Law 1993). According to the Law, such territories may be classified as strict nature reserves, national parks, biosphere reserves, nature parks, natural monuments, nature reserves, protected marine areas, and protected landscape areas (Law 1993, Section 2).

There are 2,527 listed archaeological sites in Latvia. The Ministry of Culture of the Republic of Latvia is responsible for preserving and protecting cultural monuments, while the National Heritage Board implements public administration in this field. Many archaeological monuments are situated in specially protected nature territories. Sometimes an individual natural monument, such as a tree or stone, is also an archaeological monument, thus being under dual protection.

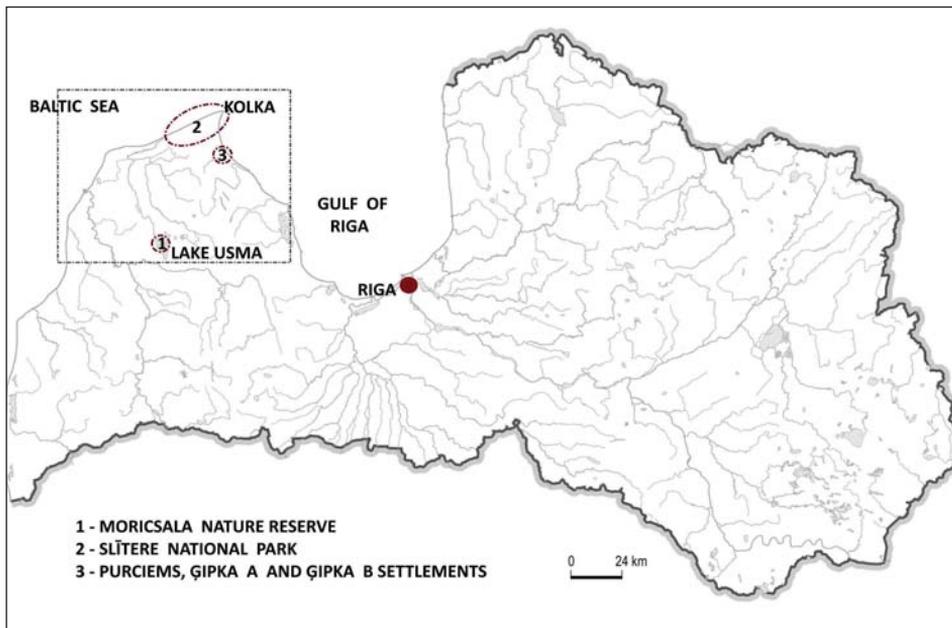


Figure 1. Schematic map of North-Western Latvia (Kurzeme) (compiled by the authors)

Considering that the preservation of natural and cultural values in Latvia is the responsibility of institutions subordinate to two different ministries, it is important to find a shared model of co-operation between them on all levels of management.

Moricsala Nature Reserve and Moricsala settlement

Moricsala is the oldest nature reserve in Latvia, founded in 1912. According to the “Moricsala Nature Reserve Law” (Law 2000), it is a specially protected nature territory of national significance. The reserve was created to preserve historically formed natural ecosystems undisturbed and to study the processes in them (Law 2000, Section 1, 2). There is also an archaeological monument, a Stone Age settlement, on the island (Figure 2).

The first stray finds from Moricsala were reported in 1926. In later years, Stone Age artefacts were also found in this area, while many Stone Age artefacts have also been found near the coasts of Lake Usma. In 1978, Ēvalds Mugurēvičs surveyed the site on Moricsala. He opened ten trial trenches and found in three a culture layer with charcoal (Zagorska 2000, 110). Mugurēvičs interpreted the results as traces of a Stone Age settlement.



Figure 2. Moricsala Nature Reserve and Moricsala Mesolithic settlement site in Lake Usma (by E. Lūsēna)

During the archaeological research in the vicinity of Lake Usma in 2003, small test excavations were carried out in the Moricsala settlement by Ilga Zagorska (Zagorska 2004, 17). The findings undoubtedly proved that a Mesolithic settlement stood in the area once.

Slitere National Park

Slitere National Park was founded as “Slitere Natural Monument”, a protected natural spectacle, in 1923 (Figure 1.2). The National Park was officially established in 2000, and the new Slitere National Park Law was adopted in 2015. The area of the park comprises 16,360 ha of land and 10,130 ha of sea surface (Law 2015, Section 2). It includes a 30–50 m high-rise of the ancient shore of the Baltic Ice Lake, a natural wide-leaf forest rich in animal and plant species, dunes, and other natural values. Although few archaeological sites have been discovered in its territory so far, considering the formation processes and historical development of the area, it has a high potential for future research. The territory of the park is divided into five functional zones with different maintenance regimes: the strict regime, the regulated regime, nature reserve territories, a landscape protection zone, and a neutral zone. In the landscape protection zone and neutral regime territories, requirements for protecting cultural monuments and the environment are mainly determined by the regulations for preserving cultural heritage. The main group of archaeological monuments in the

area is ancient cemeteries related to the origins of Livonian coastal villages that have been formed since the 16th century.

Purciems settlement

The dune settlement at Purciems is located in a dune outcrop on the bank of the Pilsupe River (Figure 3). The settlement (Figure 1.3) has been known since 1933; archaeological excavations were carried out in its area by Eduards Šturms in 1936, who discovered six dwellings (A–F) in the dune sand and interpreted them as traces of a short-term seasonal settlement.

The most important discoveries came from Purciems Dwelling C. The pottery fragments and artefacts from this dwelling indicate that it is a relic of the local Middle Neolithic. Three anthropomorphic clay figurines – first finds of this kind – were found in the lower level of Purciems C. According to Šturms, the dwellings unearthed at Purciems belonged to three different Middle Neolithic cultural groups.

Ģipka A and Ģipka B settlements

In the 1990s, not far from the Purciems settlement, Ilze Loze discovered the Ģipka A and Ģipka B Neolithic settlements. She found two dwelling sites and the remains

Figure 3. The White Dune outcrop and Purciems Neolithic settlement site (by S. Zirne)



of four hearths on the Ģipka B settlement, alongside artefacts characteristic to the Neolithic. According to Loze, the remains belonged to a former permanent base camp inhabited all year around. The few pottery fragments found in the settlement may be assigned to the Pitted Ware Culture, which seems to have been developing contacts with Scandinavia at that time.

The settlement of Ģipka A is located on a narrow belt of reworked dunes between the shore of the Litorina Sea and the Ģipka Lagoon (a later palaeo-lake). A not very intensive culture layer gave evidence of three separate cycles of habitation. Four fences, i. e., low palisades delimiting the site from the east, were discovered there. A large fireplace was found inside the enclosed area, while near the fireplace and the inner palisade wall, fragments of a pottery vessel, powdered with red ochre, were scattered. The site's archaeological record also contained fragments of an anthropomorphic figurine and artefacts characteristic of the Neolithic. As the excavations did not yield many everyday tools and pots, Loze concluded that the Ģipka A settlement was a seasonal site for rituals.

Archaeological monuments inside protected nature territories create multifunctional protected environments, the preservation of which requires a special approach that respects all its qualities and values. Considering that the preservation of natural and cultural values in Latvia is the responsibility of institutions subordinate to two different ministries, it is important to find a shared model of co-operation between them on all levels of management.

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The twain shall meet: international rules for the protection of cultural and natural heritage

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Keywords: international law, natural heritage, cultural heritage, intangible heritage, biodiversity, World Heritage Convention, Law of the Sea, Convention on the Protection of the Underwater Cultural Heritage, Wetlands Convention

Summary

This article discusses the international agreements that have been made for the protection of natural and cultural heritage and nature. In this article, the following definitions are used for both terms. Natural heritage refers to natural features, geological and physiographical formations, and delineated areas that constitute the habitat of (threatened) species of animals and plants and natural sites of value from the point of view of science, conservation, or natural beauty. Cultural heritage is the legacy of physical artefacts and intangible attributes of society inherited from past generations.

It is shown that, while there are often formal separations between the two realms, there is an increasing convergence between them.

An overview is given of the significance of the various international organisations dealing with the international rules of law concerning nature and heritage. Next, further elaboration is given on the possibilities for cooperation between the two domains on four topics: the World Heritage Convention, the conventions for biological diversity and intangible heritage, the rules concerning the Law of the Sea, and the Wetlands Convention.

1. First introduction: wars belong in the museum

When I submitted my abstract for a lecture at the 23rd symposium of the European Archaeological Council (EAC) in Vienna, the world looked different. The Russian invasion of Ukraine had not yet taken place, and Europe seemed to be a relatively peaceful continent (Figure 1).



Figure 1. Text on the wall of the military museum in Vienna: wars belong in the museum. (photo by the author)

I would like to compare the international agreements on heritage and nature and then make the opportunities for cooperation visible. There is a clear need for international cooperation to deal with these soft values.

Because of recent events, I felt the need to take one step back and pay attention to the development of international law as a project of peace, security, and well-being.

The catastrophic event of World War II gave a tremendous push to the development of international cooperation. That in itself was not surprising because the need for peace treaties actually arose every time after another terrible war had been fought in Europe. However, it seems that after World War II, we actually learned something. As President Franklin Roosevelt said, civilization is not national – it is international.

Even during the war – in the early spring of 1945 – many nations gathered in San Francisco to give rise to the United Nations. The idea was formed that an international organisation was needed for educational and cultural cooperation. No time was wasted. As early as November 1945, the United Nations Educational, Scientific and Cultural Organization (UNESCO) was founded in London. A quote from Prime Minister Clement Attlee made it to the Preamble to the Constitution of UNESCO. It declares that “since wars begin in the minds of men, it is in the minds of men that the defenses of peace must be constructed.” UNESCO was created to respond to the firm belief of nations, forged by two world wars in less than a generation, that political agreements are not enough to build a lasting peace. Peace must be established based on humanity’s moral and intellectual solidarity. There is a need to cooperate on subjects like education, science, and, yes: the protection of nature and heritage.

Another event took place in the next year, 1946. A well-known British leader of the conservative party held a famous speech to the academic youth of the University of Zurich: “It is to re-create the European family, or as much of it as we can, and to provide it with a structure under which it can dwell in peace, in safety, and in freedom. We must build a kind of United States of Europe. The first step is to form a Council of Europe.”

This idea was brought further through the conference of The Hague in 1948, chaired by the same Winston Churchill. He stated: “We cannot aim at anything less than the

union as Europe as a whole. And we look forward with confidence to the day when that union will be achieved.”

Until this day, the Council of Europe tried to be a force of good on the continent, valuing human rights, the rule of law, and democracy.

Let us not forget that other post-war organisation. At the initiative of France (Schumann, Monnet) and Germany (Adenauer), we entered into a long process toward connecting the economies of the European nations. It started the process of formal integration, which ultimately led to the European Union.

The international treaties for protecting heritage and nature are based on this post-war desire to form an international community based on certain values. The institutions that resulted from this still form the home base of these treaties to this day.

Important conventions for the protection of heritage and nature have been concluded via the United Nations and especially UNESCO and the Council of Europe. EU is dominant in the field of nature protection and, in a different way, in the protection of heritage as well.

It will do no harm as an introduction to this subject to remind us of the origins of these rules. This international cooperation is rooted in a deeply felt desire for peace.

2. Second introduction: laws for nature and heritage

From the moment people lived on this earth, they depended on their natural environment. For a long time, that relationship was quite direct. People’s lives were connected to the natural environment in a natural way. Because man succeeded in organising himself in a different way and influencing the natural environment to a great extent, that connection became less self-evident.

Nowadays, we got to the point of referring to natural and cultural heritage as two different entities that we approach from different domains. That leads to different networks, different organisations, and different legal regimes.

I experienced a Dutch example of this phenomenon myself on 8 December 2015. On that date, the Senate of the Dutch Parliament dealt with two bills: a new Heritage Act and a new Nature Conservation Act. The two legislative processes had run completely parallel, without any common points being identified or coordination being considered at any time.

In addition, both national laws are needed to implement several international treaties. Apparently, this fact created no need for coordination whatsoever. Although both domains are seemingly inextricably linked, there is surprisingly little overlap through policy and regulation. It seems that there is profit to be made at both national and international levels if these worlds are banned more from each other.

3. International organisations

It is impossible to provide an overview of the developments of international law from both perspectives within the framework of this article. However, it is interesting to see where the international protection of nature and heritage already go together and where they would likely take the initiative in this area.

From a European perspective, the Council of Europe and the European Union (EU) are the institutions from which international agreements are being produced and kept alive.

It is striking that EU plays a much more dominant role in the field of nature protection than is the case with heritage protection. Since the adoption of the Birds Directive in 1979, EU has had jurisdiction with regard to the harmonisation of rules for nature protection. This is a big difference in the protection of the heritage. The EU-treaty of Lisbon certainly devotes fine words to Europe's heritage. In article 3.3, it is stated that "It [the European Union] shall respect its rich cultural and linguistic diversity, and shall ensure that Europe's cultural heritage is safeguarded and enhanced".

At the same time, the principle of subsidiarity has been explicitly declared applicable in the same treaty. Regarding the conservation and safeguarding of cultural heritage, article 167.5 says that the EU "shall adopt incentive measures, excluding any harmonisation of the laws and regulations of the Member States."

This difference is very relevant. While EU can do a lot for heritage, it will not draw up directives or regulations for its protection. The picture in nature conservation is reversed. In particular, the EU Habitats Directive (Council Directive 92/43/EEC) is so comprehensive that the other international agreements of the United Nations (UN) and the Council of Europe lose much of their significance within EU area.

There is another reason for this. The conventions of the Council of Europe and the UN/ UNESCO still need to be translated into the national (legal) order. Due to the supranational nature of EU, there is a direct effect; moreover, there is a legal system to enforce compliance. In other words, a country will actually suffer if it does not comply with EU law.

The Council of Europe seems to be more active in the field of cultural heritage than in the field of nature conservation. Although since the Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979), a network has been actively linked to this convention, the Council's heritage initiatives are much more numerous. In this context, the conventions of Granada (1985), Valletta (1992), Florence (2000), Faro (2005), and Nicosia (2017) can be mentioned, for, successively, the protection of the architectural and archaeological heritage, the handling of the landscape, the value and significance of the cultural heritage and offences relating to cultural property.

On a global scale, the United Nations, particularly UNESCO, is active in both areas. That is most clearly expressed in the Convention concerning the Protection of the World Cultural and Natural Heritage (World heritage convention, 1972), but other conventions and associated networks also offer opportunities for the integration of goals.

4. International agreements for the protection of nature and heritage: opportunities for cooperation

Below, from a legal perspective, four treaties are discussed, in which it is promising to realize a further combination of the protection of nature and heritage. Of course, this is a far-from-exhaustive overview. However, these examples show that taking steps in the right direction is relatively easy.

4.1 *World Heritage Convention (WHC)*

The best-known convention concerning cultural and natural heritage is undoubtedly WHC.

WHC seeks to encourage the identification, protection, and preservation of cultural and natural heritage worldwide, considered to be of outstanding value to humanity. However, it is striking that even in this convention, which includes both worlds, a dualistic approach remains in place. Natural and cultural heritage have distinct definitions and can be proposed separately as World Heritage.

If we look at the application of this convention, the focus seems to be more on protecting cultural heritage. The possibility to nominate so-called mixed sites is only used in a parked way. Currently, 897 cultural properties have been designated, 218 natural sites, and 39 mixed sites. This does not mean that the implementation of the convention should be based on these sharp lines. Article 90 of the Operational Guidelines states that “biological diversity and cultural diversity can be closely linked and interdependent and human activities, including those of traditional societies, local communities, and indigenous peoples, often occurring in natural areas.”

The provisions of the Operational Guidelines relating to the management system of the listed sites (articles 108–119) are promising. They contain a clear call for integrated management: “Legislation, policies, and strategies affecting World Heritage properties should ensure the protection of the Outstanding Universal Value (OUV), support the wider conservation of natural and cultural heritage, and promote and encourage the effective, inclusive and equitable participation of the communities, indigenous peoples and other stakeholders concerned with the property as necessary conditions to its sustainable protection, conservation, management, and presentation.” In other words, even if it is not a mixed site, the Member State should consider the management in its entirety. A one-sided focus on “only” OUV is understandable but not desirable. There is an important starting point here for integrating the management of nature and heritage.

4.2 *Biological diversity and intangible heritage*

The United Nations Convention on Biological Diversity (Rio de Janeiro, 1992) and the Convention for the Safeguarding of the Intangible Cultural Heritage (2003) are conventions that each approach the convergence of the cultural heritage and the natural heritage from a different angle in a similar way.

The Convention on Biological Diversity acknowledges, in article 8, the significant contribution made by local and indigenous knowledge, innovations, and practices to achieve sustainable environmental management and protection. In this way, this convention has an obligation to take measures for this.

The UNESCO Convention for intangible heritage is more or less mirrored in this respect. The starting point of this convention is, of course, the intangible heritage. When you engage in activities regarding the safeguarding of this kind of heritage, this often goes hand in hand with activities that contribute to a sustainable use of our natural resources.

The preamble of the convention leaves no room for misunderstanding. It emphasizes “the importance of the intangible cultural heritage as a mainspring of cultural diversity and a guarantee of sustainable development”. It also mentions “the deep-seated interdependence between the intangible cultural heritage and the tangible cultural and natural heritage”. This aspect is also reflected in the treaty’s definition of intangible cultural heritage. It explicitly mentions “knowledge and practices concerning nature and the universe”.

Both treaties demand special attention to be paid to the lifestyle and practices of indigenous peoples.

4.3 Law of the Sea

Most of Earth’s surface consists of seas and oceans that are not territorially classified. The importance of dealing well with this natural marine environment goes without saying. But in the same environment, there is also a challenge in the field of heritage.

The principle of the free use of the sea has a long tradition and was legally established by the Dutchman Hugo Grotius with the publication of his book *Mare Liberum* (1609). The Law of the Sea then developed further and was finally codified to a large extent in the United Nations Convention on the Law of the Sea (UNCLOS, 1982). This convention is mainly about territorial demarcation, the economical use of the sea and the underwater bottoms, and the regulation of shipping (innocent passage).

With these principles, it is logical that the interests of nature receive a lot of attention in the treaty. There is a separate chapter on the conservation and management of living resources, and there are rules to reduce and control the pollution of the marine environment. Admittedly, these rules seem to be motivated largely by a desire for responsible economic exploitation of natural resources.

Such an incentive to set rules for the protection of heritage is much less strong, while, from a heritage point of view, there is a reason for regulation. After all, this involves dealing with thousands of ancient shipwrecks, hundreds of sunken cities, and large submerged prehistoric landscapes.

At a late stage of the negotiations on UNCLOS, two provisions were included for the handling of archaeological and historical objects (see articles 149 and 303 of UNCLOS). The operation of these articles in practice leaves much to be desired. This can partly be

explained by its unfocused formulation. It is often unclear who will have to undertake what kind of measures. UNCLOS turned out not to be sufficient for adequate protection of the underwater cultural heritage.

Due to rapid technological development and increasing economic use of the marine environment, the heritage is increasingly in the danger zone. That was why UNESCO took up the gauntlet and the initiative for a separate treaty: Convention on the Protection of the Underwater Cultural Heritage (2001).

An advantage of such a separate treaty is that the subject gets the attention it deserves while, within the extensive framework of UNCLOS, it forms an interest that easily snows under. However, an undesirable effect of such a separate treaty is that the rules of engagement become independent of the regulation of the economic activities that threaten the heritage.

In all cases, it is a good thing that the networks for the protection of both interests are able to find each other and counterbalance the geopolitical and economic exploitation of the marine environment. UNCLOS and the Convention on the protection of the underwater cultural heritage provide a useful base to do so.

4.4. Wetlands

In 1999, as part of its inaugural meeting, the European Archaeological Council (EAC) held a symposium on the archaeological heritage management of wetlands in Europe. The symposium was organised jointly with the Wetland Archaeological Research Project. This meeting was also the prelude to the first publication of EAC (occasional paper no. 1).

The international agreements on wetlands are laid down in the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar, 1971). This treaty is about the management of wetland ecosystems; in other words, nature conservation. But the treaty also recognises the importance of cultural, historical, and archaeological interests.

Here lies a fertile ground for cooperation: the Wetlands convention is an excellent starting point to ensure that the needs of the cultural heritage, alongside those of the natural heritage, are properly considered in the management and wise use of wetlands.

The strategy for the heritage management of wetlands drawn up by founding EAC president Adrian Olivier (included in the publication mentioned above) is still relevant today.

5. Conclusions

Although there is a clear need to connect the management of the interests of heritage and nature, it too often appears that the formal structures with which these domains are approached operate independently.

Already in the very first publication of EAC, a bridge was built between, in this case, the wetlands convention (Ramsar) and the practice of archaeological heritage management. The EAC proceedings of the international online conference, "Climate Change and Archaeology" (1–2 July 2021), also touched on this theme.

This article mainly looked at the existing possibilities for cooperation based on international agreements for nature protection and heritage. A number of examples of this have been elaborated.

Even more important than these international treaties are the people who have to bring them to life. It is important that crossovers are made from the existing networks, and the existing framework for international cooperation can be used for this purpose. Behind all international agreements is an infrastructure that has its roots at UN/ UNESCO, the Council of Europe, or the European Union.

At a time when the world community is facing enormous challenges in terms of climate, caring for the environment, and preserving biodiversity, it is important that the heritage community continues to connect with these developments. It is no longer profitable to stay safe within the boundaries of one's own domain. Knowledge of international law can help to take this step.

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Archaeological sites and monuments are integral parts of their respective environments. As human societies have constantly adapted to and changed their environments, archaeological sites also reflect this principle. In this volume, the authors explore three different themes: the management and protection of sites and monuments as habitats for flora and fauna, the understanding of archaeology and biodiversity (both historic and present), as well as the organizational and legal framework necessary for accomplishing a more integrated approach towards nature and heritage conservation.

The implementation of the right management plans may improve both the biodiversity and the quality of conservation of sites (front cover: the Roman town of Aguntum, Austria, ©Andrea Hassler, REVITAL Integrative Naturraumplanung). In other cases, the introduction of certain species may pose challenges for conservators (back cover: pike perch, a new “resident” of the submerged pile dwellings in Keutschacher See, Austria, ©Kuratorium Pfahlbauten).

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