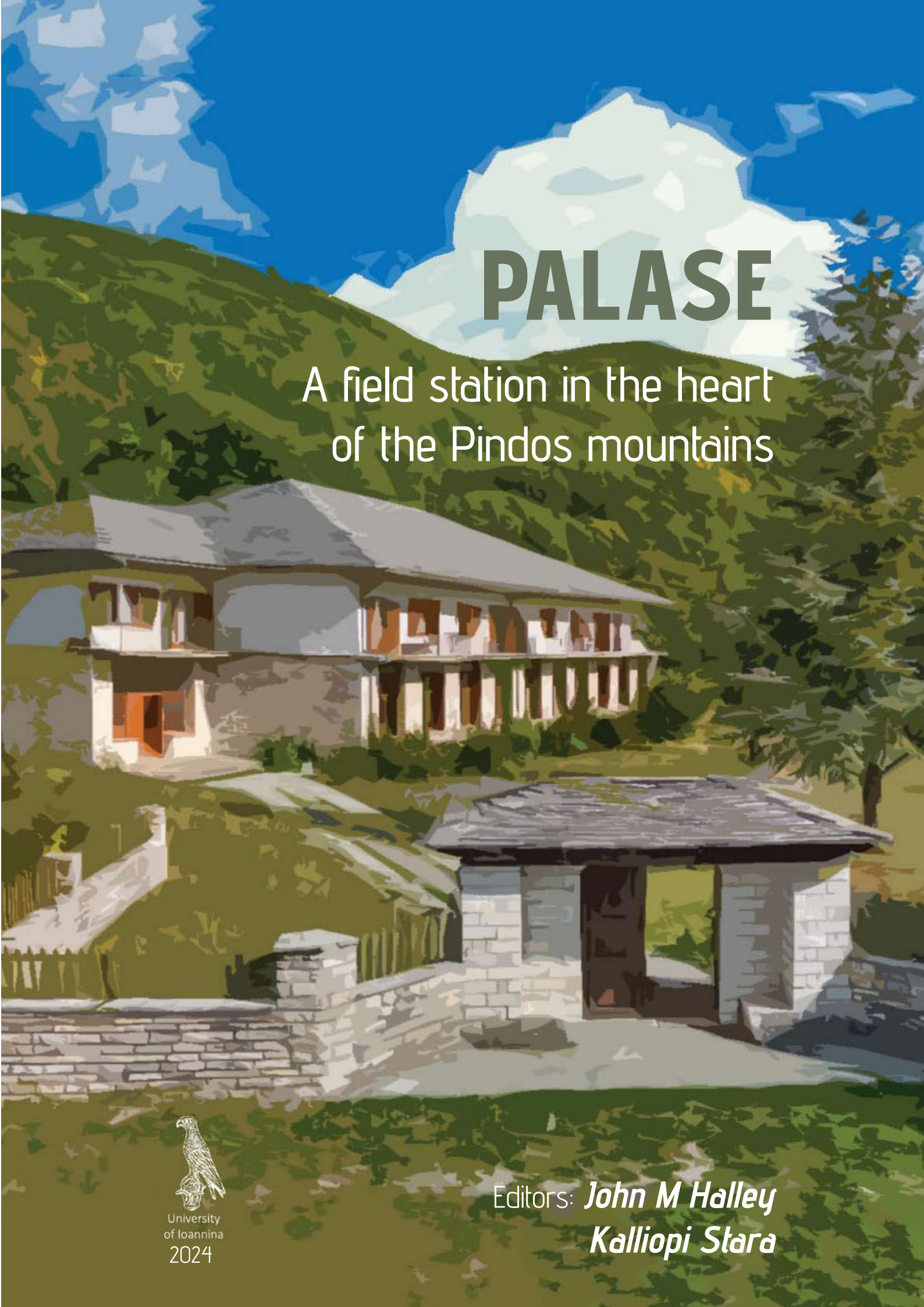

PALASE

A field station in the heart of the Pindos mountains

Editors: *John M Halley*
Kalliopi Stara

University of Ioannina
2024

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of the Pindos mountains

PALASE. A field station in the heart of the Pindos mountains

Editors: John M Halley & Kalliopi Stara

Translations: John M Halley [Chapters 3, 6, 7, 19] and Kalliopi Stara [Chapters 4, 18]

Graphic design: Myrto Miliou

ISBN: 978-960-232-292-4

Sponsored by:

Required citation: Halley JM, Stara K (editors). 2024. PALASE. A field station in the heart of the Pindos mountains. University of Ioannina, Ioannina, Greece.

PALASE

A field station in the heart of the Pindos mountains

Dedicated to the memory of Georgios Douvlis (1935 -2024)

Editors: **John M Halley**
Kalliopi Stara

University of Ioannina 2024

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Ano Pedina, © C Zissis

Contributing authors

M Charitonidou	Postdoctoral researcher - Lecturer, Laboratory of Ecology, Department of Biological Applications & Technology (BET), University of Ioannina (UOI)
PS Cohen	Executive director emeritus, Jasper Ridge Biological Preserve, Stanford University (USA)
M Dimou	PhD, Graduate of BET, UOI
T Dinos	President, Mushroom Association of Epirus
E Douvli	Retired teacher at the Labriadeios School - folklorist - writer
G Douvlis	Educator, former chairman of the Management Committee of the Labriadeios School
M Friberg	Professor, Department of Biology, Lund University (Sweden)
JM Halley	Professor, Laboratory of Ecology, BET, UOI
G Kapsalis	Professor emeritus, Department of Primary Education and former rector, UOI
V Kati	Professor, Laboratory of Biodiversity Conservation, BET, UOI
P Kostoulas	MSc Architect, founding member, Boulouki | Itinerant workshop on traditional building techniques
G Koutropoulos	MSc Architect, founding member, Boulouki | Itinerant workshop on the traditional building techniques
N Kyriazis	Forest technician, Northern Pindos National Park
G Makris	Screenwriter, actor, artistic director of Zagoriwood
N Markos	Postdoctoral researcher, Laboratory of Ecology, BET, UOI
T Michailidis	Associate professor, Laboratory of Neuroimmunology, BET, UOI
N Monokrousos	Associate professor, University Centre for International Programmes of Studies, International Hellenic University
F Moudopoulos -Athanasiou	Postdoctoral researcher, Catalan Institute of Classical Archaeology, Tarragona (Spain)
A Papingioti	Head of publicity and education, Northern Pindos National Park
E Papingiotis	Secretary of the board, Cultural Association of Panosudeniotes
H Petrén	Postdoctoral researcher, Department of Biology, Philipps-Universität Marburg (Germany)
I Sklavounos	MSc Architect, PhD candidate Universiteit Antwerpen, founding member, Boulouki | Itinerant workshop on the traditional building techniques
K Sotiropoulos	Associate professor, Laboratory of Molecular Ecology and Conservation Genetics, BET, UOI
K Stara	Postdoctoral researcher, Lecturer, Laboratory of Ecology, BET, UOI
C Theocharis	Msc Civil engineer, founding member, Boulouki | Itinerant workshop on the traditional building techniques
R Tsiakiris	Forester, PhD, MSc Ecology, D.Head - Dept. of Forest Works, Ministry of Environment & Energy, General Secretariat of Forest, Forestry Service of Ioannina

Central Zagori, © K Stara

Prologue

This book is about the first ten years of operation of PALASE field research station (University of Ioannina - Labriadeios Research Station). Education, research and monitoring are paramount among the many activities carried out at field stations. Scientists find there the necessary conditions that allow them to conduct research, collect data and test their hypotheses. As field stations are usually located in important areas of nature conservation, such as national parks, in our case Northern Pindos National Park, they can also serve the research and educational needs of university institutions, giving staff and students access to these areas. In a time of unfolding climatic crisis, field stations gain additional status as places to collect environmental data and monitor changes. However, there is a shortage of such stations, especially in the Mediterranean, despite the fact that this is Europe's main biodiversity hotspot and also a cradle of culture that has left permanent marks on the landscape.

The idea of creating this field station in Zagori was born in 2012. Zagori had one of the best-preserved natural environments in Europe with outstanding biodiversity and a rich cultural tradition. Located in Epirus, between the Mediterranean and Central European climatic zones, it has an impressive geology dominated by the Pindos mountains and had been inhabited since the Paleolithic. So, Zagori naturally attracted the interest of both researchers and university teachers from all over Europe. At the time, however, students at the nearby University of Ioannina had very little actual contact with or knowledge of Epirus. It was therefore clear to us from the beginning that the establishment of a university research station in Zagori could fulfill some important purposes:

- To welcome students of the University of Ioannina for practical training in fields related to environment and culture.
- To be a center for research, education and monitoring of the natural environment.
- To become an open European destination for the study of the Mediterranean environment.

- To contribute to the creation of deeper ties and the strengthening of relations between the university and the local society of Zagori and Epirus in general.
- To attract prestigious Greek and international visitors, helping contribute recognition of the area and stimulate the local economy.

We note that the “Zagori Cultural Landscape” has been included in the UNESCO World Heritage List in September 2023. Consequently, PALASE acquires an additional value: not only does it contribute to the research and Culture, but also to their special long-term relationship, which is reflected in the landscape of Zagori.

The PALASE field station, a collaboration between the University of Ioannina and the Labriadeios School, reflects these objectives. A novel aspect of PALASE is that the management includes people from the area and the local community as well as from the university. This book records some of the highlights of our first decade of operation. We hope that readers will gain something of the excitement and satisfaction that we have enjoyed in this endeavour.

John M Halley & Kalliopi Stara

Kato Pedina plateau, © K Stara

Campanula *(Campanula spatulata)*, © K Stara

Acknowledgements

We owe special thanks to the people who helped during these first ten years of operation of PALASE. The initial conception of the idea and in the first steps of creating the station, George Thyfronitis, then president of the Department of Biological Applications and Technology of the University of Ioannina, as well as Rigas Tsiakiris and Nikolaos Monokrousos contributed to the drafting of the proposal for its creation. Also, we thank those who believed in the idea of its creation and with us co-created the vision for PALASE. From the Labriadeios Home Economics School, we especially thank Georgios Douvlis and Vassilis Donos, and from the community of Ano Pedina, Eleni Douvli, Vassilis Labridis, Georgia Traki, Stavros Vassos and Alexandra, Evangelos and Pantelis Papingiotis.

From the University of Ioannina, we thank the former rectors Georgios Kapsalis and Triantafyllos Albanis who played an important role in the creation and operation of the station, and from the Municipality of Zagori, the former mayors Gavriil Papanastasiou and Vassileios Spyrou, as well as the current mayor Georgios Soukouvelos for their support.

We thank the Region of Epirus and the Rufus Halley Foundation (Ireland) for significant financial support to improve the infrastructure and equip the station and to Doric Shipbrokers AE who sponsored this publication. Also, we thank the international Organization of Biological Field Stations (OBFS) for their support and funding of our participation at one of their annual meetings in the USA in 2013, as well as the Bodossaki Foundation and the Society for Conservation Biology (SCB) for supporting the summer school “Biodiversity in Theory and Practice” (GSS) that was hosted annually at PALASE. In addition, we owe thanks to the Most Reverend Bishop of Ioannina, Maximos, who in fact was the first to suggest that a book be written that captures our work and makes it known to the public.

We thank our colleagues, the current and former members of the board of PALASE that we have not mentioned and, in alphabetical order, Konstantina Bada, Konstantinos Gavrilakis, Yorgos Goletsis, Apostolos Katsikis, Eleni Kotzampopoulou, Giorgos Mallinis, Konstantinos Sotiropoulos, Stavros Tzokas and Stergios Vergos who contributed time and work to the planning and operation of the station. We thank all the groups that chose PALASE as a venue for their research, educational programs and events, turning it into a lively space that welcomed, in its ten years of operation, thousands of visitors from Greece and the world.

Finally, we owe thanks to all those who provided us with photos and maps and to Vasilis Mouyis of Doric Shipbrokers for his support, to Despina Vokou for her contribution to the editing of the texts and to everyone else in the University of Ioannina, from the rector's office to the technicians, who in one way or another supported our work.

Vitsa plateau. © K Stara

Foreword

On behalf of the University of Ioannina

Anna K Batistatou Rector, Professor, Department of Medicine

The University's Labriadeios Field Research Station (PALASE) in Ano Pedina, Zagori, represents an important initiative and activity of the University of Ioannina that began 12 years ago, with the signing of an agreement of cooperation between the University of Ioannina and the Foundation of the Labriadeios Home Economics School, and with the establishment of an eleven-member Board of Directors chaired by Professor JM Halley, having the Department of Biological Applications and Technology (BET) as the principal contributor. From the inauguration of the station in 2014 to the present day, many important educational, research and collaborative initiatives have taken place in Zagori, at PALASE, for which the University of Ioannina is proud.

We would like to express our satisfaction with this bilingual (Greek and English) book, edited by Professor Halley and University associate Dr K Stara, which describes the actions of PALASE in its first ten years of operation. We are sure that this book will contribute to promoting the work of PALASE research station, the University of Ioannina and the rich heritage of Zagori in Europe and the world.

Kato Pedina plateau,
© R Tsiakiris

Foreword

On behalf of the Department of Biological Applications & Technology of the University of Ioannina

Petros Marangos Head of Department, Associate Professor

The PALASE field station has been an important part of the work of the BET Department of Biological Applications and Technology, since it began operation. The station is central for our students learning about the Environment as it offers them close contact with it and allows them to learn in situ about relevant environmental themes: ecological sampling, data analysis and scientific understanding of the Environment. We are proud to be the only department of biological sciences in Greece to play a central role in the running of a field station. The station has also contributed to the biomolecular sciences in our department and to other departments in the university by providing a relaxing atmosphere that is ideal for retreats and workshops. The Department is very pleased with this book that summarizes so much of this work achieved by PALASE.

Foreword

On behalf of Zagori municipality

Georgios Soukouvelos Mayor

The establishment and operation of the University Labriadeios Research Station, one of the first such Research Stations in the Mediterranean, is an important opportunity for Zagori to study, highlight and protect the natural and cultural wealth of our region. It is important that, in this effort, the University of Ioannina sought partnership with the local community and its agencies, members of which participate in the PALASE board of directors.

Zagori is a place that has always given special interest to knowledge and education. The operation of PALASE contributes to the use of this valuable educational space and helps the local community to better know its wealth, and also its prospects. The Municipality of Zagori supports this effort and will always be at the side of the board of PALASE.

Foreword

On behalf of the Labriadeios Home Economics School

Vassilis Donos

In an important step towards realising the original vision of seminarian Neophytos Doukas of Ano Soudena, to establish a university in Zagori, the president and our Management Committee, after a short and substantive meeting, granted the use of the building of the Labriadeios Home Economics School to the University of Ioannina, represented by the Department of Biological Applications and Technology. For more than seventy years, the Labriadeios School had offered a rich educational, intellectual, and professional service during those difficult years when the region lacked such institutions. Now, the entire community of Ano Pedina, along with the Municipality of Zagori, participates in this new pioneering project to establish a Research Station of the University. Since 2012, scientific and artistic groups have been coming to the station, so that PALASE station is now known throughout the world! This initiative therefore offers the prospect of renewal and development for Ano Pedina and the whole of Zagori.

Áno Pedina plateau, © R Tsiakiris

PALASE board of directors

Current members (2022)

John M Halley

Chairman

Dept. of Biological Applications and Technology, University of Ioannina

Kalliopi Stara

Secretary

Dept. of Biological Applications and Technology, University of Ioannina

Konstantinos Sotiropoulos

Bursar

Dept. of Biological Applications and Technology, University of Ioannina

George Thyfronitis

Dept. of Biological Applications and Technology, University of Ioannina

Yorgos Goletsis

Department of Economic Sciences, University of Ioannina

Costas Gavrilakis

Department of Primary Education, University of Ioannina

Vasileios Donos

Labriadeios Home Economics School, Ano Pedina

Alexandra Papingioti

Management Authority of the National Parks of Vikos - Aoos and Pindos

Evangelos Papingiotis

Local Community of Ano Pedina

Stavros Tzokas

Municipality of Zagori

Former members

Georgios Douvlis (2012 - 2015)
Labriadeios Foundation, Ano Pedina

Pantelis Papingiotis (2012 - 2017)
Municipality of Zagori

Konstantina Bada (2012 - 2021)
Department of Folklore, School of History and Archaeology, University of Ioannina

Eleni Kotzampopoulou (2012 - 2021)
Archaeologist, Archaeological Institute of Epirotic Studies
(2012 - 2014) and independent scientist (2015-2021)

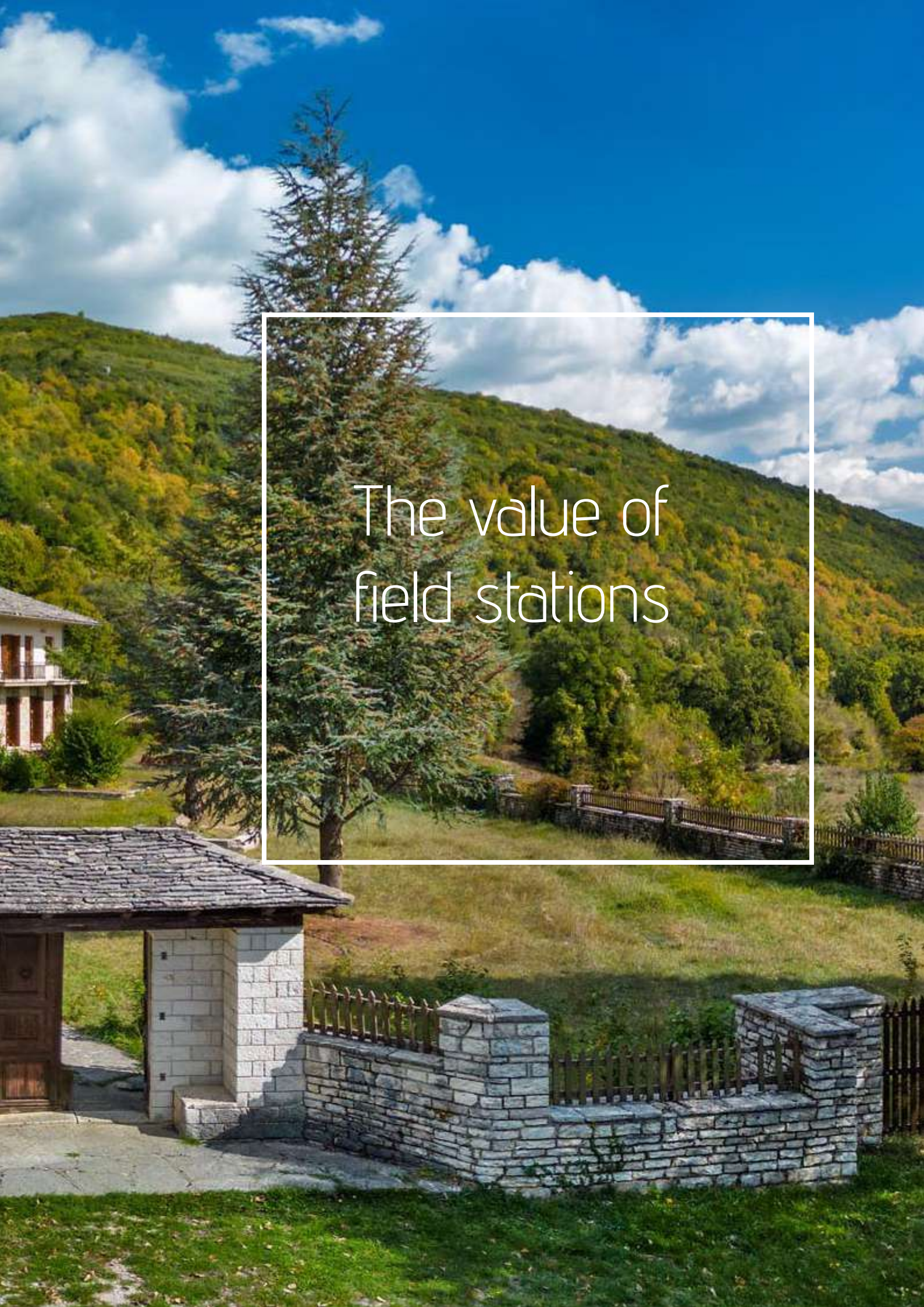
Giorgos Mallinis (2015-2021)
Agency for the Management of the National Parks of Vikos-Aoos and Pindos

Apostolos Katsikis (2012 - 2014)
Pedagogical Department of Primary Education, University of Ioannina

Stergios Vergos (2012 - 2015)
Agency for the Management of the National Parks of Vikos-Aoos and Pindos

Ano Pedina plateau,
© R Tsiakiris

PALASE, ©C Zissis



The value of field stations

01

University of Ioannina's PALASE Research Station completes 10 years of operation

Field research at PALASE. ©JM Halley

University of Ioannina's PALASE Research Station completes 10 years of operation

John M Halley

Figure 1
The building that houses PALACE, © PS Cohen

PALASE (University of Ioannina - Labriadeios Research Station) is a Field Station in Ano Pedina, Zagori, run by the University of Ioannina (UOI). It is housed in the two-story building of the Labriadeios School, now leased to the University of Ioannina for 25 years (Fig. 1). PALASE is a public international station which encourages third-level educators and researchers to visit. Its purpose is written in the following mission statement:

"The mission of PALASE is to provide a place for education and a basis for research and environmental protection in Zagori for both the University of Ioannina and for other universities of Greece and abroad. In close cooperation with the community of Zagori, it will create a facility that provides access to modern equipment and knowledge of the environment. Particular emphasis will be given to studies in ecology, geology and cultural anthropology. Our vision for PALASE is as a leading field station of international importance. Protection of the natural environment is of paramount importance in this age. It is clear that Man must understand it better, which calls for closer contact with the environment. One of the best ways for a university to accomplish this is through an environmental field research station." [1]

1 See website http://fieldstation.bat.uoi.gr

PALASE is one of a very small number of stations in the Mediterranean (and the only such station in Greece) that invites groups outside the parent university to use its facilities. Thus, PALASE enables access to the environment of Zagori, a place of great biodiversity, beauty and cultural richness. Zagori is known for its outstanding features such as the Vikos Gorge, the imposing towers of Mt Tymfi and the remarkable uplands of central Zagori. It contains the Northern Pindos National Park and the Vikos-Aoos UNESCO Geopark. Zagori is an ideal place for teaching on and researching its biodiversity, its geology and its cultural heritage. At the same time, PALASE is easily accessible from the city of Ioannina, being situated just 36 km away (approximately a 40-minute drive).

Beginnings

In 2007, the Labriadeios School in Ano Pedina closed for the last time. The school, which had recently moved to its new building, was compelled to close as people were increasingly moving to large towns and cities (see Chapters 4 & 6). In 2011, a team mainly from the BET department of UOI, saw the promise of the building and proposed that it become a field station of UOI [1]. The rector of UOI, T Albanis, approved the initiative in 2012. After discussions and legal preparations, Labriadeios School foundation granted to the University of Ioannina (UOI) the exclusive use of the building (apart from two rooms) for 25 years, with the goal of hosting research and teaching by operating as a field station (Fig. 2). A board of 11 directors was appointed by the university to manage the station in September 2012. The primary responsibility for the station rested with the Department of Biological Applications and Technology (BET) that was represented with four members of the board. There were also two members from other departments of UOI, three representing the local community, a member from the Labriadeios Foundation itself and one independent scientist.

The board of directors of the new university unit decided to give it the name ***University of Ioannina - Labriadeios Research Station*** in 2013. The abbreviation ***PALASE*** is based on the acronym in Greek (ΠαΛαΣΕ: Πανεπιστήμιο Ιωαννίνων – Λαμπριάδειος Σταθμός Έρευνας). The same year PALASE joined the Organization of Biological Field Stations (OBFS) global network. The offi-

Figure 2
John Halley signs the agreement of the University with the Labriadeios Foundation. G Douvlis, representing the Foundation, is on the right. Also present are G Thyfronitis, then Head of BET department (middle), and members of the University Technical Service, © V Pavlou.

cial inauguration of PALASE took place in November 2014, which happily coincided with celebrations for the 50th anniversary of the foundation of the University of Ioannina (see Chapter 3). The inauguration featured greetings from G Kapsalis, then rector of the university, a representative of the Metropolitan of Ioannina, V Spyros, the Mayor of Zagori, M Tzaflidou, dean of the School of Health Sciences, and from T Trangas, head of the BET Department. The opening speech was by the chairman of the PALASE board of directors, JM Halley, and was entitled *Why should the University of Ioannina have a field station in Zagori?* To this question the following answer was given: *"The station exists for three basic reasons: to promote ecological field research at the University of Ioannina, to promote the university and Zagori internationally and to foster good communication of the university of Ioannina with the local community"*. This follows the tradition fostered by the OBFS ([2], also see Chapter 2).

Finances

For the years 2012 - 2022, the station has received basic support from UOI, through payment of water, electricity and provision of heating oil. In addition, there have been a few grants provided by institutions and foundations (Table 1). Payments from visiting groups are used to fund ongoing renovation and repairs.

Table 1

Agencies that have offered grants to PALASE.

Year	Foundation
2015	Region of Epirus
2014	Rufus Halley Foundation (RHF, Ireland)
2014	Bodossaki Foundation
2015-19	Society of Conservation Biology

The money from the RHF was used to finance the inauguration ceremony in 2014 and initial cleaning and refurbishment of the building. This included painting and plastering of the ceilings on the lower floor. The grant from the Region of Epirus was used to renovate the upstairs bathrooms and toilets, to purchase new furniture for the dining room and for the kitchen and staff bedrooms. This money also paid for the acquisition of important field guides for the flora and fauna of Epirus as well as scientific equipment (telescopes and binoculars). The other two grants were smaller and were used to support the Greek Summer School (see Chapter 13).

Use of PALASE by Greek and international visitors

Since 2012, when the initial agreement was signed between the university and the Labriadeios Foundation, the station has been operating every year. In total, from 2012 to 2022, the station was used by 5,540 visitors for a total of 620 days, recording 15,600 visitor-days in 72 bookings. The station is mainly used in the months of May, June, July and September. The use of the station is relatively stable, but there was a significant increase in the years 2014-2015 (Fig. 3). The station operated even during the pandemic years 2020-21, although there was a large drop in the number of visitors. Important contributions have been the annual field course of BET (see Chapters 10-11), the annual festival of the Mushroom Association of Epirus (see Chapter 18) and the Greek Summer School (see Chapter 13).

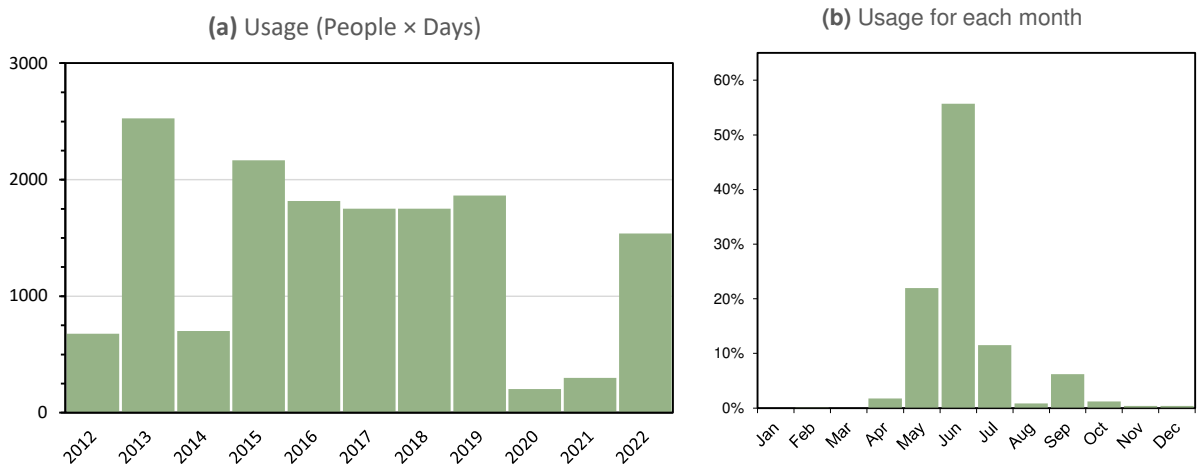


Figure 3:
(a) Yearly usage of PALASE, (b) Usage by month.

PALASE station aims to have an international character. In the period 2012 - 2022, the use of PALASE by international visitors approached 10%. A total of 29 different nationalities have used the station. Of these, the most consistent foreign visitors, those with 10 days or more per year, are from Italy, Holland, Germany, Sweden and Hungary (Fig. 4).

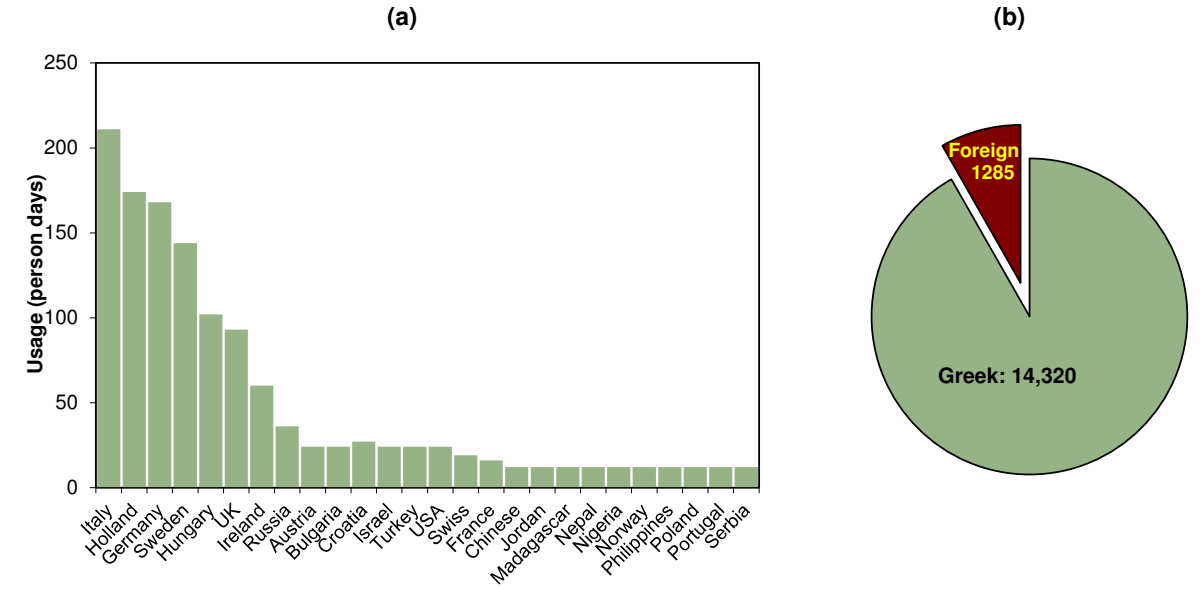


Figure 4
Usage of PALASE facilities by international visitors. (a) Numbers by country, (b) Proportion of international visitors.

National and international teaching

Several courses of the university of Ioannina and summer schools have been hosted in PALASE. Those most consistently conducted there are the following:

Field Ecology *(Undergraduate course of the BET department of UOI).* This 8th semester BET course has been taught since the station was established in 2012, except for the two pandemic years. The purpose of this course is to introduce the students of the Biological Applications and Technology Department (BET) to real ecological systems in the field. The main part of this course takes place at PALASE (Figs 5-6), where students spend six full days of practical work in the field (8 × 6 = 48 hours minimum). In addition, six more two-hour lectures are held on the university campus in Ioannina prior to departure for the field station. This was a pioneering course, the first of its kind at the university of Ioannina and possibly in Greece (See Chapters 9-11 & 15).

Greek Summer School (GSS): Biodiversity in Theory and Practice. Since 2014, the GSS has been running at PALASE, hosted by the BET department of the University of Ioannina (as "Greek Summer School – Biodiversity in Theory and Practice") until the pandemic years. The GSS had already been running since 2008 from nearby Papingo village, having been initiated by V Kati in a pioneering initiative that brought professors and students from all over the world for conservation biology in Zagori. The GSS aims to investigate biodiversity and conservation issues using modern approaches. At the same time, participants have the opportunity to get to know the biodiversity of Zagori in the various small projects they take. The school's participants are typically postgraduate students or postdoctoral researchers from various European institutions. While at PALASE, the GSS has hosted teachers and participants from 25 different countries (see Chapter 13).

History, Society and the Culture of Work (Autumn school, in Greek). It was organised from 2011 to 2013 by K Bada, from the Department of History and Archaeology at UOI in collaboration with the Department of Social Policy of Panteion University, the Hellenic Folklore Research Centre, Democritus University of Thrace, University of Peloponnese and University of the Aegean.

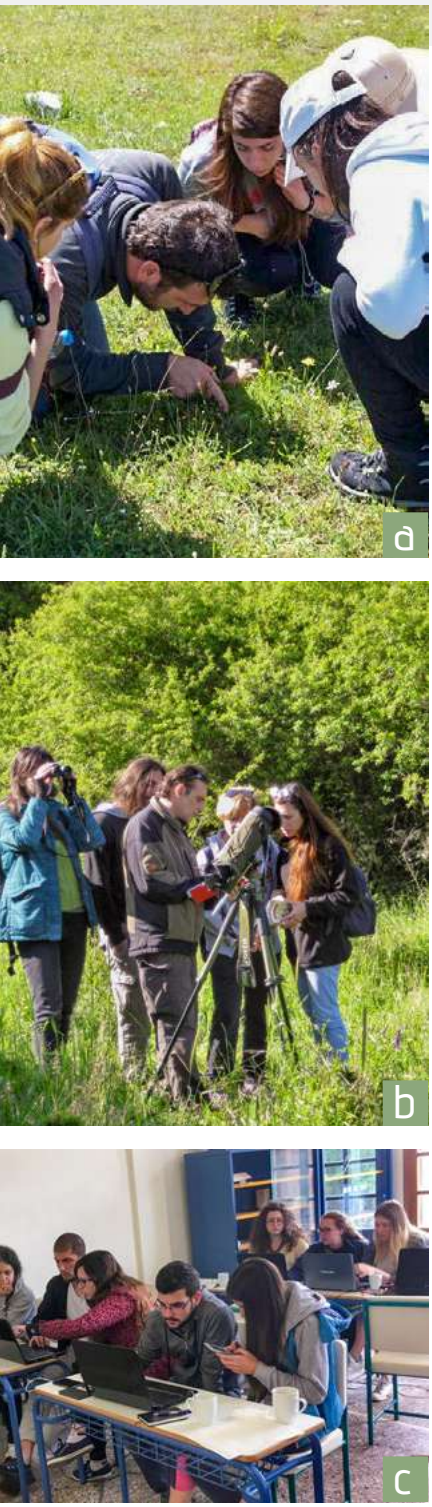


Figure 5
The UOI Field Ecology course combines in one week (a) observation, (b) sampling and (c) data analysis of various taxonomic groups,
© JM Halley.

This school examined the history, society and the labor culture of the region. Particular attention was paid to changes in the nature of work, in modern society, that accentuate social inequality. The magazine *The world of work*[2] is a product of the on-site training of students and researchers in Ano Pedina, Kato Pedina and Elafotopos of which this autumn school was part.

Research Methods in Genetic Engineering (Undergraduate course of the BET department of UOI, 2012 - 2018). This course has been held at PALASE annually, between 2012 and 2019, and has been coordinated by T Michaelidis from BET. Students visit the PALASE facilities for their course needs every June and spend a day at the station preparing and giving presentations on posters (See Chapter 12). Significantly, this outing is based on the concept of a "retreat", namely getting away from the normal atmosphere of the university to a quieter place where people can work in a more relaxed environment.

Figure 6
Sampling amphibian populations as part of the BET course Field Ecology, ©JM Halley

Research and data generation

One of the most important missions of field stations is the collection of field data and the hosting of research efforts to this end. Since it began operation in 2012, PALASE has hosted several ongoing research programs with cutting-edge research on environmental themes, including the following:

A: The Biodiversity of the Sacred Forests of Epirus. Sacred Forests are natural habitats that are traditionally important because of their spiritual, protective and cultural importance to local communities. In the context of the THALIS-SAGE program *The Sacred Groves of Epirus: Conservation through Religion* (2012 - 2015), an international interdisciplinary team of 38 people worked to study the contribution of Sacred Forests to biodiversity conservation [3] (Figs 7 and 9a). An important part of this research was hosted at PALASE, especially in the years 2012 - 2015. The investigation of sacred groves in Zagori continues as a research theme in BET (See Chapter 9).

2 See http://kosmos-ergasias.unit.uoi.gr

Figure 7
Part of the international research team for the THALIS-SAGE programme in February 2013, ©K Stara.

Figure 8
John Halley sampling orchids that are harvested for salep on Mt Peristeri, © K Stara.

B: Assessing the effects of harvesting for salep on local orchid populations. NW Greece is characterized by high levels of orchid diversity and endemism. Orchids are protected by European directives and Greek legislation, but their populations are still threatened by several factors including their collection for salep[3]. PALASE hosted research carried out to study salep collection and its effect upon orchid populations in the North Pindos region (Fig. 8). It is part of wider research activities related to Non-Wood Forest Products, and also research on the abundance of orchids in the area (see Chapter 16). This work done at PALASE has made major contributions to several published studies in this subject [4-5].

C: Assessment of the evolution and genetics of the Macedonian newt in Northern Pindos. The amphibian and reptile fauna of Zagori includes 13 and 28 species, respectively, and is considered one of the richest in Greece. Of these, the Macedonian newt (*Triturus macedonicus*), a European priority species (ANNEX II, 92/43 EC) has been studied by the Laboratory of Molecular Ecology and Conservation Genetics of the University of Ioannina both from a genetic, conservation and evolutionary point of view, using PALASE as a regular base (see Chapter 15). This work found that in Zagori there are two separate and highly differentiated gene pools that can be designated as two distinct “Evolutionarily Significant Units”, entitled to separate conservation status [6].

3 A beverage common in Turkey and the Eastern Mediterranean, made from the tubers of several species of orchids.

D: Investigating evolution of the floral scent for the alpine rock-cress. This plant (*Arabis alpina*) can be found in almost all mountain regions of Europe, yet the flowers have different fragrances. How did this come to be? Starting in 2017, a group from Lund University, led by M Friberg and H Petrén, based at PALASE, performed a three-year study of this plant in Zagori to compare it with a similar population in Italy (see Chapter 17). By studying the pollinators of both populations and the biochemical composition of the floral scent, the Swedish team concluded that the different floral scents were driven by their different pollinators. In this way, Greek and Italian *A. alpina* plants smell differently because natural selection is acting differently on the two populations [7].

E: Investigating systems to utilize Non-Wood Forest Products (NWFP). The PALASE hosted meetings for the INCREdible project (2017-2021) aimed to support synergies between research and business innovation for NWFPs in the Mediterranean, which involved 13 organisations from 8 countries, and drafted a white paper on NWFPs, which has also been translated in Greek and other languages [8].

F: Quiet Spaces for the Completion of Dissertations. One of the important potential contributions of a field station (as pointed out by T Michaelidis, in Chapter 12) is to provide a space where people can retreat to concentrate intensively on their research, to write papers, proposals or dissertations. PALASE field station hosted the research and acted as a place of retreat for several researchers as they finished theses or scientific papers. These included N Pion [9], AE Tzortzaki [10] and V Marini-Govigli [11] who used the building to complete doctoral or MSc dissertations.

Figure 9
Research teams: (a) V Marini-Govigli with N Pion taking tree cores near Kipoi village, (b) S Everingham performing soil samples in 2021 near PALASE, as part of the BUGNET programme, © JM Halley.

Other notable events

2014-2022: The Annual Mushroom Festival. Over the last 20 years, in Europe there has been a steady growth in popular interest in edible mushrooms. The Annual Mushroom Festival, organised by T Ntinos and the Mushroom Association of Epirus, is a celebration with talks, musical events, workshops for children, and field collection and identification of mushrooms that attracts hundreds of visitors each year (see Chapter 18).

2012 - 2022: Zagoriwood film school. Since 2010, G Makris and colleagues have been organising Zagoriwood, a film festival workshop, every summer based in Kato Pedina. People involved in cinema and other audiovisual applications, participate in the workshops and young filmmakers and amateur enthusiasts can learn more about technique and the creative grammar of the image. Since 2014 PALASE station has hosted many Zagoriwood activities and organised some joint initiatives (see Chapter 19).

Many groups have carried out work at PALASE on a single visit. The purpose of PALASE is primarily academic and research orientated, but we have often hosted other groups, especially when academic demand is not so high.

2012, May. National Technical University and Metsovo Center for Interdisciplinary Research. To study sustainable development plans in Zagori in the framework of the project *Environment and Development of mountainous areas*.

2014, July. Training camp for young people from the Netherlands, under O van Herwaarden.

2014, June. Dr V Bouba (Medical School, UOI) brought a group of children to visit Zagori for scouting activities.

2014, October. *Aristotelis* Climbing club from the Outdoor Activities group of Antirrio, under Dr S Salamouras.

2015, May. Physical Education department of Aristotle University of Thessaloniki, under A Giannakos, held a Handball Specialization Symposium.

2015-2017. Researchers from the Institute of Local History, under K Papagianopoulos and E Simoni, studied the connections of the Ano Soudena and Kato Soudena villages of Zagori with the homonymous villages of Kalavryta [12].

2018, May, June, July. Volunteers of the NGO *Callisto*, under G Theodoridis, for the program *WE EXIST* aiming at improving the conditions for human coexistence with large carnivores and encouraging active participation in conservation.

2018, May. Theology Department of Aristotle University of Thessaloniki, under A Zabakidis, for an educational trip to Zagori.

2020, July. Members of the Boulouki "Reappearances" project, a combination of a practical workshop and a participatory restoration of old cobbled pathways in Aristi village (see Chapter 20).

2021, July and October. Summer Schools *Ecoscapes* and *Yonder*, organised by G Scheiner and N Giannis.

2021, May and 2022, March. Researchers based in University of Bern, Switzerland, under E Allen and S Everingham, carried out sampling for the BUGNET Programme aimed at better understanding the impact of invertebrate herbivores and pathogenic fungi on plant communities and ecosystems on a global scale (Fig. 9b, https://www.bug-net.org/).

Events for the general public

25/4/2012, Lecture. A Ramsey (Professor, University of Cumbria): *Conservation and Economic Development: Can they coexist?*

27/4/2012, Lecture. D Vokou (Professor, Dept. of Biology, Aristotle University of Thessaloniki): *Ten years of operation of the Protected Area Management Agencies: an assessment.*

22/7/2017, Film Screening. *The Eagle Huntress*, in the square of Kato Pedina, Zagori, co-organisation with ZAGORIWOOD.

27/3/2017, Lecture. PS Cohen (Stanford University, USA, and Former President of the organisation of Biological Field Stations): *The Importance of Field Stations for Scientific Research and Environmental Protection* (Held at BET, UOI, Ioannina).

13/5/2019, Conference. *Energy, Environment and Climate Change* (Held at Zosimaia Academy, Ioannina, under the auspices of PALASE).

27/7/2019, Lecture. R Miller (Professor, Dept. Theology, Creighton University, USA): *The theology of climate change: humans and the "deep future" of Earth*.

15/7/2021, Open Discussion. V Nitsiakos (Professor, Dept of History and Archeology): *The Craftsmen of Epirus. From agricultural and livestock self-sufficiency to technical specialization*. One of a series of open events offered by the Boulouki *Reappearances* project (Held in courtyard of PALASE).

4/4/2023, Conference. *Electricity generation in Greece: the optimal mix of sources* (Held at Zosimaia Academy, Ioannina, under the auspices of PALASE).

02

PALASE as a global research station

PALASE from above, © C Zissis

PALASE as a global research station

Philippe S Cohen

Understanding the depth and complexity of the relationship between humans and natural systems is a critical and essential need in today's world. Too often, human dependence on natural systems and services is an opaque relationship. In truth, we live in a time when Nature's struggles become humanity's challenges: as ecosystems degrade, so does the quality of our lives and essential services, such as water, soil, pollination, clean air, safe food, and other ecosystem services. The stability and resilience needed to support the human enterprise often degrade before our very eyes and become the source of social upheaval and displacement. Hence, any activities that shed light on how humans can sustainably and resiliently reside within the planet's ecosystems are to be treasured and encouraged and is one of the truly wondrous contributions of field stations such as PALASE. They make our connections and dependencies on natural systems and other life forms visible and visceral to the generations that must grapple with the shortcomings of my generation and the formidable challenges they must face. In many ways, field stations and marine labs (FSMLs) are what I refer to as global backyards: places where the operating instructions for planet Earth are discovered, made accessible and experiential within a local context. These global backyards are like sentinels, often in a unique position to document and interpret environmental responses to climate change at local and regional scales. Many of the world's most important environmental multidecadal data sets are anchored to field stations—they often supply the data needed to track changes, discern patterns, and solve the environmental challenges that characterise the Anthropocene.

The basic requirements for life and civilization are inexorably linked to natural resources and the well-being of our environment. As the population has swelled to over 8 billion, understanding and predicting human impacts to the planet and the reciprocal consequences become increasingly urgent. Field stations sit at the interface between human societies and the natural environment, serving as hubs of exploration, education, interdisciplinary research, and monitoring. PALASE is an important contributor to this critical mission and support for such field stations is an acknowledgment of our responsibility to prepare current generations of students for the formidable challenges they are facing. The educational and research missions of field stations and marine labs are integral to scientific literacy and remain critical to the protection of Earth's natural heritage and its life-sustaining ecosystem services. When all is said and done, public understanding, participation, and trust in science is essential for increasing human connectedness to the natural world and empowering local communities to design and engage in public policy.

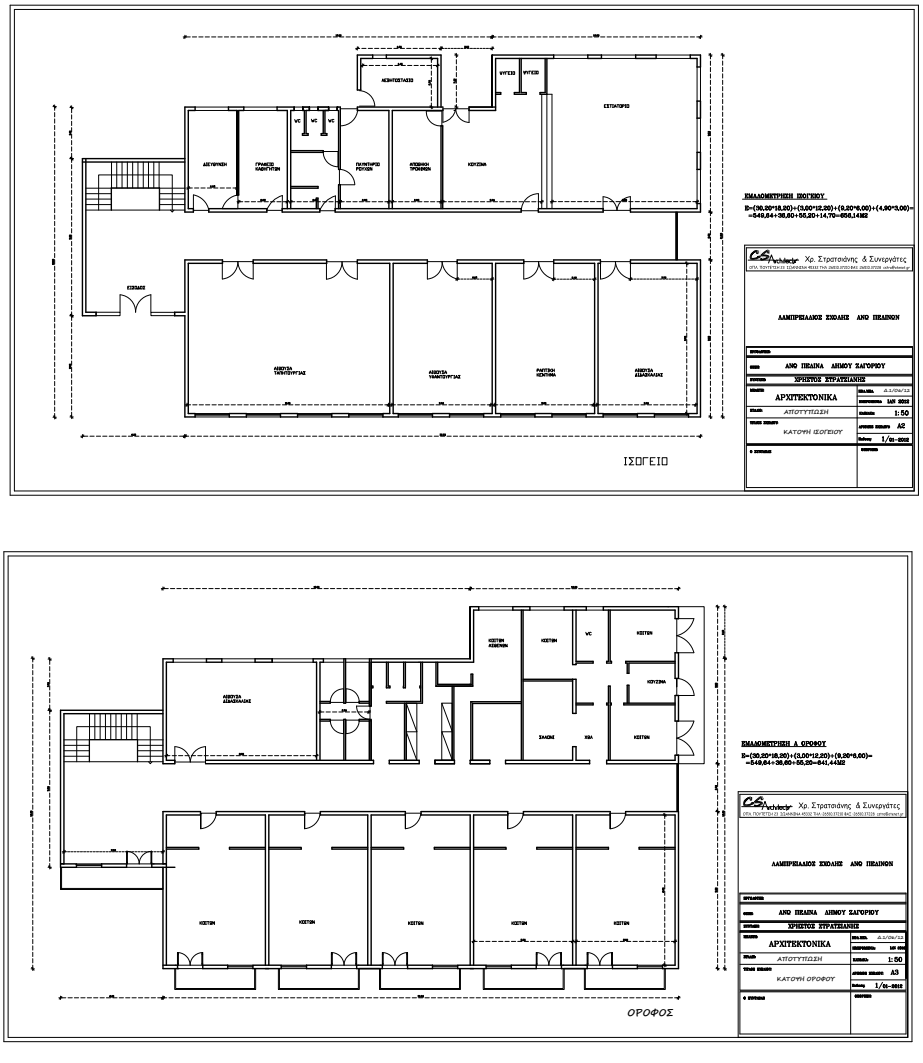


Figure 1
Floor plan of the ground floor of PALASE,
© C Stratsianis.

The services provided by field stations like PALASE provide enormous benefits and even greater potential in four ways:

1 They provide essential infrastructure and resources to facilitate important scientific research and education while providing access and means for studying diverse life forms and the ecological processes/relationships they comprise;

2 Facilitate the effective and efficient use of public resources for field-based research and education in the sciences;

3 Diversify local economies with high-skill jobs in science, technology, engineering, and mathematics. In the last 15 years, these are professions that have grown three times faster than other sectors in developed countries;

4 Help develop a diverse set of work-force ready graduates with the critical thinking skills needed for a broad range of careers along with increasing the scientific literacy of its citizenry. For instance, recent studies in the U.S. have shown that FSMLs have a high success rate at recruiting student interest in the sciences, engineering, and mathematical fields as well as enhancing scientific literacy in the general public.

Figure 2
Two PALASE board members participated in the annual meeting of OBFS in Southwestern Research Station in Arizona, USA on 19-21/9/2013, © OBFS.

There is growing evidence that field courses contribute to recruitment, retention and inclusion of students in the sciences. While many colleges, universities, and biological field stations have initiated innovative efforts to develop and implement virtual materials and live-stream research-based field experiences for the classroom (e.g., https://thevirtualfield.org), these cannot replace place-based learning and physical contact with nature. There is a sense of intellectual discovery that comes with the study, design, data collection, and analysis conducted in field courses when combined with the added value of being absorbed in nature that yields an accompanying sensation of self-discovery and the realisation that Earth is still a little-known planet. Scientists and non-scientists that experience field stations like PALASE take away a deeper understanding and empathy for nature, and a willingness to embrace an ethic of planetary stewardship. One of the true gifts of having managed field stations for nearly three decades is witnessing first-hand the way such places change the trajectory of people's lives.

Figure 3
Philippe Cohen along with John Halley (left) and Georgios Kapsalis (then rector of UOI) at the University of Ioannina, where he was a guest of the BET department in 2017, © V Pavlou.

Figure 4
Dining area on the first floor of PALASE
© C Zissis.

Given the history and biological significance of the Zagori region, PALASE has an especially unique role that has important implications for what a sustainable and resilient future looks like. Think about it, the Pindus Mountains and Zagori region are considered a naturally beautiful area, a biodiversity hotspot with rugged mountains, deep gorges, and crystal-clear rivers, all while representing one of the oldest, continuously settled landscapes in Western civilization. Any success at preserving and rehabilitating ecosystem services and biodiversity in such a landscape can speak volumes about the future prospects of western civilization. Greece, as one of the original cradles of Western civilization, provides landscapes that have been occupied for millennia, and hence can provide important insights into how land can be successfully stewarded. For eons, this region has been an important source of natural resources such as timber and minerals, and an important hub for textiles and agricultural products. Add to that the layers of a rich cultural heritage, from ancient Greek spiritual symbols to present day traditional ways of life, and this is a region where a biological field station such as PALASE can help bridge many gaps. As you read the ensuing chapters, think about the many opportunities that lay ahead to make a real difference in the lives of individuals, in the contributions to the surrounding communities, and to what we can begin to understand about how to make a more sustainable and resilient future.

03

The vision of a University of Ioannina Research Station in Zagori

The Kato Pedina plateau, © K Stara

Georgios D Kapsalis

I feel particularly happy, as today[4] we celebrate the opening of PALASE, following a bold decision of the Labriadeios estate to lease the site of the Labriadeios Home Economics School to the University of Ioannina for an extended period of time. I should point out, however, that this decision of the Endowment Committee to collaborate with the University of Ioannina is a choice representing all the residents of the community. Once again, this shows that Ano Pedina is a community with a great spiritual and cultural tradition, a community that is determined to continue today in the tradition of the inspirational personalities from the Ottoman times Neophytos Doukas and Neophytos Dottos, as well as author and physician Ioannis Labridis.

We all know that the benefits of this collaboration are mutual, both for the University and for Ano Pedina, indeed for the whole of Zagori. The University of Ioannina now has a field research station, which will be one of the first not only in Greece but in the whole Mediterranean. The station, located in Northern Pindos National Park, is situated in an environment of amazing biodiversity of every form and type. Of course, other similar actions will follow at this station, such as the organisation of summer schools and educational seminars, as well as the study of local culture and tradition. This will enable Ano Pedina to act as a centre of inspiration for the many visitors to the Station to become acquainted with the wider area of Zagori.

The first question that I asked Professor Halley, when he was telling me about this station, was about the impressions of the station from visitors. *"They leave impressed and seek to come back as soon as possible"* was his answer. This is something that we, the University and the local community, should preserve and protect.

4 Speech delivered at the opening of PALASE in Ano Pedina (30-11-2014).

Figure 1
Snapshots from the inauguration ceremony, 30.11.2014, © UOI.

As mentioned earlier, the Department of Biological Applications and Technology, of the University of Ioannina, will have a leading role and responsibility in this station. However, it is certain that the Station will be utilised in the future by almost all departments of our University, and we hope that among them will be the department of Architectural Engineering that we are trying to have up and running in the coming academic year.

At the same time, the University of Ioannina, as the higher education institution of the region, has important obligations. First of all, respect is required for the Station building itself, which is a building that contains an entire history of the local society and of the wider region.

Next, we must undertake actions and initiatives to make this station a nucleus of research and culture, publicising our actions and initiatives everywhere and enabling all the relevant bodies that can be used to expand its activities. This initiative is an important form of outreach for our University, not only to Greece, but also to Europe and the World.

For the local community, no encouragement is needed as to their obligations, because they have proved to all of us already how much they love this place, given the care with which they preserve their customs and traditions. At the same time, they have shown that they are able to make important decisions on the way to a better and more hopeful tomorrow.

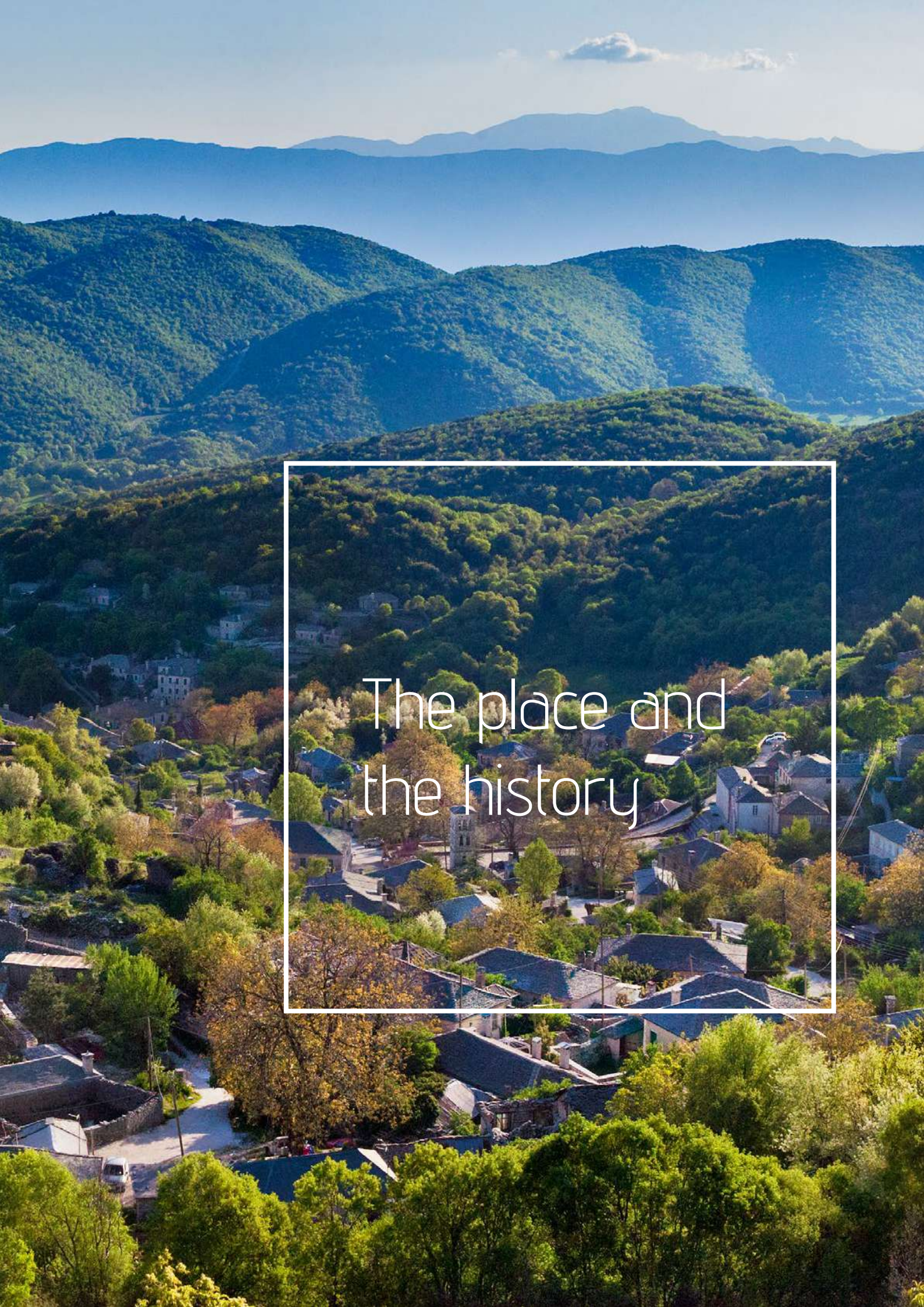
One more factor, which needs to be highlighted, has to do with the structural issues needed in the PALASE building itself, and also for laboratory and hosting infrastructures. The board of directors of PALASE and the School of Health Sciences have already submitted a detailed proposal for interventions required for the building. As a university, we will seek in the coming days to meet with the regional governor of Epirus, Alexandros Kahrimanis, to whom we will present our complete proposal, expecting an immediate response.

I should point out that this collaboration is not the first that the University of Ioannina has developed with the Municipality of Zagori. It is, however, an example of joint action between the university and the local community with mutual benefits. It also becomes clear that in order to achieve such a result, a common will for action among all stakeholders is required. There are still some people who believed and worked harder to achieve such a result. I will address my first thanks to His Grace Metropolitan

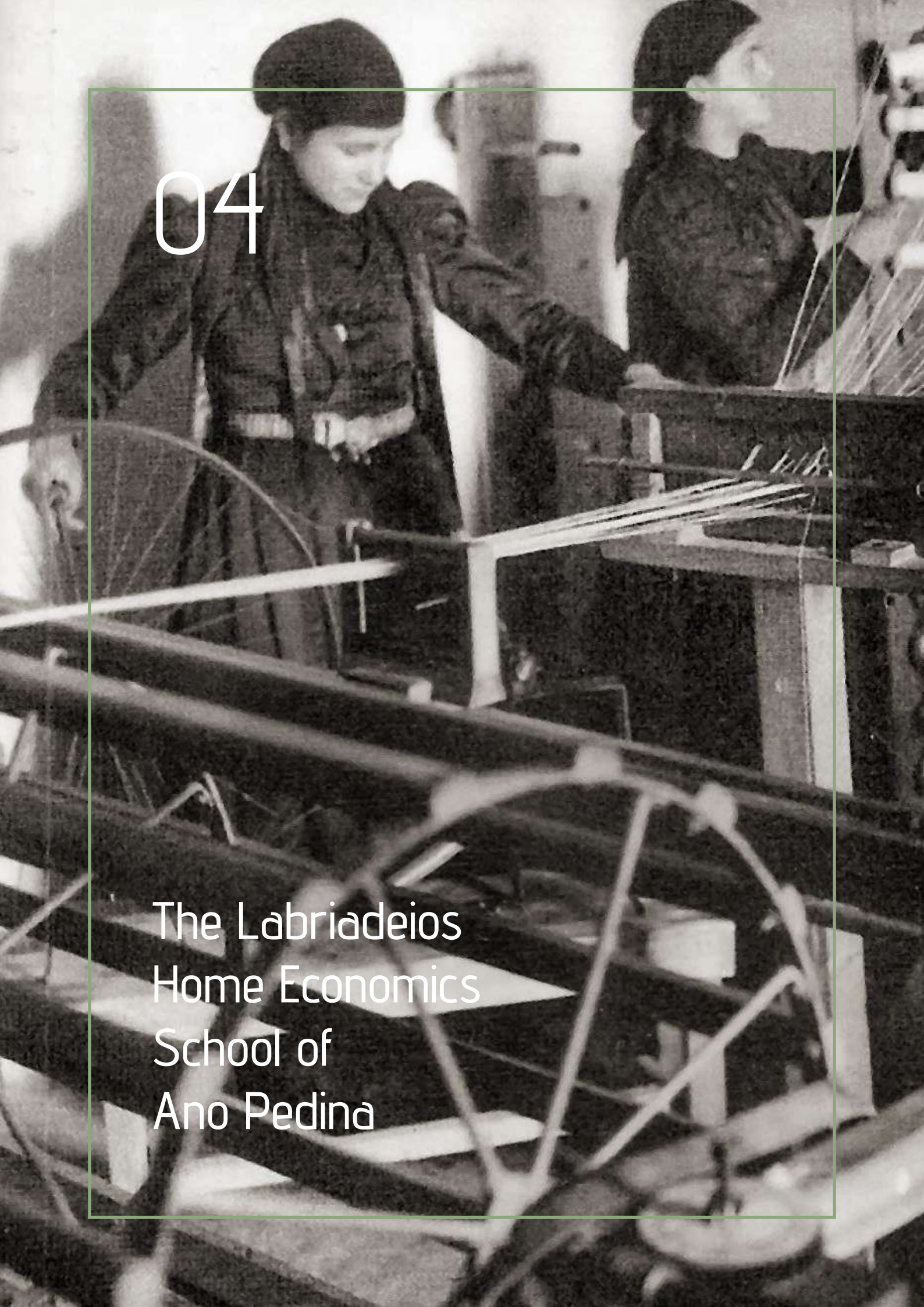
Maximos of Ioannina who in a recent meeting we had with all the stakeholders, completely agreed with the aims and objectives of this project. I would like to continue with Georgios Douvlis, who is the current president of the Management Committee and the "heart and soul" of the Labriadeios Foundation, who believed from the beginning in the idea of this cooperation and struggles every day to achieve the goals we set. It would be remiss of me not to mention the former Mayor of Zagori, Gavrilis Papanastasiou, and also the current Mayor, Vassilis Spyrou, for the excellent cooperation we have developed both in this and other similar issues. From our side, I would especially like to express my warm thanks to professor John Halley, whose systematic scientific engagement with this particular project is also a guarantee for the future. I further thank my fellow vice-rectors, the members of the Administrative Authority of the Labriadeios Foundation, as well as the members of the PALASE board of directors. I sincerely thank all of you who honour us with your presence and love and who believe with us in the goals and aspirations of this joint venture.

Figure 2
From the interior of PALASE: lecture room, books in library, dining room and one of the dormitories, © C Zissis.

Ano Pedina, © C Zissis



The place and the history



04

The Labriadeios Home Economics School of Ano Pedina

Georgios Douvlis

The Labriadeios School suspended its operation in 2007 due to a lack of students, after a rich educational and social contribution of 73 years. Even in very difficult times when the educational care for the countryside was completely non-existent, thanks to the foresight of its founder, the ever-memorable Ioannis Labriadis, this unique School had been the only institution that offered a complete four-year professional and classical education for girls in the wider region of Epirus (Fig. 1). Thus, during the 73 years of its operation, hundreds of Greek and foreign girls, especially from Albania, attended this modern boarding school and acquired a professional education, receiving also social education and all the necessary skills to become skilled in crafts and home economics[5] (Fig. 2). The Labriadeios School, with these contributions over many years, was one of the most valuable educational institutions of its time.

The founder of the School, Ioannis Labriadis, originated from Ano Pedina. Born in 1821 in Ano Soudena (today Ano Pedina) he followed the distinguished tradition of many from this region, characterised by benevolence and philanthropy, and spent many years working and travelling in the region of Wallachia[6]. Having acquired considerable property, he returned to Greece and settled in Corfu where he invested his savings mainly in the market for real estate. Since Labriadis and his wife Eleni (née Skourti) (Figs 3-4) were not lucky enough to have any children, all their property, following a will drawn up in 1888, was allocated for the

Figure 1
At the Labriadeios Textile and Tapestry School of Ano Pedina (1938), detail, © S Meletzis, Labriadeios School archive.

5 Home economics (or housekeeping) schools were established in Greece mainly in the first post-war decade of the 1950s. They were concerned with the education of girls in rural areas. This education had a moral and cultural character including such things as good manners towards family and strangers. At the same time, they provided practical knowledge on the needs of house and family and skills related to everyday chores as well as hygiene, basic healthcare and first aid. Girls were taught embroidery, how to sew and use a loom and how to care for infants, domestic animals, birds and plants and how to decorate a home (note of the editors).

6 In present day Romania.

Figure 2
Graduation in 1976,
© G Douvlis [1].

professional education of the girls of their village (Ano Pedina) and beyond. However, the implementation of his will was not an easy task and his heirs immediately challenged it after its publication. Thus, over 40 years were spent in fruitless legal battles, to the point that the whole matter might have been forgotten as the statute of limitations expired. Then in 1923, by a fortunate coincidence Nikolaos Georgiadis, a prominent personality in Athens but also from Ano Pedina, took over the management of Piraeus Bank. Georgiadis was methodical, relentless and had exceptional administrative skills as well as a deep love for his hometown. He thus undertook the difficult research regarding the fate of the forgotten legacies of Zagori and especially that of Labriadis. With the help of Konstantinos Batas, also from Ano Pedina, he learned about the legal issues. Also involved was Dimitrios Pappas, again from Ano Pedina, the bank's cashier; the solicitor, Vassilios Leonardidis; the director of the *Public Employees' Share Fund*, Konstantinos Zavitsianos and his friend general administrator of Epirus Georgios Modis. There was the professor, expert in matters of folk-art, Angeliki Chatzimichali and of course the great churchman, Spyridon Vlachos[7]. After the establishment of the seminary

7 Metropolitan of Ioannina 1916-49, Archbishop of Athens and All Greece 1949-56 (note of the editors).

at Vella, the bishop also put effort into the education of girls, not only in Ano Pedina, but in the whole of Zagori and Epirus in general. Despite his failing health, with characteristic stubbornness he proceeded to establish the Labriadeios School. Thus, the bishop and Georgiadis, together with the representative of Ioannina Konstantinos Katsadimas, son-in-law in Ano Pedina, with methodical actions and targeted interventions, achieve the passage of the founding law of the School, No. 5825/2-10-1933, win the relevant lawsuit and thus compel the heirs to hand over the remaining assets. Thus ended the first phase of the establishment of the School and followed the second and more difficult one, that of its operation. Much was required before the operation could begin. But everything had been initiated and planned by the wise Georgiadis, who was the driving force and mastermind behind the whole effort. He aspired, like Bishop Spyridon, for the school to be based on a solid foundation so as to be viable and exemplary. Thus, the Labriadeios school, with its excellent basis and its sound operation, gradually became renowned in Zagori and beyond, acquiring a reputation as a great vocational school. In the beginning, the school functioned essentially as a carpet factory. Slowly, however, it took its definitive form with four classes: carpet making, weaving, sewing and embroidery. The technical courses were taught by qualified personnel, while the director taught a course on home economics and a teacher appointed by the Ministry of Education taught the courses of the standard curriculum. In the first three years of their studies the students attended all four workshops, while in the fourth year they specialised in just one (Fig. 5). At the same time, they were given lessons in horticulture, beekeeping and sericulture by a specialist agronomist.

Figures 3, 4
The founder of the School, Ioannis Labriadis (1821 - 1989) and his wife Eleni,
© G Douvlis [1].

The Management Committee from the outset had two major problems: a lack of sufficient resources and the unsuitability of the buildings where the students were staying, since the only suitable building was the workshop building, the Tzovaneio school, which had been granted by the community for this purpose. Both eventually found solutions, thanks to the help of Stathis Labridis and his son Vasilis (a high court judge) through the modification of the will of the late Rizaris brothers and the construction of a new building.

The Management Committee, consisting of nine members, has always been chaired, according to its rules of operation, by the Metropolitan of Ioannina Theoklitos Setakis (except for the period 1991-2014, when he had resigned, due to his disagreement with

the members of the Management Committee) and was chaired at first by the late doctor Georgios Donos and then by Geirgios Douvlis until 2014, who resigned with the arrival of the new metropolitan. The Labriadeios School reached its high point in the 1990s with the 50-60 schoolgirls, the organisation of educational seminars for Greek teachers from Albania and other cultural events. It was a time when the village of Ano Pedina was bustling with life and the presence of the School. However, as is often the case, prosperity is followed by decline. This also happened to the Labriadeios School, since the dwindling numbers of girls in the area were going increasingly to high schools. Also, the migrants from Albania, who used to flock to the Labriadeios School, now preferred to work in bars and hotels in the cities. Thus, in 2007 the school closed. With this unfortunate development, the Management Committee had to deal with two new and serious problems: that of the fate of the Labriadeios Estate and of course that of the new building. Both of these major problems have been given the best possible solution by the Management Committee. On the issue of the Legacy, the Committee appealed to the Athens Court of Appeal, which in its decision No 6478/2011, enables the Committee to grant educational aid to the young men and women in Ano Pedina, who are attending higher educational institutions. The Management Committee, through the mediation of promi-

At the Labriadeios Textile and Tapestry School of Ano Pedina (1938), © S Meletzis, Labriadeios School archive.

Figure 5
At the looms of Labriadeios (1930s), © “Nelly’s” (Elli Suyultzoglou-Seraidari), from Labriadeios School archive

nent environmentalist Kalliopi Stara, came to an agreement with the Department of Biological Applications and Technology of the University of Ioannina for the establishment of a field research station in the premises of the School. The relevant contract, an historical milestone for the development of Zagori, was signed on the 3rd of September 2012 at the Rectorate of the University, in a solemn ceremony, by Giorgios Douvlis as representative of the School and the Rector of the University, Professor Triantafyllos Albanis. In conclusion, with these last two decisions, both the educational character of the legacy is fully preserved and, with the creation of PALASE by the University, the most promising prospects for the upgrading of the entire wider region of Zagori are enabled.

05

The tapestries of the Labriadeios School and their symbolism

The tapestries of the Labriadeios School and their symbolism

John M Halley & Eleni Douvli

In the entrance to the station, we see a large tapestry which embodies a central idea in the mission of PALASE. The Tree of Life tapestry was embroidered by the girls at the Labriadeioς School. Under the supervision of Stavroula Bakogianni and Konstantina Damou, many designs were adapted from the works of Angeliki Chatzimichali (1895-1965) and others. This design is from Skyros island.

The Tree of Life is a fundamental archetype in many of the world's mythological, religious, and philosophical traditions. The Tree of Life connects all forms of creation. It is closely related to the concept of the Tree of Knowledge, connecting Heaven and the Underworld. In the Christian world, the Tree of Life appears in Genesis 2:9 and echoes again in the last chapter of the last book of the Bible (Rev. 22:14) and, of course, in the parable of the mustard seed that grows to become a great provider of shelter (Mat 13:32). The tapestry in PALASE (Figs. 1-3) follows the typical ancient iconography, with the tree in the middle and two symmetrical figures facing it on either side. In the Greek folk tradition, one may see two people (Fig. 1), but the two main characters are usually peacocks (Figs 2-3), while in other traditions one can see lions, bears and other creatures variously representing rulers, deities and even human organisations [1].

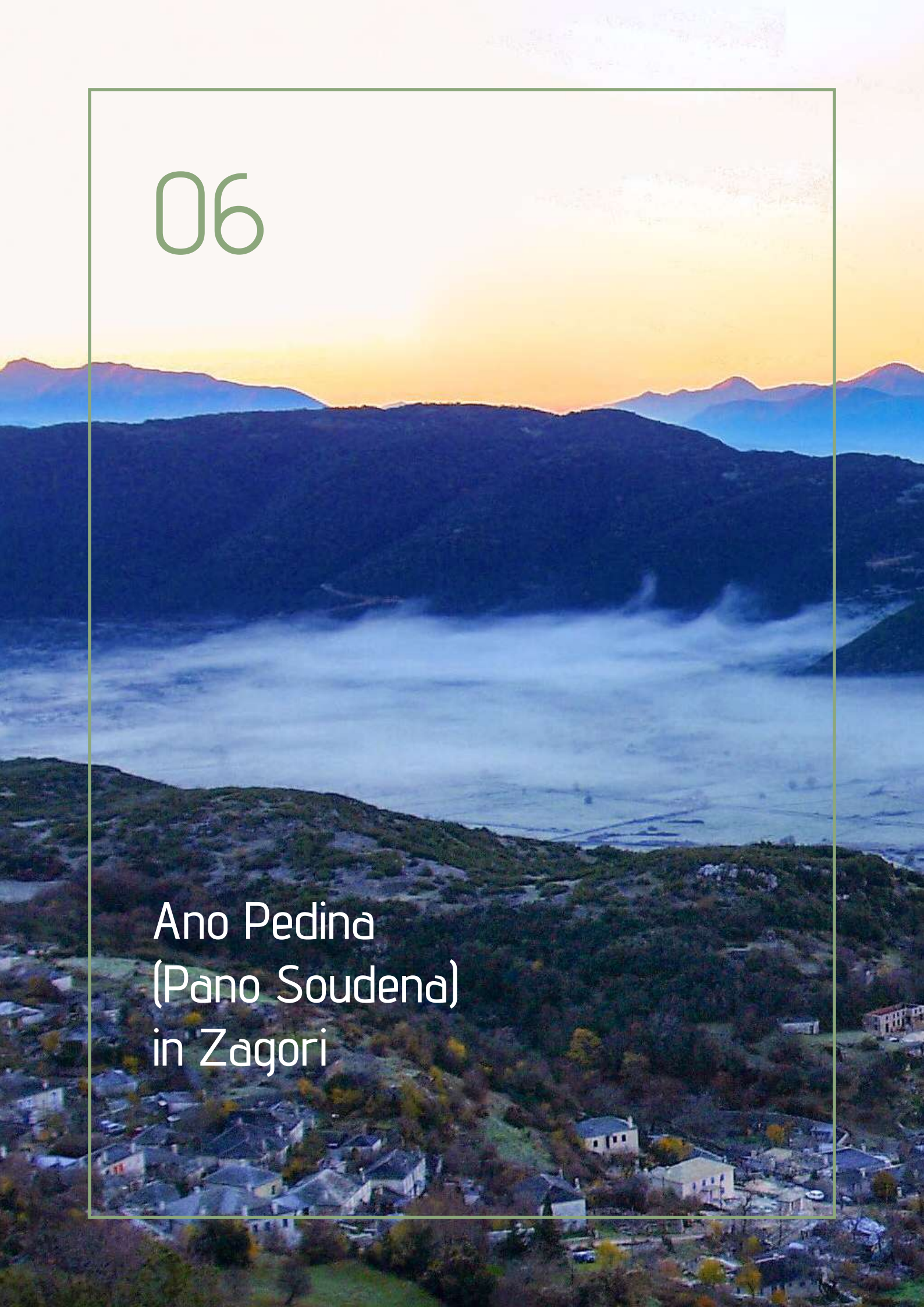
Figure 1
The Tree of Life with two people. Woven at the Labriadeios School, © C Zissis.

Figure 2
Monochrome design of the Tree of Life from the Labriadeios School, © K Damou.

In these tapestries the Tree protects and draws all sorts of creatures, not only birds, but also people. We see small birds and poultry, deer, plants, people, even snails. The Tree reflects the interconnectedness of Life. Thus, this Tree of Life is an important element of continuity from Labriadeios School to PALASE. It echoes the purpose of PALASE field station, which is to draw people's awareness to the Environment and the interconnected nature of our world. It calls us to understand and protect our environment and to recognize our own dependence on it.

Figure 3
The Tree of Life tapestry in the foyer of PALASE, © C Zissis.

Figure 4
Tapestry with a decorative bird (probably a hoopoe) in PALASE, © C Zissis.



06

Ano Pedina (Pano Soudena) in Zagori

Ano Pedina (Pano Soudena) in Zagori

Evangelos Papingiotis

Ano Pedina or Pano Soudena is one of the oldest villages in Zagori [1]. It is located in central Zagori, at a distance 35 km northwest of the city of Ioannina by road. The name of the village is possibly of Slavic origin and means “cold place”, although there is also a version that it comes from the word “suda” (originally derived from Latin), meaning “narrow passage, ravine” [2] (Fig. 1). The settlement is located on the foothills of Mt Stouros, at an altitude of 930 to 1030 metres, built on five hills, along a ravine, which is also the main road of the village [3] (Fig. 2). The communal area of the village covers a relatively limited area by Zagori standards, from 600 to 1300 metres altitude.

Traditionally, inhabitants of the village engaged in agriculture and domestic livestock farming. To the north and east of the village are the highest elevations of the communal area, where the sheep and goats grazed: each family kept a few domestic animals, which grazed together under the supervision of shepherds paid by the community. The community area occupies the southern part of the plateau, which is one of the most important agricultural parts of Zagori. Dry cereals and legumes (wheat, maize, chickpeas, lentils) have been cultivated here [4]. In the deeper part of the plain, which was waterlogged during the winter, was the “Voidolivado” where the community herd of draft animals grazed, as each family maintained one or two cows, which were also used for agricultural work. In the western, lower parts of the communal land, were vineyards and fruit trees [5]. The agricultural products were intended for consumption at home or for exchange in a bartering system. An important economic and productive factor was the monastery of Evangelistria, which owned fields, pastures and cattle [6] (Fig. 3].

Figure 1
The plateau of Ano Pedina, © K Damos.

Figure 2
The upper district of Ano Pedina in 1930, © Archive of the Ano Pedina Community.

The Ottoman occupation (1430) was an important turning point in the history of Zagori. The Ottomans were not very interested in a poor, mountainous region like Zagori, and gave to the Zagorian villages the privilege of self-government. This privilege was very beneficial for the development of the region, as the communities were able to manage community affairs (in other areas the decisions were made by the Ottoman feudal lord) and the inhabitants were not tied to agricultural and pastoral activities, but were able to travel and choose their profession, as long as they paid the tax on agricultural products. At the same time, the Ottoman conquest marked the beginning of emigration for Zagorians, as communities were obliged to send an agreed number of young men to Constantinople, to serve as ostlers in the cavalry of the Ottoman army. These Zagorians who went to Constantinople later found the opportunity to engage in technical professions and trade.

From the 18th century onwards, male emigration became widespread, initially to the cities of the Ottoman European territory and then to Western and Central Europe and the Russian Empire [7]. The inhabitants of the village emigrated mainly to the southern Balkans and Romania, where they often became rich as merchants, innkeepers or as revenue agents [4] (Fig. 4). Gradually, they became aware of the importance of knowledge in their work, resulting in the development of education and investment. Many Zagorians, especially from the 19th century onwards, emigrated to study and work as teachers, doctors and lawyers. In Pano Sudena there were basic education schools for boys and girls and, from the mid-19th century, a "Greek school" (secondary school we would call it today). Important scholars of the 19th century, such as Neophytos Dottos, the teacher and translator of ancient Greek and philosophical works, Neophytos Doukas, the doctor and poet Panagiotis Lazaras, and the doctor and historian Ioannis Labridis, all came from this village (see also Chapter 4). In the village the women were responsible for agricultural production and household economy. In the middle of the 19th century the development of Zagori reached its demographic peak. At that time, only a few families of Soudenians had left the village, which had 130 houses and about 800 inhabitants.

Figure 3
The monastery of Evangelistria at Ano Pedina, © C Zissis.

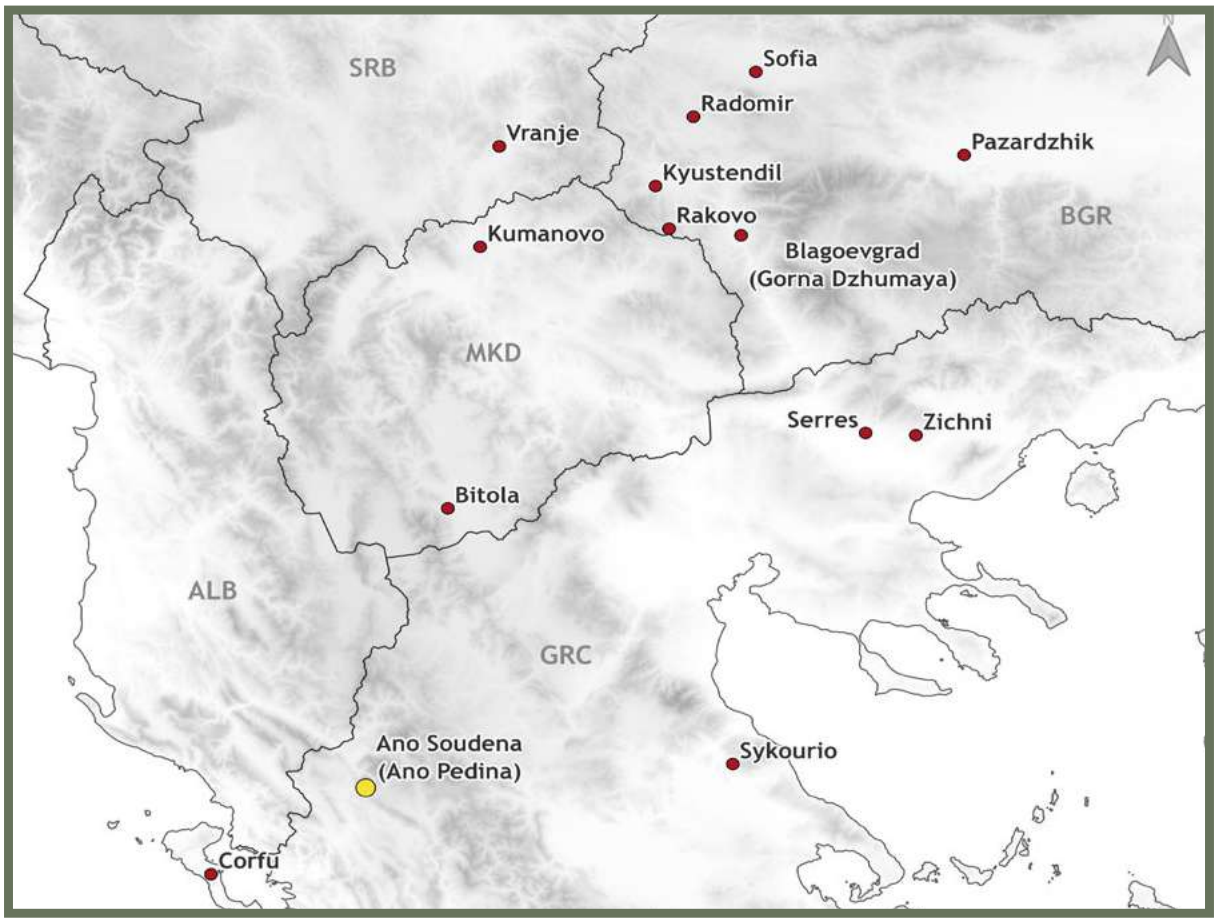


Figure 4
Communities of Ano Pedina migrants in the central Balkans, Map: M Charitonidou.

Despite the universal emigration of the men of the region, the ties with their homeland were very strong. The wealth accumulated abroad returned to Zagori and was used to build imposing houses and public works and to pay communal employees (teachers, doctors, shepherds, farm guards). Throughout Epirus, but especially in Zagori, wealthy residents might become benefactors of the community and of the wider region. The foundation of the independent Greek state in 1830 led many Soudenians to return to Greece. At the same time, the growth of Balkan nationalism forced most Zagorians to leave Romania and Bulgaria and to set up their businesses in Egypt. In 1913, Epirus was incorporated into the Greek state, during a period of significant political and social upheaval. The community of Ano Soudena was renamed Ano Kampos in 1928 and Ano Pedina in 1929, as part of a broad effort by the Greek state to replace names not etymologically derived from the Greek language [9][8].

Urbanisation, slight during the inter-war period but increasing after the second world war, gradually led to the abandonment

8 Both Ano Kampos and Ano Pedina may be translated as Upland Plain (in contrast to the typically mountainous Zagori).

of the mountain settlements. During this period, families of transhumant farmers, Sarakatsani and Vlachs, as well as some families from other villages of Epirus, working as cultivators in the villagers' fields or as shepherds in the communal herds, settled permanently in the village. However, the "Sirens" of internal and external migration also called the newcomers, resulting in a gradual decrease in the number of permanent residents. The few families that remained were engaged exclusively in livestock farming. Agriculture was otherwise completely abandoned, as it could not support the families financially. In the 1980s the area began to develop as a tourist destination.

Nowadays in Pano Soudena the permanent residents are engaged in animal husbandry and tourism. Young people have settled in the village, which does not show a picture of complete abandonment as many mountain settlements have. The number of permanent residents in winter is about 60. The school was closed in 1991 and a few years later the village grocery store closed. There are, however, guesthouses and restaurants in operation daily. The surrounding hills have been forested and are almost inaccessible, but the fields of the plain are clear and are used for grazing sheep and growing fodder. This has been helped by agrarian consolidation, which was completed in 1979. In recent years, dry legumes and cereals have been grown again on a small scale.

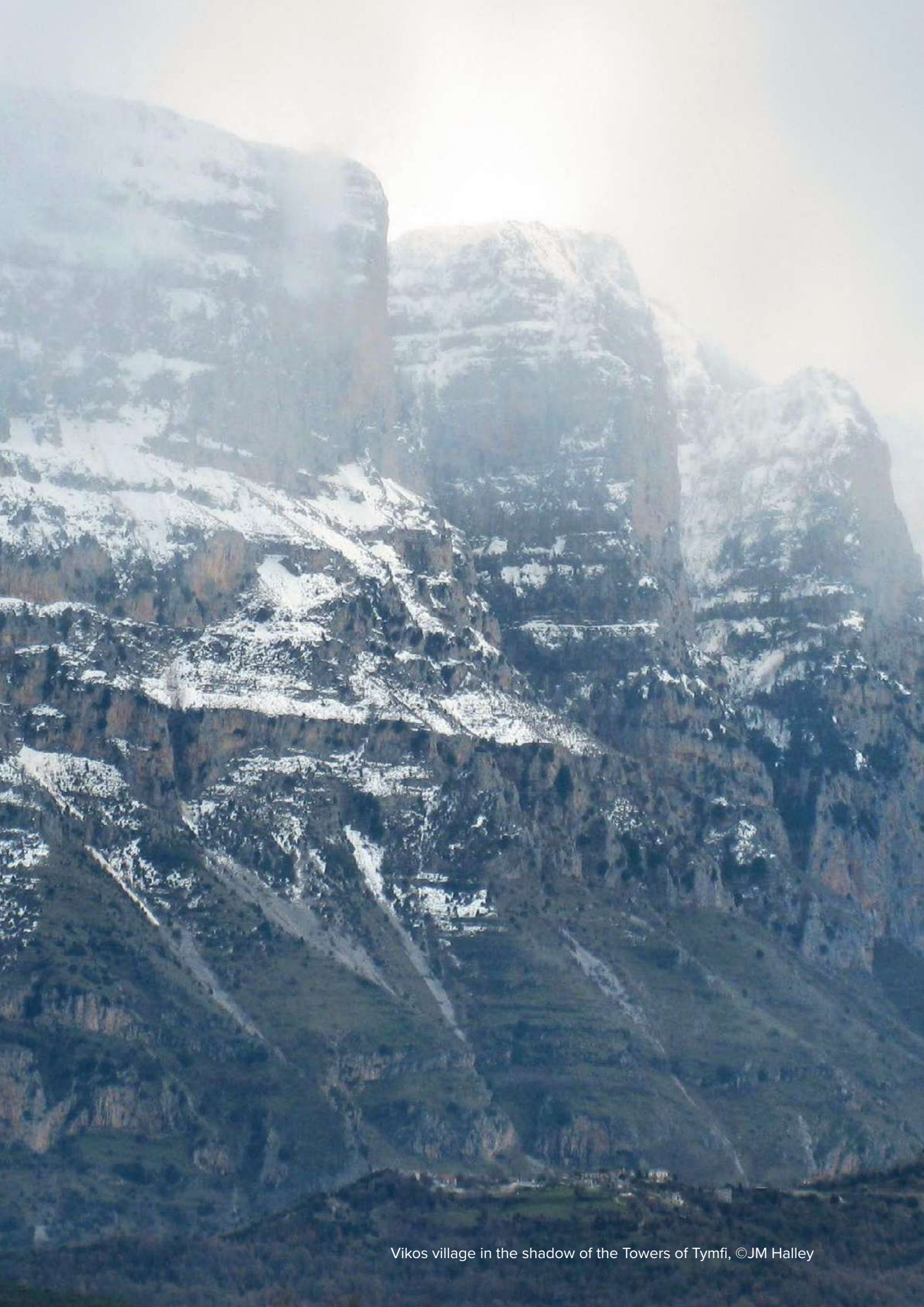
However, a big question mark hangs over the future of the mountain villages of Epirus. At present, hopes for the regeneration of mountain villages seem to have no impact on reality. The Cultural Association of Panosoudeniotes, founded in 2001, is

Figure 5
The centre of the village, showing the central square, with its centuries old oriental plane tree, the central church of Agios Dimitrios and the village school, © C Zissis.

trying to stimulate social life in the village and to have a permanent presence and activities throughout the year. It undertakes the regeneration of public spaces (Fig. 5), the opening of forested paths, organises festivals and cultural events, cooperates with other bodies for events and any other matter concerning the development of the village. The most important annual events of the Association are the two-day traditional festival on 24 and 25 August, the cutting of the New Year's cake in mid-January, the lighting of the carnival bonfire ("kalologos"), the Mushroom Festival in early June (see Chapter 18), undertaken at PALASE in cooperation with the Mushroom Association of Epirus.

The establishment of PALASE on the premises of the Labriadeios School of Home Economics gave life to an important educational site, which for decades had been an educational centre for the surrounding area. The presence of the University of Ioannina and academic researchers and students and the connection of the research work with the local community offer the possibility of highlighting the prospects and development potential of Zagori and create a new perspective for the future.

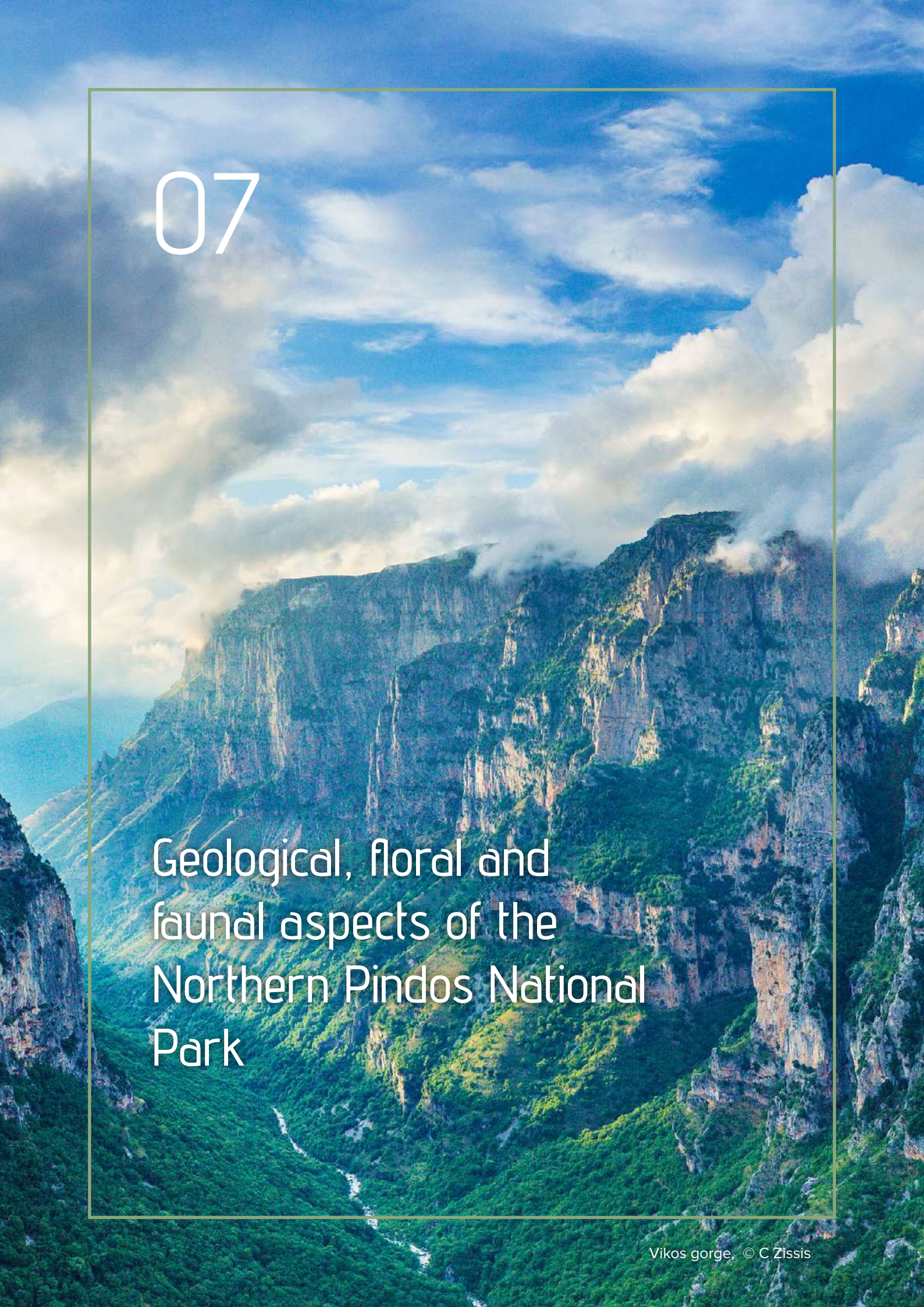
Figure 6
The main building, the courtyard area and support buildings of a private house in Ano Pedina (1970s), © Valanos family archive.



Vikos village in the shadow of the Towers of Tymfi, ©JM Halley

07

Geological, floral and faunal aspects of the Northern Pindos National Park



Vikos gorge, © C Zissis

Nikolaos Kyriazis & Alexandra Papingioti

The Northern Pindos National Park (NPNP) is one of the largest terrestrial National Parks in the country and within its boundaries contains the entire area of Zagori and parts of Konitsa and Metsovo, as well as the western part of the prefecture of Grevena (Fig. 1).

The mountainous forest ecosystems of Northern Pindos have maintained for many centuries a remarkable relationship of balance and symbiosis with Man. They helped decisively in his survival, won his respect and determined the activities that developed in the wider area. At the end of the 20th century, the need to preserve these ecosystems, combined with balanced sustainable development and compatible human activities, required the design and implementation of an organised system of sustainable management, which would effectively protect and showcase the area. Thus, Greece established the National Park of Northern Pindos in 2005, which incorporates the National Forest of Pindos (Valia Kalda) and the National Forest of Vikos - Aoos, also eleven areas that belong to the Pan-European Network of Protected Areas (NATURA 2000), eleven Wildlife Refuges, a Landscape of Particular Natural Beauty (Mount Orliakas), a Biogenetic Reserve in the area of Valia Kalda and two Geoparks, the Vikos-Aoos Geopark and the Grevena-Kozani Geopark. Currently, responsibility for the management of the Park, in partnership with other public agencies, rests with Greece's Natural Environment & Climate Change Agency (NECCA).

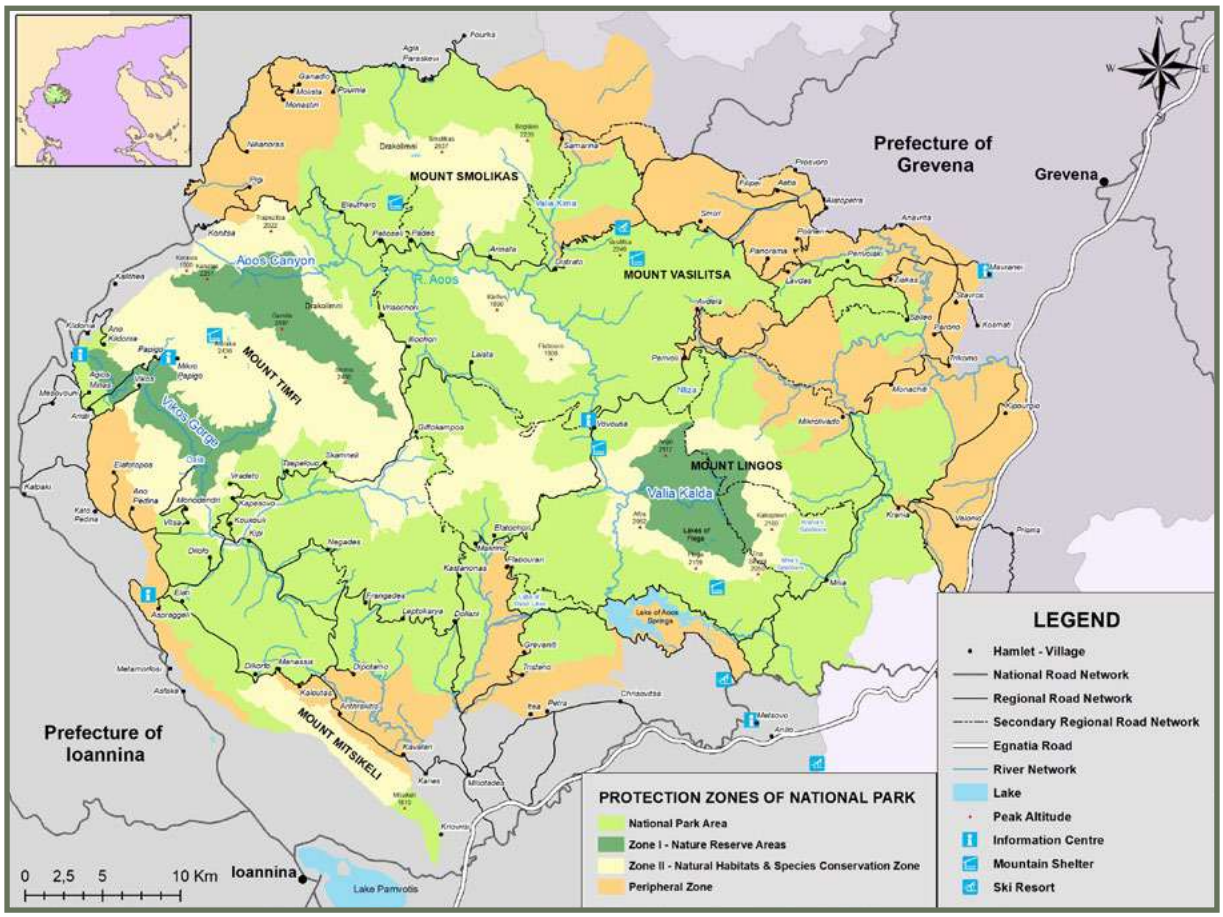


Figure 1
Map of Northern Pindos National Park.

The geological value of the area is extremely high, scientifically and aesthetically. The rocks of the National Park tell in their own way the story of the largest mountain range of the Greek peninsula, the Pindos mountains. Serpentine (ophiolite), which gets its name from its greenish, shiny appearance, reminiscent of snakeskin, originated at the bottom of the Tethys Ocean many millions of years ago and rose in mountains around the river Aoos. The largest complex of serpentine rock in the country with a total area of approximately 1,000 km^2 (and one of the largest in Europe) is made up by the mountains Smolikas (2,637 m, the second highest in Greece), Vasilitsa (2,249 m), Lyngos (2,177 m), Tsouka Rossa (1,987 m), Kleftis (1,846 m) and Flambouro (1,914 m). Their soils are particularly rich in magnesium and for this reason host a distinct flora dominated by black and Bosnian pine forests, as well as many rare or endemic plant species (Figs 2-4). Bare steep slopes, with boulders, caves and precipices show the continuity of geological history in their limestone formations. Limestone, one of the commonest rocks in Greece, also came from Tethys, about 35 million years ago. There, the shells of marine organisms set-

tled on the seafloor, creating the rocks that gradually rose to the surface to form large parts of Pindos, including Mt Tymfi (2,497 m) and Mt Mitsikeli (1,810 m) as well as the Vikos and Aoos gorges.

In between the mountains are shallow basins called “polges” that are typical of limestone, they are remnants of karst formations and testify to the geological history of the region. These basins form plateaus and small fertile valleys, putting their own stamp on the landscape of Pindos. The most impressive and the largest in area, is the almost flat polge of Asprangeloi - Ano Pedina and Kato Pedina, which is also the only extensive lowland area in Zagori.

In some places, the limestone and serpentine formations are interspersed with zones of flysch, which are solidified deposits of shallow marine clay and sand. The geological significance of the area led to the creation of the two Geoparks (Vikos-Aoos and Grevena-Kozani) and their inclusion in the UNESCO Global Geoparks Network as World Geological Heritage Monuments.

The special geomorphology, climatic conditions and long-standing human presence create the unique natural wealth of the Northern Pindos National Park. The variety of altitudes and the diversity of the area’s topography means that all the vegetation zones of the country can be found within the protected area of the park.

In Northern Pindos at the lowest altitudes (400m-700m) one encounters the eu-Mediterranean vegetation zone or the zone of evergreen broadleaves or of holm oak (*Quercetalia illicis*) with a characteristic representative the prickly oak (*Quercus coccifera*) and main species mock privet (*Phylyrea latifolia*), manna ash (*Fraxinus ornus*), junipers (*Juniperus communis* and *J. oxycedrus*), the Greek strawberry tree (*Arbutus adracnhe*) and others. The forests of this zone are dominated by shrubs and heavily fragmented, especially in the ravines of Vikos, Voidomatis and Aoos.

At altitudes of 700m-1,000m the para-Mediterranean zone or zone of downy oak (*Quercetalia pubescentis*) is found, which consists of thermophilic forests of deciduous oak species, including Hungarian oak (*Quercus frainetto*), Turkey oak (*Q. cerris*), Macedonian oak (*Q. trojana*) as well as downy oak itself (*Q. pubescens*), mixed with European hop-hornbeam (*Ostrya carpinifolia*), two species of hornbeam (*Carpinus orientalis* and *C. betulus*) and Cornelian cherry (*Cornus mas*) etc.

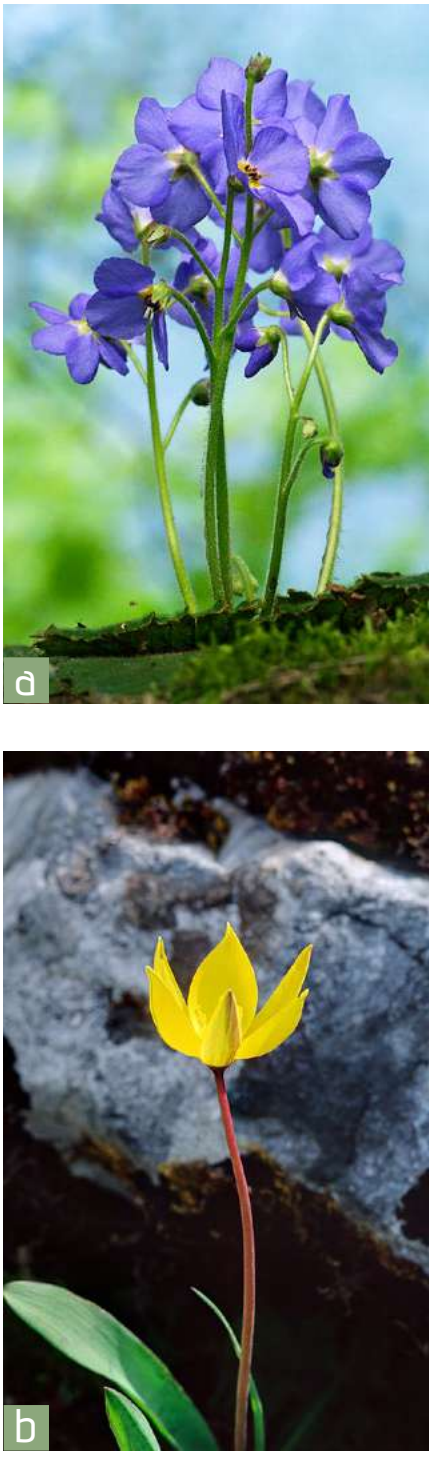


Figure 2
(a) Serbian ramonda *(Ramonda serbica),* (b) Southern Tulip *(Tulipa sylvestris subsp. australis),* © C Zissis.

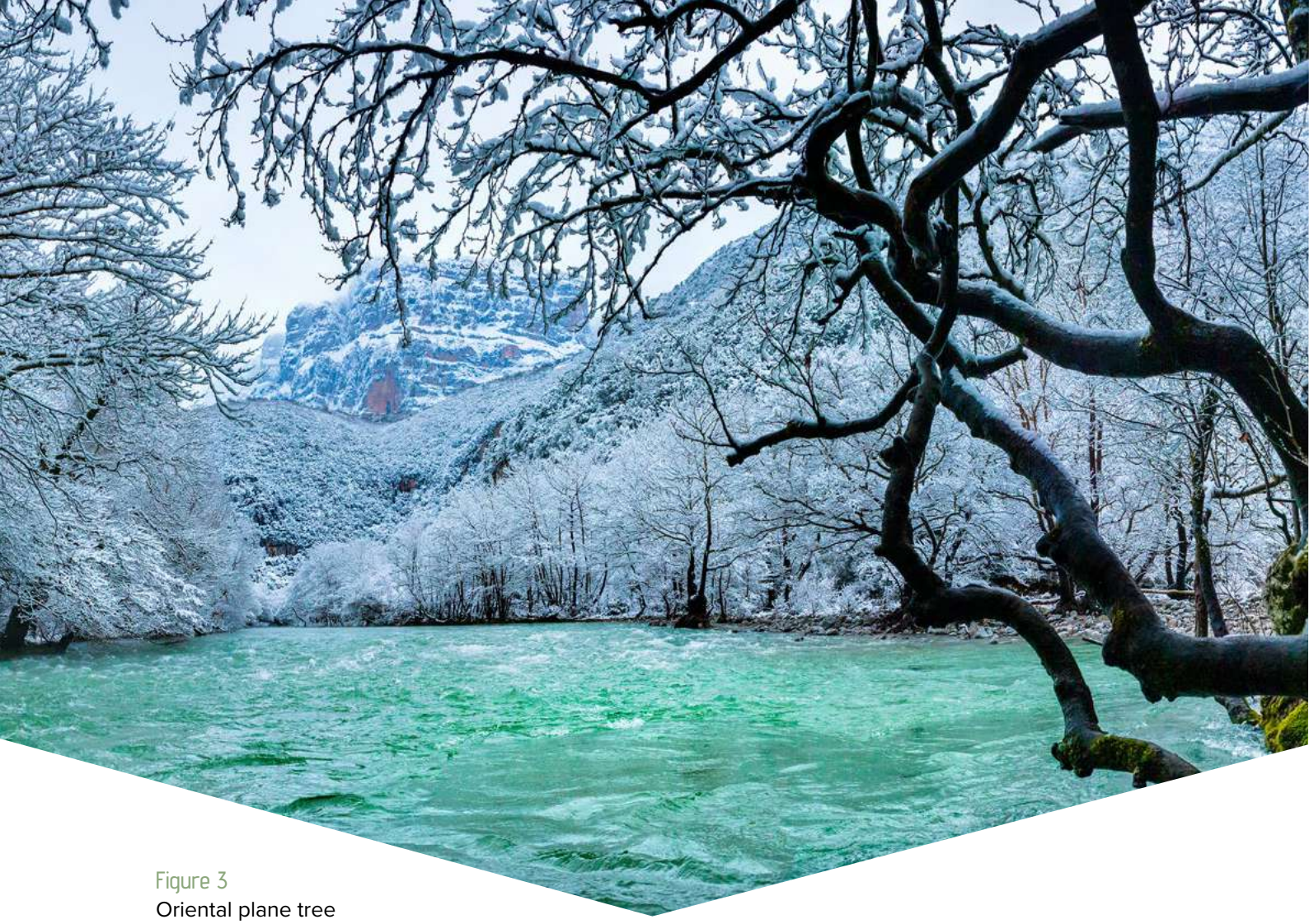


Figure 3
Oriental plane tree forest by the banks of the Voidomatis in winter, © C Zissis.

At altitudes of 1,000m-1,600m, we meet the beech-fir zone (*Fagetalia*), which consists of forests of European beech (*Fagus sylvatica*) and Bulgarian fir (*Abies borisii-regis*) mixed with black pine (*Pinus nigra*). The black pine is a dominant species in the central and eastern side of the NPNP and forms pure stands, on the ophiolitic rock that are priority habitats under the EU Directive 92/43/EEC. This zone extends to the slopes of Smolikas, the northern slopes of Tymfi, Vasilitsa, Avgo, Baltses and Zygos, as well as Central and Eastern Zagori. It also covers the main part of the National Forest of Pindos (at Valia Calda), as well as the forests of Perivoli, Krania, Milia and others.

At altitudes of 1,600m-2,000m we find the zone of cold-resistant conifers (Vacinio-Picetalia), with a unique biocommunity appearance of Bosnian pine (*Pinus heldreichii*), whose forests have great ecological and economic value for the region, contributing to the protection of the soil, the production of water and a valuable supply of malleable wood, suitable for carving, barrel-making etc. The ecosystems of this zone make up the natural and man-made forest boundaries on the highest peaks of Pindos, such as in the area of Katara, around the perimeter of all the peaks

of Valia Kalda, Vasilitsa and Smolikas. In the warm valley of Valia Calda, and also on the slopes of Mt Flega, small populations of Scots pine (*Pinus sylvestris*) are probably remnants from the last glacial period. The diverse ecosystems in this zone are of special interest due to their uniqueness.

At high altitudes, above 2,000m, we find the non-forested zone of high mountains dominated by the steppe-like alpine meadows and the plant communities of steep limestone rocks and screes, i.e. the moving, relatively stabilised, sars. These ecosystems can be found in Smolikas, Vasilitsa, the mountains of Lyngos, Tymfi and Mitsikeli and are the preeminent summer pastures of trans-humant herders.

In addition to the above vegetation zones, in some places where water is plentiful, extremely rich riparian ecosystems develop, consisting of hydrophilic woody species, such as the oriental plane tree (*Platanus orientalis*) (Fig.3), the common alder (*Alnus glutinosa*) and various willow species (*Salix* spp).

Overall, in the NPNP, 30 types of habitats are found, five of them characterised by high ecological value and rarity at the European level, according to the criteria of Directive 92/43/EEC on the conservation of habitats and species. These include black pine forests, ravine forests with linden (*Tilia* spp.), alder alluvial forests and others.

The floral species richness in NPNP is thought to exceed 2,000 species, which include impressive species like the poet's daffodil (*Narcisus poeticus*), also four wild lilies, including the emblematic *Lillium chalcedonicum*, and important species of orchid (93 species of orchids have been recorded to date). Of particular interest is the orchid *Dactylorhiza kalopissii*, which is listed as endemic to the Balkans (Fig. 4b). The flora includes many other endemic plant species, such as the centaury (*Centaurea vlachorum*, Fig.4a), the silene of Pindos (*Silene pindicola*) and the onosma of Epirus (*Onosma epirotica*). Other notable plant species with a limited geographical distribution, within the National Park, are the Serbian ramonda (*Ramonda serbica*), the insectivorous butterwort (*Pinguiculla crystallina* ssp. *hirtiflora*) and the German bearded iris (*Iris* x *germanica etc*). Of particular interest is the flora of the mountains that have a serpentine substrate (Smolikas, Vasilitsa, Lyngos and Flambouro) as it includes several plants that have adapted to live in soils with high concentrations of metals, such as the Smolikas alyssum (*Alyssum smolicanum*) or the Albanian violet (*Viola albanica*).

Figure 4
(a) The centaur *(Centaurea vlachorum)*, © S Vergos, (b) Kalopisis' dactylorhiza *(Dactylorhiza kalopissii)*, © M Charitonidou.

Figure 5
The park is home to a vast array of fungi (a) *Volvopluteus gloiocephalus*, (b) *Clitocybe agrestis*, (c) *Panaeolus papilionacea*, © G Konstantinidis, see also Chapter 18.

The ability of plants to treat various diseases has been known since ancient times. During the 17th to the 19th century, the famous Vikos doctors, practitioners who used medicinal plants from Vikos, travelled around the Balkans, Constantinople and Russia, curing all kinds of ailments. Plants in the National Park with medicinal properties include mint (*Mentha longifolia*), sage (*Salvia officinalis*), thyme (*Thymus leucospermus*), mountain tea (*Sideritis raeseri*), St. John's wort (*Hypericum perforatum*), hemlock (*Conium maculatum*), elder (*Sambucus nigra*), yew (*Taxus baccata*) and others.

The large variety of forest types and the heavy rainfall of the region have created suitable habitats for many mushroom species (Fig. 5). Around Grevena alone, more than 2,000 species have been recorded. The best-known edible species of the meadows and pastures are species of the genus *Agaricus*. In the oak forests, golden chanterelles (*Cantharellus cibarious*) and various boletes (*Boletus* spp.) abound, and at the forest edges there are parasols (*Macrolepiota procera*). Common species in pine forests are milk-caps (*Lactarius* spp.) while morels (*Morchella* spp.) abound in fir forests.

In addition, the wild fauna of the NPNP is rich both in total number and in the presence of rare and protected species. Emblematic species such as the brown bear (*Ursus arctos*) and the Balkan chamois (*Rupicapra rupicapra balcanica*) (Fig. 6), maintain their largest population in Greece. Other large mammals of mainland Greece are the wolf (*Canis lupus*), wild cat (*Felis sylvestris*), otter (*Lutra l*utra), roe deer (*Capreolus capreolus*) and, the most common, wild boar (*Sus scrofa*). In the area there has also been evidence of the occasional presence of the lynx (*Lynx lynx*), the largest felid in Europe. Other smaller mammals found in the National Park are the fox (*Vulpes vulpes*), badger (*Meles meles*), hare (*Lepus capenis*), hedgehog (*Erinaceus concolor*), red squirrel (*Sciurus vulgaris*), pine marten (*Martes martes*), many micromammals and several species of bat. In total, about 60 species of mammals are found in the National Park.

Of the 186 species of birds in the area, the birds of prey are of great interest and especially the globally endangered Egyptian vulture (*Neophron percnopterus*) which, however, since 2008 no longer nests in the area, the golden eagle (*Aguila chrysaetos*), the peregrine falcon (*Falco pereginus*), the short-toed eagle (*Circaetus gallicus*) and the lanner falcon (*Falco biarmicus*). Also noteworthy are the rock partridge (*Alectoris graeca*), the wall-

creeper (*Tichodroma muraria*), the black stork (*Ciconia nigra*) and a number of woodpeckers, including the black woodpecker (*Dryocopus martius*) and white-backed woodpecker (*Dendrocopos leuconotos*).

The National Park's 30 species of reptiles include 16 species of lizard and 4 of turtles, while amphibians number 10 species. As an example, we mention the presence of the Dalmatian algyroides (*Algyroides nigropunctatus*) and the marginated tortoise (*Testudo marginata*). Of the 14 species of amphibians found in the National Park, we note the presence of the fire salamander (*Salamandra salamandra*), the green toad (*Bufo viridis*) and the Macedonian newt (*Triturus macedonicus*).

Twenty-two species of fish live in the aquatic ecosystems of the National Park. It is worth mentioning the endemic species of the Aoos river, *Oxynoemacheilus pindus*, from the stone loach family. Also rare in Greece is the Albanian roach (*Pachychilon pictum*) which is found in the Aoos river basin, the two endemic species of trout (*Salmo farioeides* and *S. pelagonicus*) (Fig. 7), the Aoos riverhead (*Squalius* sp. Aoos), the barbel (*Chondrostoma vardarense*) and three species of *Barbus*. The invasive pumpkinseed (*Lepomis gibossus*) is also found in the artificial lake of Aoos Springs, and is considered detrimental to endemic fish populations, as it feeds on their eggs.

Since the establishment of PALASE until the writing of this book, Northern Pindos National Park has been represented on the Board of Directors of PALASE, where decisions are made on the way the Station is organised and operated. Events, workshops and voluntary actions have been organised jointly alongside the National Park Management with the objective of informing and raising awareness in the local community for the need for research and conservation of the area, as well as on issues of disseminating scientific knowledge.

Figure 6
Balkan chamois (*Rupicapra rupicapra balcanica*) on Mt Tymfi, © C Zissis.

Figure 7
Endemic West Balkan trout, *(Salmo farioides)* can often be seen in the Voidomatis river, © A Dakis.

08

Topographic and seasonal variability in Zagori

The unique sacred protective beech forest of Greveniti (East Zagori), © K Stara

Nikos Markos

Topography of Zagori region

Zagori is characterised by large altitude differences. The altitude of the area ranges from 413 m up to 2448 m above sea level with a mean altitude of 1160 m. The area has a very rich network of rivers, which totals 618 km[9]. There are 54 settlements in total, which are connected by a decent network of primary and secondary roads. The above information is summarised in Fig.1.

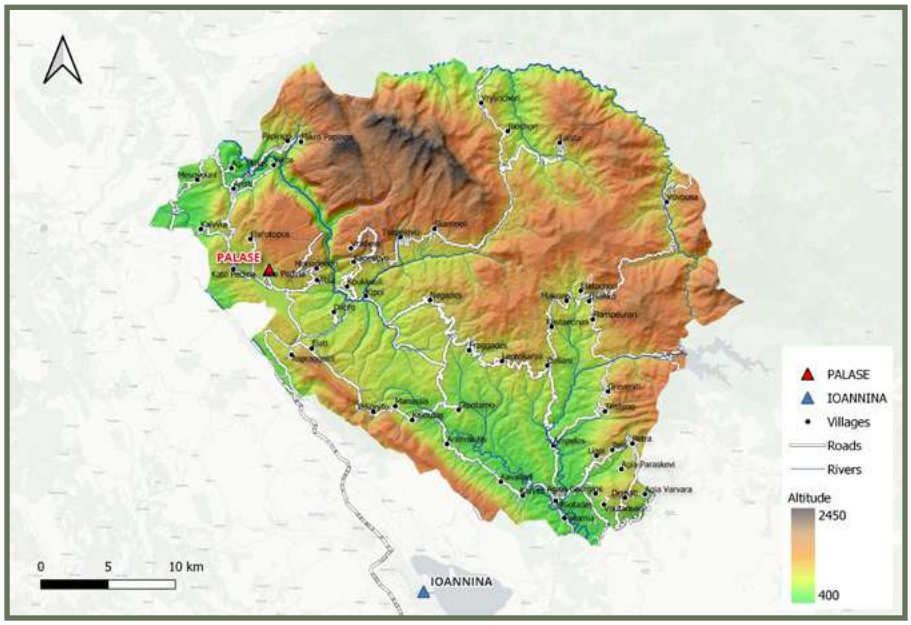


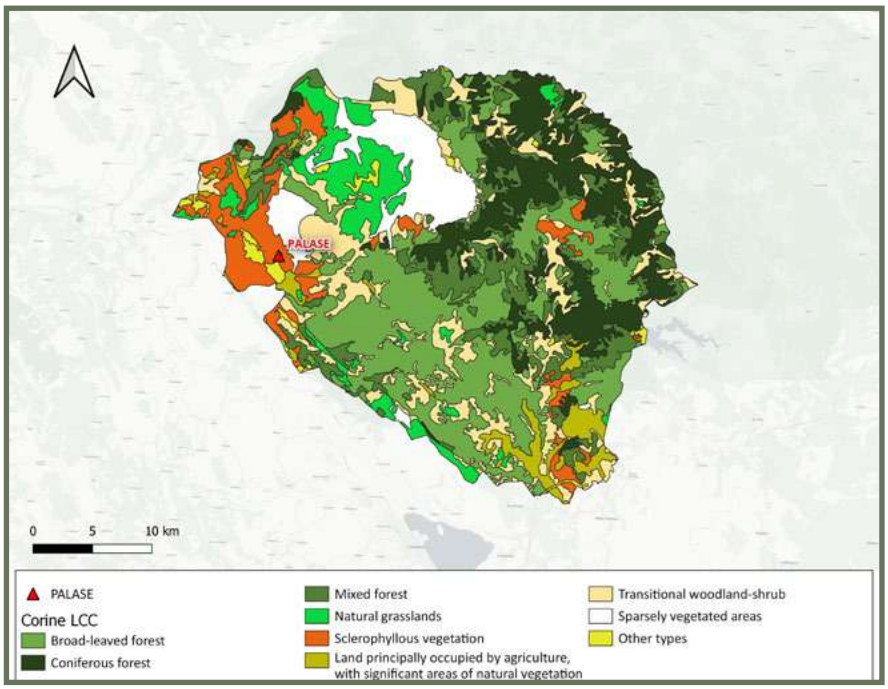
Figure 1
Elevation map of the whole Zagori region, including the road and river network, the settlements, as well as PALASE station.

Vegetation types in Zagori

In Zagori we meet 17 different land-cover types, as presented in Fig.2, according to Corine 2018 Land Cover Classification[10]. The most abundant land-cover type is broad-leaved forests, covering 26.4% of the total area size, followed by the coniferous forests (17.2%), transitional shrubland/grassland (14.6%) and mixed forests (13.8%). Total forested area, including sclerophyllous vegetation, reaches up to 79.2% of the total area of the region, while when all vegetation types are considered, naturally occurring vegetation reaches up to 94.4% of the total area.

9 It refers to the total river length when all Strahler stream orders [1] are considered.
10 https://land.copernicus.eu/pan-european/corine-land-cover/clc2018

Figure 2
Land cover in Zagori according to Corine 2018 LCC classification



Climate and weather in Zagori

The climatic conditions of Zagori can be characterised as intermediate between the Mediterranean and Central European types. When annual rainfall is considered, the climate can be classified as humid (1000 - 2000 mm annual rainfall). Most rainfall occurs during winter and autumn, although storms during summer are quite frequent. The average winter temperature is below 5 °C, while mean summer temperature reaches 21-22 °C. Due to the strong mountainous relief, the climate of Zagori shows a large degree of local variation.

There are several meteorological stations in Zagori, which belong to the wider network of the National Observatory of Athens (NOA) [2]. The annual fluctuations of mean monthly precipitation and temperature, as recorded from the Aspraggeloi meteorological station (39.48’ N, 20.42’ E, 945 m a.s.l), are presented in

Figure 3
Representative monthly precipitation (a) and temperature (b), recorded by the NOA meteorological station at Aspraggeloi over a 15year period (2008 - 2022). Both charts feature the mean±stdev of monthly values.

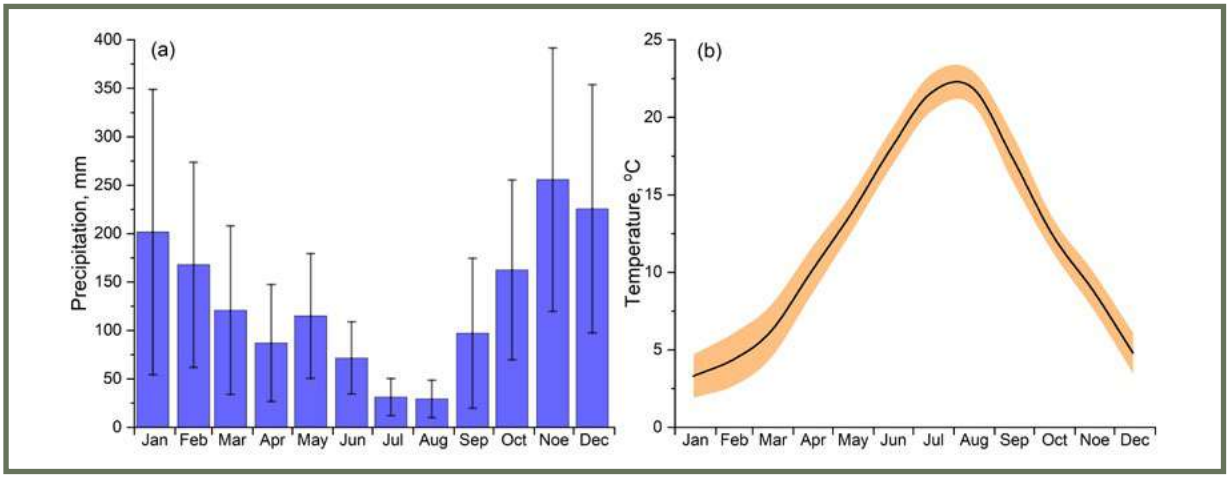


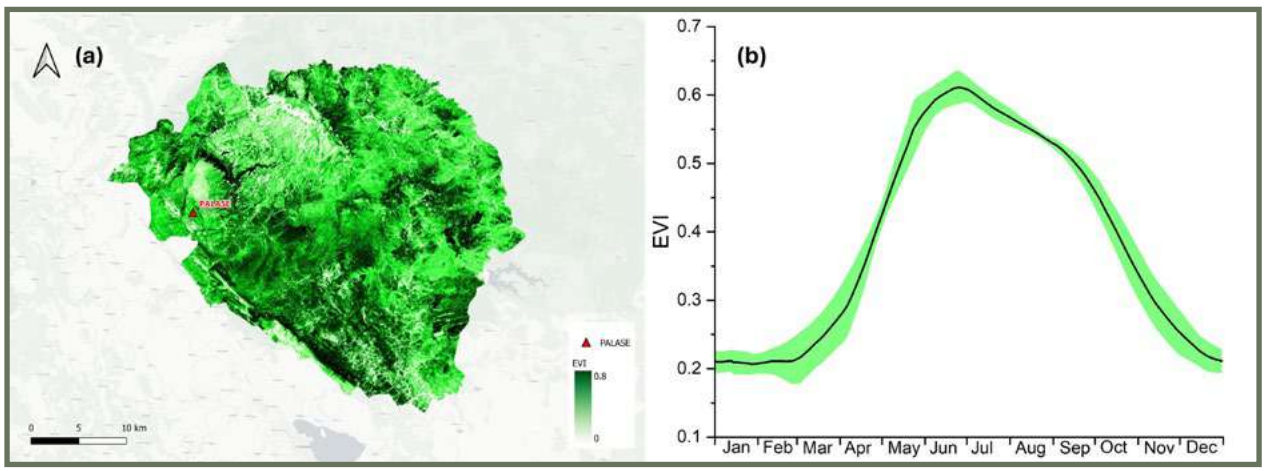
Fig.3(a) and 3(b) respectively. Meteorological data were kindly provided by NOA and these refer to a 15 year period (2008-2022). According to the data, a two-month xerothermic period occurs, during July and August, that constitutes a period of water stress for plants.

Seasonal changes of vegetation phenology

Vegetation phenology is the description of plant life cycle events during the growing season. It is representative of the added impact of several environmental variables, i.e. the time of leaf expansion and senescence in deciduous trees is strongly related to temperature [3]. Enhanced Vegetation Index (EVI) is related to total leaf area of the plants and has been recognized as representative of the plants' phenological status [4, 5]. Consequently, EVI annual fluctuation can be used as a representative of the changes of the seasons. An EVI map for the whole Zagori region is presented in Fig.4a. The map was created with the use of Sentinel 2 msi L2A products[11] for a cloudless summer day (15/7/2022). The map is representative of the proportional "leaf surface" in each area, ranging from zero (when there is no vegetation) almost to unity (for highly vegetated areas). As the broadleaved forests are the most abundant type in Zagori, the seasonal fluctuation of EVI for them can be representative of the vegetation status for the whole region. The mean seasonal fluctuation of EVI for broadleaf forest inZagori, as estimated for a five-year period (2018 - 2022), is presented in Fig.4b. According to the diagram, the peak of the vegetation activity is met during June and July, while the active growing season is from the beginning of May until the end of October.

Figure 4
EVI map of the whole region (a), which defines the vegetation's presence and abundance. Dark green areas correspond to dense vegetation, while white the absence of vegetation. The seasonal fluctuation of mean daily EVI values (±stdev) for the broadleaved forest (b), estimated for a five-year period (2018-2022) provide information about the beginning, peak and end of the growing period.

11 https://sentinels.copernicus.eu/web/sentinel/missions/sentinel-2

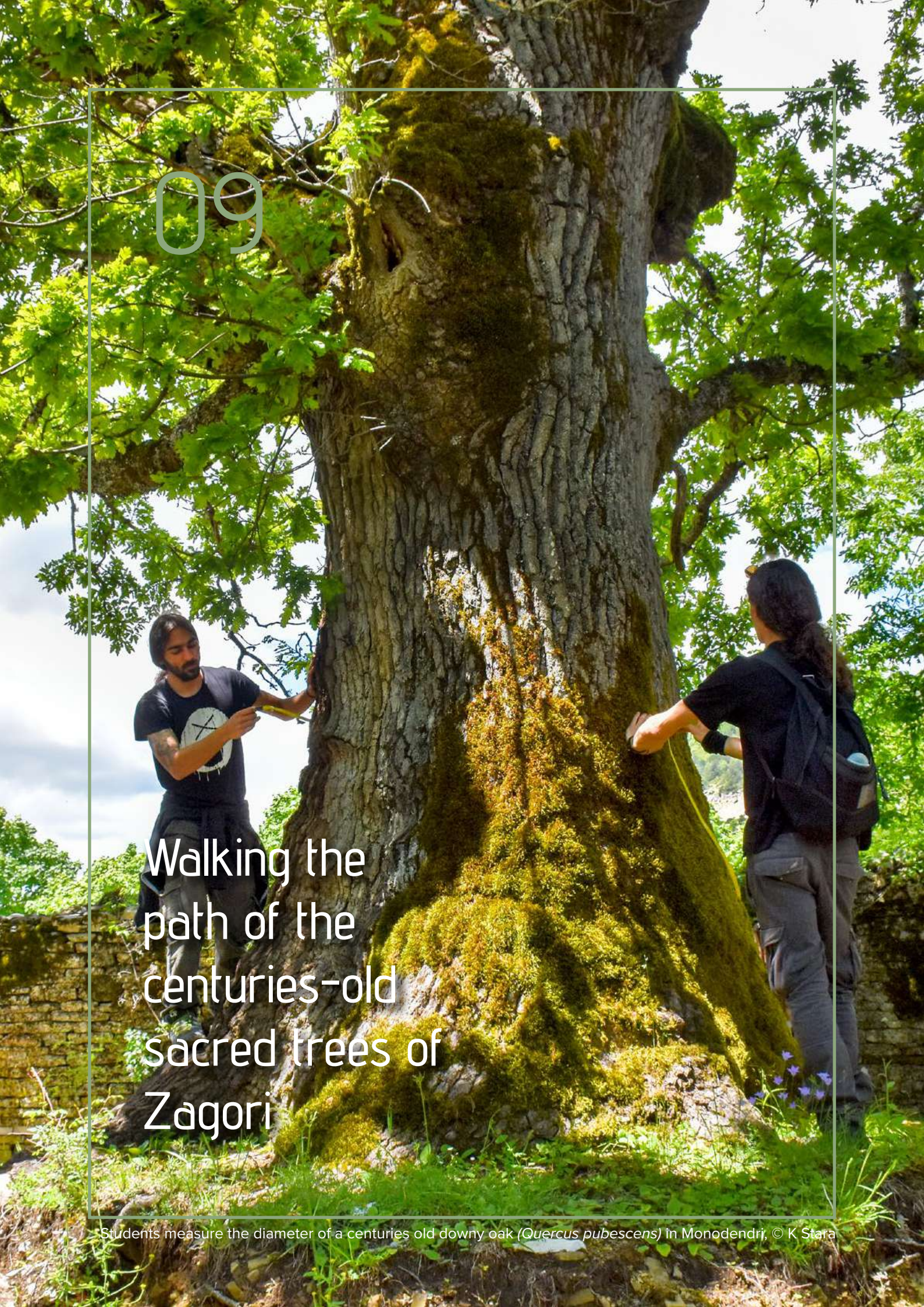


Walking down the Vitsa Stairs during the Cultural Ecology course, 2019, © K Stara


University
classes

09

Walking the path of the centuries-old sacred trees of Zagori



Students measure the diameter of a centuries old downy oak *(Quercus pubescens)* in Monodendri. © K Stara

Walking the path of the centuries-old sacred trees of Zagori

Kalliopi Stara

Figure 1
Centuries-old trees offer tree-related microhabitats suitable for many organisms, such as lichens,
© K Stara.

Sacred Natural Sites (SNS) are areas of special spiritual importance. Among them are some of the most iconic landscapes of the planet. Mountains such as Everest (Nepal and Tibet), Kilimanjaro (Tanzania), Athos and Meteora (Greece), but also rivers, lakes, volcanoes, islands and smaller areas such as caves, rock formations, springs, forests, groves or isolated centuries-old trees. All together create a long catalogue of places that are conceptualised as signs of encounters with divinity.

In this rich list there is a place for the sacred forests of Epirus and the outlying churches with their accompanying trees that are characteristic figures in the cultural landscape of the area [1]. These centuries-old trees are protected through locally adapted conservation systems, which in the majority of cases, constitute strict systems of controlled management, in which the Divine acts as mediator between the secular and the sacred [2]. In the case of forests, the reasons for conservation are related to the natural protection of specific areas, the safeguarding of settlements from natural disasters, such as landslides, floods and avalanches and the reassurance of the collective use of important natural resources for the survival of the Community [3]. At the same time, sacred woods and trees, especially when dedicated to the Virgin or specific saints who take them under their protection, also serve aesthetic and recreational functions being used as community's important festive places.

Characteristic examples of SNS are the sacred forests of the villages of Zagori and Konitsa that since 2015 have a place in the national Intangible Cultural Heritage index[12] as past management

12 Intangible Cultural Heritage (ICH), according to the UNESCO Convention (2003), refers to practices, representations, expressions, knowledge and techniques, which its actors (communities, groups or individuals) recognize as part of their cultural heritage. See also http://www.ayla.culture.gr/iera-dasi-twn-xwriwn-tou-zagoriou-kai-tis-konitsas

systems of the commons. These can inspire modern forms of conservation and play an important role in maintaining a special biodiversity related to organisms that prefer centuries-old trees as their habitat (Fig. 1).

Since 2014, the students of the Department of Biological Applications and Technology, in the frame of the *Field Ecology* course, have had the opportunity to learn about the SNS of Zagori and their magnificent trees, following a path that initially led from the PALASE field station to the square of Monodendri and recently to this of Vitsa village (Fig. 2).

The purpose of this educational path is to become familiar with the vegetation of the area, the tree species, and their shapes as the result of their adaptations to the human presence and use in the long course of people-nature coexistence in the area. The path starts from PALASE, goes up the main street of the village and stops first at the emblematic plane tree (*Platanus orientalis*) in the central square of the village, planted in 1819. In the adjacent central church of Agios Dimitrios we look for the stump of the prickly oak (Quercus coccifera) under which Saint Kosmas the Aetolian spoke in one of his missions in Zagori (1767 or 1777-8). The village commemorates this event with its annual festival every August 24. The vegetation we meet along our route within the settlement gives us the opportunity to discuss the use and value of trees, but also issues about species that concern the global scientific community. One such species is the invasive "tree of Heaven" (*Ailanthus altissima*) which came to Europe from China as an ornamental species in the 18th century and has been expanding alarmingly ever since, causing problems for both human settlements and native vegetation.

Figure 2
The path followed by the students of the Field Ecology course and the main points of interest,
© Map: M Charitonidou.

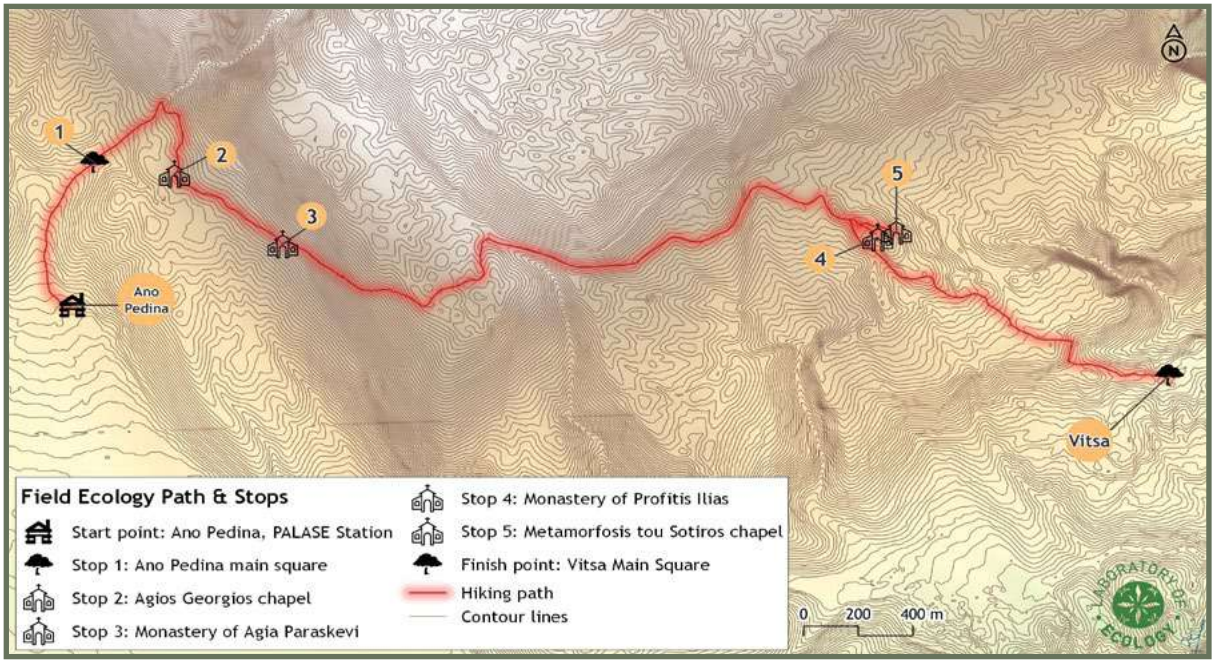


Figure 3
The view towards the plateaus of Ano and Kato Pedina and Vitsa, © K Stara, May 2018.

The path continues upwards passing the small church of Agios Georgios with its mature Montpellier maple tree at the village boundaries to reach then the monastery of Agia Paraskevi. Only a small part of the surrounding forest, consisting of mature Montpellier maples and prickly oaks, managed to escape the devastating fire of 2000. This catastrophe was a consequence of land abandonment and the recovery of a pyrophilous vegetation and indicates how vulnerable these precious old growth forests are and how imperative is the need of a plan for their conservation. The path continues uphill to the top of the slope overlooking the plateaus of Ano and Kato Pedina and Vitsa villages (Fig. 3).

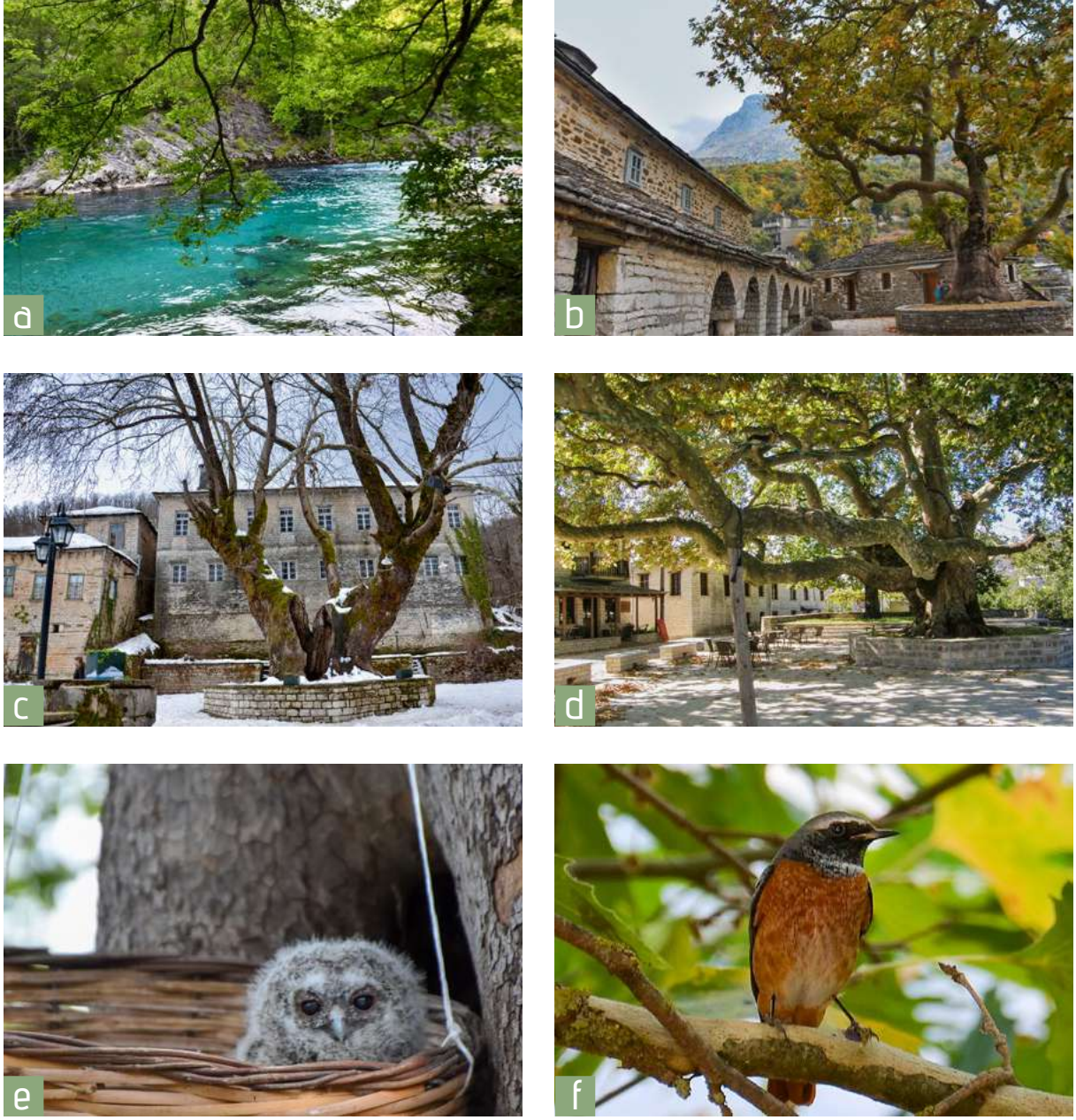
These small “plains” between the mountains are a valuable refuge for the rare and threatened biodiversity associated with rural landscapes (See Chapter 14) and also provides an opportunity to talk about the history of the landscape as reflected in the form and shape of the fields below. The rectangular shapes of the land under tillage versus the irregular multi-faceted shapes of the small plots outside of it, whose boundaries are marked by hedgerows, artificial ponds for watering animals, wells, canals and seasonal wetlands, create a unique landscape mosaic. In the adjacent hills, old vineyards, cereal fields and pastures are no longer discernible in the “green continuum” of natural forest regeneration of the last 60 years. By contrast, the sacred protective forests of Kato Pedina can be distinguished from the ho-

mogeneous vegetation when looked at carefully, which creates a great opportunity to "read" the local history. First is *Anilia* (literally "sunless"), the sacred forest that protects the threshing floors and barns of the village and then there is *Megala Pournaria* ("big prickly oaks"), which protects the south slope of the village. The path now becomes smoother and leads to our next destination, the abandoned monastery of the Prophet Elias to the north of Vitsa with its imposing maiden maples (*Acer obtusatum*) which create the atmosphere of a place of festivity, altogether a contrast to the heavily-used "working trees"[13] nearby. These maples are extremely rare and include five of the largest 12 that we recorded in the SNS of Zagori [5].

Next to this monastery is the outlying church of the Transfiguration of Jesus, which administratively belongs to Monodendri. Also here is an ancient downy oak (*Quercus pubescens*), one of the ten largest in Zagori. "Beautification" efforts in 2015 threatened this great oak. Ever since, the group photo of our students (Fig. 4) under the branches of this tree gives us the opportunity to talk about the need for proper arboriculture management adapted to such valuable trees.

13 Working trees are those which are heavily used and their form follows function: shredded, pollard, coppiced or pruned [5].

Figure 4
The downy oak next to the church of the Transfiguration of Jesus in Monodendri with participants of the Greek summer school for Conservation Biology (See also chapter 13), © K Stara, June 2019.



We started from a plane tree and now we end up at a plane tree, in the shadow of the magnificent plane in Vitsa Square, which the villagers wish to include in the national catalogue of Natural Monuments. Teachers and students are always excited by this sense of diving into local history guided by centuries-old trees and their living legacy. Our aim is to understand that such a tree is an ark of biodiversity, an archive of climate history and both a natural and a cultural monument [6].

They also have the power to link the past with the present and the future and to be an integral part of the landscape. From September 2023, Zagori cultural landscape is included in the list of World Heritage Sites (UNESCO). In the description of the site[14] centuries-old plane trees in village squares (Fig. 5) and sacred forests that accompany settlements are mentioned as prominent and characteristic elements of the landscape.

Figure 5

Centuries-old plane trees in Zagori: (a) riparian forest in Voidomatis river, (b) Mikro Papingo Square, (c) Dilofo Square, (d) Vitsa Square. Centuries-old plane trees are repositories of biodiversity and host a multitude of species: (e) Tawny owl chick *(Strix aluco)* on Leptokarya Square's plane tree, which was rescued by villagers under the guidance of the Hellenic Wildlife Care Association ANIMA, (f) the common redstart *(Phoenicurus phoenicurus)* in a plane tree in Kato Pedina during autumn migration, © K Stara.

14 See Zagori Cultural Landscape https://whc.unesco.org/en/list/1695/

10

Establishing a field ecology course – the crucial role of a field station

Centuries-old Bosnian maples *(Acer obtusatum)* in the monastery of the prophet Elias at Vitsa, © K Stara, May 2015

Establishing a field ecology course – the crucial role of a field station

Nikolaos Monokrousos

Zagori is an area of outstanding natural beauty, with striking geology and two national forests, one including the Vikos-Aoos and the other around Valia Calda, to the east of the imposing snow-capped Mount Tymfi. The Vikos-Aoos national forest is located 30 km north of the city of Ioannina in the northern part of the Pindos mountain range and is part of the Natura 2000 ecological network.

For several years, members of the Ecology Lab of the Department of Biological Applications and Technology (BET) were aware of this biodiversity richness in the vicinity of the University of Ioannina (UOI). When I first joined the teaching personnel of BET as an adjunct assistant professor, there needed to be more emphasis on fieldwork in the department. Most of the environmental courses given to the students were in class or in the labs in front of computers ("desktop" ecologists). Ecology Lab's vision was to bring the students closer to the natural environment and in touch with the biodiversity richness of the area. To achieve this goal, Professor John Halley and I organised some one-day field excursions for our second and third-year undergraduate students related to the laboratory activities of General and Applied Ecology courses. The students were very enthusiastic about these activities as it was something totally new to them, and they were asking for more environmental activities. Nevertheless, as we did not have a base in Zagori, these daily excursions were the best we could do at the time.

Two were the key factors that motivated the members of the Ecology Lab to organise a field-oriented course for the students. The first one was the fact that our lab was funded to coordinate a THALIS programme entitled "Conservation through Religion: The Sacred Groves of Epirus" (2012 - 2015), which played a crucial role in identifying the biodiversity richness of the Zagori area. This research programme attempted to understand the function

of sacred forests and to showcase them as forests that represent the strength of the natural ecosystems of Epirus and successful small-scale management systems. A large group of scientists of various specialties and nationalities collaborated on the THALIS programme. It investigated the fungi, lichens, herbaceous plants, woody plants, nematodes, insects, bats, and passerine birds for species richness in the Zagori region [1]. This in-depth research revealed even further the overall biodiversity of the area, diversity per taxonomic group, and numbers of species from the European SCI list (Species of Community Interest). This knowledge was the most critical factor for us, the professors of BET, to start considering organising a field ecology course for our students. This would be a course that would last for more than a single day, and could offer much more than just a short visit in the natural environment to the students. However, apart from having all these thoughts, a significant piece of the puzzle was still missing. Many ecologists would agree that an ecology field station is one of the things to have the most significant impact on students interested in working with field ecology. Some of the seminal works in ecology have arisen from work conducted at field stations (see Chapter 2 and associated references). The benefits of having the course taught in a field station are many. Aside from teaching and explaining the conservation value in class, the students also have the opportunity to collect their own data and build interdisciplinary collaborations. Based on international standards, most universities in the top 10 for Environmental Sciences and Biological Sciences have access to their "own" field stations. So, even though the Ecology Lab had the expertise and the people to organise an ecology field course, the opportunities of the Zagori area were unavailable.

Figure 1
Students and faculty from the universities of Ioannina and Cumbria at Kokkoris Bridge in 2012, © JM Halley.

Figure 2
University of Cumbria's Andrew Ramsey (centre) explains acoustic sensor equipment to students, © JM Halley.

The second and most crucial game-changing opportunity was presented to us in 2011. It was when the community of Ano Pedina (a village in the Zagori region) asked the UOI whether they would be interested in using the former Labriadeios Home Economics School, a building located in Ano Pedina (50 km from UOI) and housed the school from the end of the '80s until it closed in 2007, as a field station. It was the ideal opportunity for UOI to have an ecological field station in a region of great significance in biodiversity, and very close to the city of Ioannina.

Now everything was set for the organisation of an elective course entitled "Field Ecology". The course was offered to 4th and 5th-year students of the department. The course was conducted at the PALASE field station facilities. It would last for one week, during which the students would be trained in applying sampling techniques and methods in observing different groups of organisms in the field, the experimental field design, and the production and interpretation of ecological data. Most importantly, during that time, the University of Cumbria (in the UK) had expressed an intention to organise a field course in a field station located outside the borders of England and in an area of great importance for biodiversity. The previous year, Prof. Halley had met Prof. Andrew Ramsey at the GSS in Papingo (see Chapter 13) and had agreed to do something jointly. So, in its first year, the course also involved researchers and graduate students from England who gained unique experience and local knowledge of the region. All courses were given in English, and the outcome was excellent. All students, either Greek or British, were impressed by the novelty of this course. This was the third field station for students in Greece (after Perouli and Chalkidiki, used by Forestry Departments), yet PALASE, apart from being a permanent and

well-equipped field station, is also open to all and had the advantage of close vicinity to all these natural treasures, in terms of biodiversity. PALASE proved to be a place for education and a basis for research and environmental protection in Zagori and other universities from abroad.

Students worked closely with instructors during their stay in PALASE. Instructors conducted modules emphasising natural history, experimental design, field techniques, and statistical procedures. Nevertheless, the most crucial aspect of the course involved the hours well spent in the field observing organisms and collecting data. Time passed quickly; successful projects were usually straightforward and used abundant and easy-to-observe organisms. The most exciting projects often used plants, reptiles, amphibians, insects, small mammals, or birds as study subjects. Data were collected in small groups (2-3 individuals), but each student was responsible for submitting their own scientific report for each project by the end of the course. On completion of this course, the students were able to: (a) Identify common plant species, (b) identify the most important fauna in the field, (c) systematically collect ecological data, (d) design and conduct simple surveys and field experiments in ecology, (e) write up the results of simple ecological studies in a concise and informative manner (Figs 1-4).

Figure 3
Learning the reptile fauna of Zagori with Kostas Sotiropoulos, © K Stara, 2013.

Figure 4
In the earlier years, studying the vegetation of Zagori, students followed the Vitsa Stairs, © JM Halley, 2012.

This first year was a true success. Over the next decade, *Field Ecology* was one of the most chosen elective courses in BET. More students wanted to experience this unique opportunity to spend a week and conduct fieldwork in such a radically different environment to the university campus. Additionally, the international students and their instructors passed the word that a new field station is operational in such an important region as Zagori, which led more people to join the field station to conduct their studies or courses.

After all these years, I am filled with a sense of fulfilment knowing that I have made a positive impact through my involvement in various student-focused activities. Although I now serve as a professor at another university in a different city, I am confident that PALASE, as well as the *Field Ecology* course, will keep providing invaluable experiences for the students at BET for years to come (Fig. 5).

Figure 5
The Field Ecology program for 2016 (at PALASE 22 - 29/5). JMH: John Halley, KS: Kostas Sotiropoulos, DY: Dionisios Youlatos, MA: Maria Argyropoulou, RT: Rigas Tsiakiris, KS*: Kalliopi Stara.

		Morning	Midday	Afternoon	Evening	
Sunday				Arrival		
Monday		Trees & Plants (KS*)	Identification (KS*)	Database (JMH)	Set traps for small mammals	
Tuesday	Set traps for small mammals	Arthropods (MA)	Identification (MA)	Database (JMH)		
Wednesday		Birds (RT)	Analysis (JMH & RT)	Analysis (JMH & RT)		
Thursday		Reptiles & Amphibians (KS)	Analysis (KS)	Database (JMH)		
Friday		Mammals (DY)	Data analysis (MA/DY/KS/JMH)	Data analysis (MA/DY/KS/JMH)	Presentations	
Saturday	Reading + Database					
Sunday		Exam	Departure			

Key
Fieldwork
Labs & PCs
Exam
Free

11

Learning field ecology – a student's perspective

Learning field ecology – a student's perspective

Maria Dimou

During my fourth year as an undergraduate at the University of Ioannina's Department of Biological Applications and Technology, I enrolled in the *Field Ecology* course. My interest in the field of environmental biology as a future profession had already been stirred since early on in my studies. My high expectations for the course were encouraged by the positive experiences and stories shared by former students. I believed that the course would be a refreshing departure from the traditional undergraduate curriculum, and the prospect of a week-long field trip only added to my excitement. However, the overall experience exceeded even my high expectations. This course offers someone passionate about the environment the chance to gain hands-on experience in the field and get a glimpse of what it's like to work as a biologist.

The daily routine during the field trip was structured into two segments. The initial portion entails gathering data in the field, where students have the opportunity to develop their field observation skills and learn to use a key for species identification, understand the systematics and naming conventions of different species. Throughout this part of the course, we received instructions on various sampling techniques from all the professors.

The latter part of the day involved analysing the collected data statistically after compiling it into a database. Even though this initially seemed to be the boring part of the course, I quickly changed my mind. I started to understand the importance of the entire process of conducting an ecological study from beginning to end. For me, it was no longer a field trip to see different species in their natural habitat, now it was much more; it was important that we learned how to effectively analyse our results by using the proper statistical analysis methods to understand the implications of our findings for the field of Biology and the natural environment as a whole.

Figure 1
The author, learning dendrochronology from Valentino Marini-Govigli,
©JM Halley, 2015.

Figure 2
Returning from a night walk on species identification,
© JM Halley, 2015.

The day is rounded off with leisurely activities such as listening to music, watching movies, playing ping pong, and stargazing with a telescope, all aimed at promoting teamwork and collaboration among the group. Overall, we gained a wealth of knowledge and had hands-on field experience, creating our own databases in the process. Furthermore, we had the chance to interact with professors who specialise in various subjects and learned many fascinating things from them, which we might not have discovered otherwise without this field trip. The excursion provided us with opportunities to broaden our horizons and make new connections.

Among the things that stood out within the course are the evening walk in the lake to listen to the frogs, the impressive sacred trees, thousands of years old, and how I can estimate their age in practice (Fig. 1). Importantly, I was able to confront my fears about reptiles and amphibians and dispel myths about them. The knowledge that I gained through experience and not just by studying a book has been imprinted in my memory and is still with me today (Figs 2-4). Undoubtedly, I would recommend this course, not only to those who want to study ecology, but also to those who are either undecided or have decided to study other branches of biology. Apart from the skills one can gain through fieldwork, the week-long break from the routine of everyday life and the contact with nature are unforgettable experiences. The best memory of my undergraduate studies.

Figure 3
Ping-pong,
© JM Halley, 2023.

Figure 4
Going out to eat,
©JM Halley, 2012.

Field Ecology

10 years

Field Ecology 2023

(Back row) K Sotiropoulos, *E Iliadou, A Konstantinidis*, A Mitka, C Balta, A Boulala, P Dovas, I Korkou, A Paraskevopoulou, AK Zimarikopoulou, N Filippidis, JM Halley, CG Vlachopoulou, M Karagouni, L Meggou, AM Tsitouri, *S Syllekti, I Samartza*, HA Andreou, N Kourouna, D Youlatos, M Argyropoulou, K Stara. (Front row) A Triantafyllidis, *E Gkagka, M Paradeisioti,* E Konstantinidou, *E Kaltsouni, M Syrri, R Stagiopoulou,* E Sakkoudi, V Patouna. (Aristotle University MSc students in italics).

Field Ecology 2022

(Back row) JM Halley, A Rapti, K Stene, E Gotsi, L Bechlis, AP Tiktapanidis, T Danelis, N Kastellos, M Androulaki, O Gatsios, D Youlatos, A Giannopoulou, K Sotiropoulos. (Front row) A Theodoropoulos, S Koilakos, M Argyropoulou, K Siozios, D Roubis, A Talioura, K Nasiou.

Field Ecology 2019

(Back row) C Levidiotis, K Sotiropoulos, JM Halley, E Papastavrou, A Stefanidis, T Michelis, M Bellou.
(Front row) A Dadakaridis, M Argyropoulou, D Youlatos, K Levidiotis, C Diamantopoulou.

Field Ecology 2018

(Back row) G Kazantzidis, A Nikolaou, M Zafeiriadou, ME Rizou, S Boura, G Traki (the cook), M Argyropoulou, K Sotiropoulos, E Toli. (Front row) E Vakalouli, O Grizi, I Nikolopoulou, E Varouha, N Chondrelli, P Kontogeorgiou, P Pohani, V Kati (& Myrto).

Field Ecology 2017

(Back row) D Youlatos, M Iakovou, A Efthymiou, E Kouveli, O Koukougeli, G Alambasi, M Argyropoulou, JM Halley, K Sotiropoulos, E Kalagia, N Pyrovolaki, A Athanasiou. (Middle row) MI Tambakidou, M Molochidou. (Front row) M Keroglidou, M Tsinoglou, O Mavridi, V Aletra, K Serasidis, G Notaridis, K Karanikolas, G Ypsilou, C Havas.

Field Ecology 2016

Students (alphabetically): N Albanou, P Botsidou, O Christodoulou, E Dakou, E Gandzou, E Haliasou, ME Kafritsa, V Komninou, T Konstantinopoulos, V Mantzana-Oikonomaki, K Myronaki, X Renta, N Smit, A Tsikriki, S Tsola, D Tzallas, P Vardaka, P Zacharaki, P Zimpliakidis. Professors: M Argyropoulou, JM Halley, K Sotiropoulos, D Youlatos.

Field Ecology 2015

(Back row) K Konstantinidis, V Tolis, C Nikolaidou, A Gounari-Papaioannou, D Apostolidis, K Stara. (Middle row) E Athanailidou, M Chamargias, MA Akritidou, M Vlachou, M Zioutopoulou, K Polypathellis. (Front row) A Galaris, SA Siarambi, M Dimou, K Terizi, E Papadopoulou, A Karras, ©JM Halley.

Field Ecology 2014

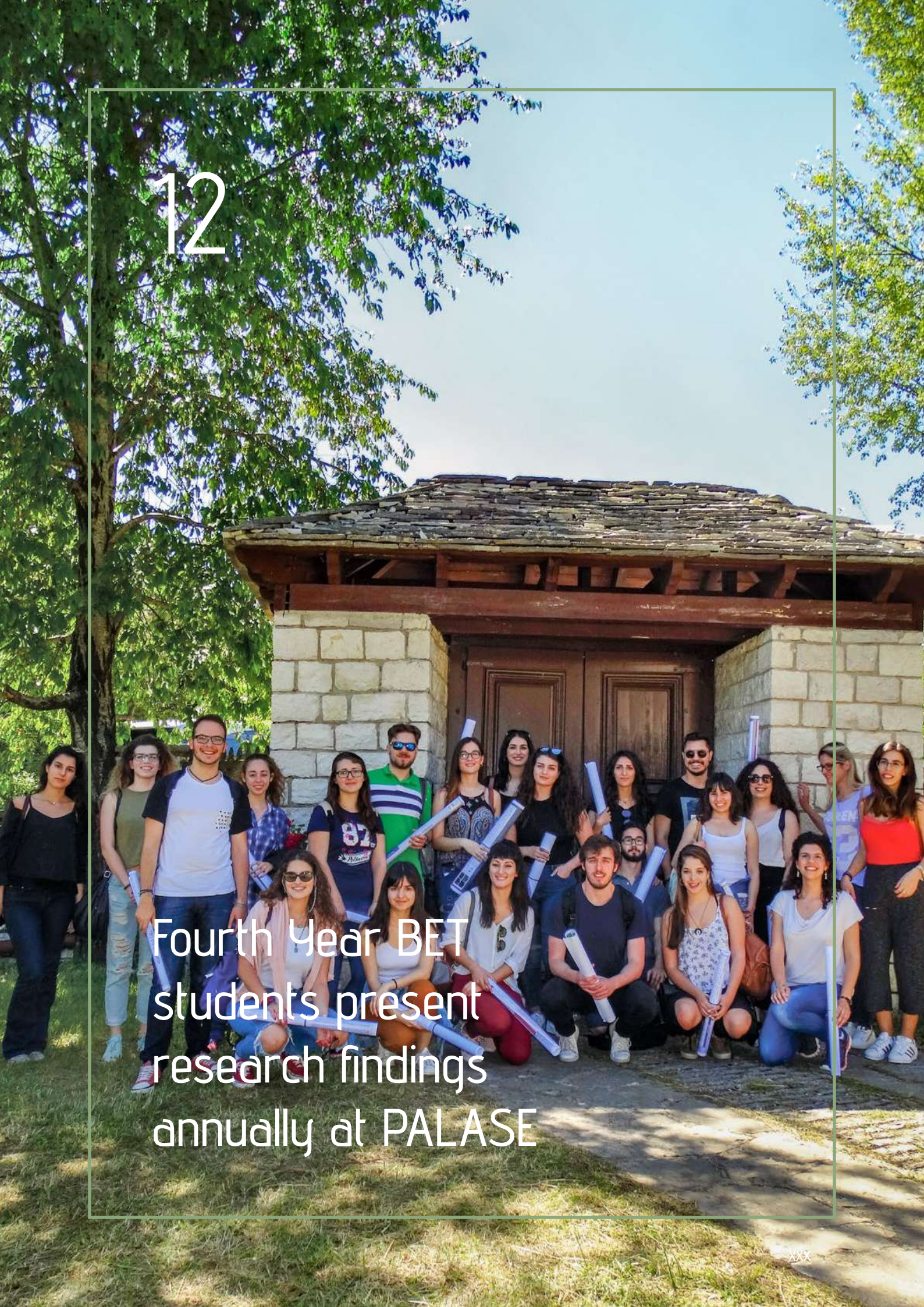
(Back row) N Monokrousos, A Papamitrou, N Chanioti, E Sousourogiannis, K Niaka, JM Halley, E Toli, C Karyou, E Moraitopoulou, M Katraki, N Gourgoulianni, A Georgakli. (Front row) G Koutoupas, E Moustakas, V Platania, P Papadopoulou, M Zachari, T Siekas, A Didaskalou, D Sergiadou, D Mousa, K Sotiropoulos.

Field Ecology 2013

Students (alphabetically): E Draina, E Erini, P Gavrilidis, E Giosa, F Kaldis, P Kavroulakis, A Kontovourkis, C Korobilis, T Kourtis, E Koutmanis, D Krokou, K Marmara, E Mitsou, K Moustakas, A Moschona, C Papadaki, K Theodoridis, D Vongoli, A Zagari, D Zervas. Professors: JM Halley, N Monokrousos, ©K Stara.

Field Ecology 2012

(Back & middle rows) N Wilkins, E Koufogeorgou, G Zavliaris, E Papantoniou, C Karli, A Mazis, P Pelitaris, C Turtle, D Smith , N Monokrousos, J Howarth, K Sotiropoulos, JM Halley, A Ramsey.
(Front row) J Keighley, P Zacharopoulou, C Wilson, V Roupaka, M Ganiatsa, E Liti.
(Students and teachers from the University of Cumbria in italics).



12

Fourth Year BET students present research findings annually at PALASE

Fourth Year BET students present research findings annually at PALASE

Theologos Michaelidis

The Labriadeios Research Station of the University of Ioannina (PALASE) gave the opportunity to a very demanding, experiential course called *Research Methods in Genetic Engineering*, to include in its educational innovations the organisation of a mini-conference by the students themselves. Thus, it concludes, in an ideal way, the education of those students who chose and attended this course (Fig. 1).

Research Methods in Genetic Engineering is a course offered to students in their fourth year of studies, when they have almost completed the journey of knowledge provided by the Department of Biological Applications and Technology. By now they have acquired both the knowledge background and the maturity to profit from an educational experience that introduces them to the world of research, and particularly to state-of-the-art research issues in Molecular Biology and Genetics. It is a laboratory course *par excellence*, where each student works by himself or herself on the bench for 4 to 5 hours, once a week, for the entire semester, dealing with modern standard approaches to molecular biology. This course has an interdisciplinary character; therefore, it is chosen by students who follow both directions offered by the department, namely that of *Biomolecular Sciences and Biotechnology*, and that of *Environmental Biology and Technology*.

PALASE station offered an extremely welcoming, lively environment for the organisation of a day-conference in which the students get the experience of a mini-symposium (Fig. 2). The purpose of this meeting is to teach students how to present their scientific results to a wider audience in the form of a poster (Fig. 3).

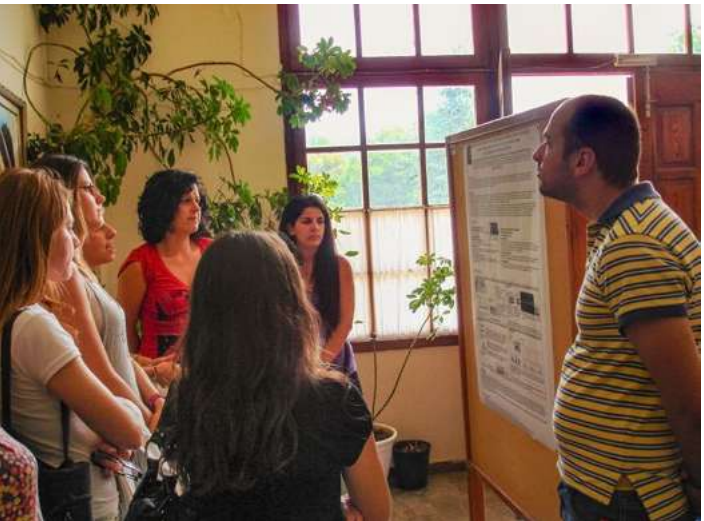
Figure 1
Ano Pedina, 2018 – Conference in the framework of the course Research Methods in Genetic Engineering. Students and tutors in the courtyard of PALASE at the end of the day, before departure, © K Papageorgiou.

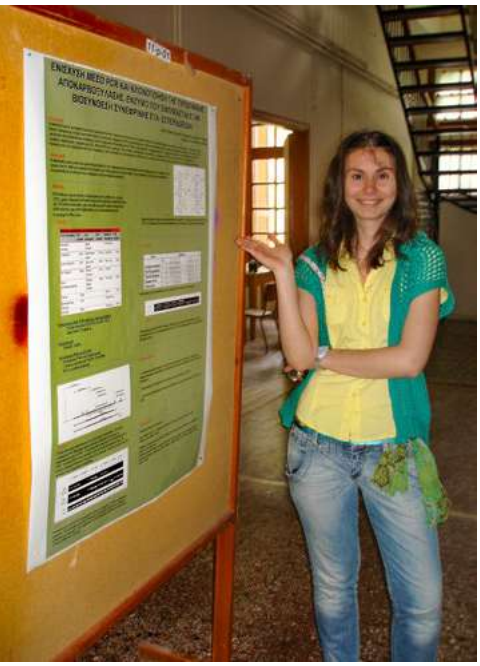
Figure 2
Ano Pedina, 2012 – Conference in the framework of the course Research Methods in Genetic Engineering. Students and tutors at the entrance of PALASE before lunch,
© T Michaelidis.

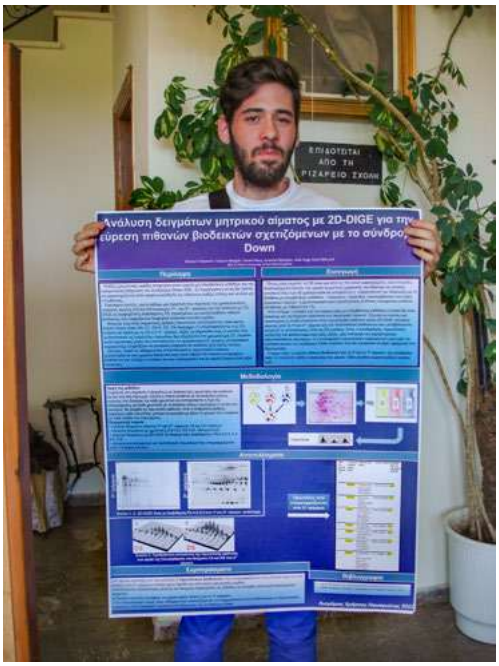
Through this activity, they learn that this way of communicating scientific data enables researchers to present their unpublished experimental results and promote fruitful interactions with other colleagues.

By fostering direct and spontaneous discussions between young scientists and more experienced scientists, this process creates a lively and friendly atmosphere. Unlike scientific talks, the time spent presenting a poster has an *observer-guest* character rather than an *author-speaker* character.

Figure 3
Ano Pedina, 2012 – Snapshots from the presentations of the posters in one of the interior halls of PALASE,
© K Papageorgiou.







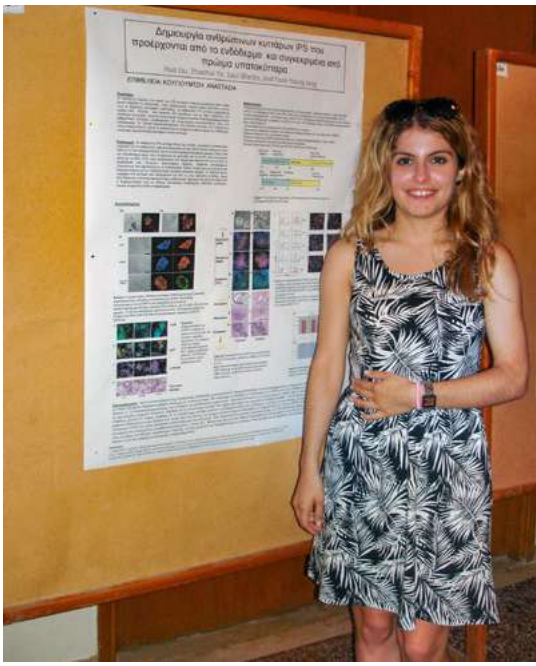


Figure 4
Ano Pedina, 2012 – Students proud of the results of their efforts, © I Tsigas.

That is why the natural environment of the station provides a great place for concentration, inspiration, and scientific discussion, a unique educational experience, from which the students drew many positive images and, as they tell us, they never forget them (Figs 4, 5).

Key contributors to the implementation of this educational activity were the laboratory members and colleagues, **Kyriaki Papageorgiou, Ioannis Tsigas, Marousa Darsinou, Anastasia Xagara, Eytichia Vasili**, and **Alexia Tsakaneli** from the Department of Biological Applications and Technology, and **Maria Parapouli** from the Department of Chemistry.

Figure 5
Ano Pedina, 2012 – The relaxed and pleasant environment of PALASE is reflected in the smiling faces of the tutors, © M Parapouli.

13

The Greek Summer School (GSS) 2008 – 2019

The Greek Summer School (GSS) 2008 - 2019

John M Halley & Vassiliki Kati

Introduction

An important initiative in the environmental promotion of Zagori was the Greek Summer School in Conservation Biology (GSS). From 2008 to 2019, the GSS promoted Zagori in Greece and abroad by hosting participants to study ecology and conservation biology in a magnificent environment.

The summer school involved intensive field sessions and field sampling techniques for a wide spectrum of the biodiversity of the area, including vascular plants, orchids, grasshoppers, butterflies, amphibians, reptiles, birds and mammals. Field outings were combined with lab sessions, data analysis and lectures about theory. This introduced the participants to the multidisciplinary and exciting world of conservation biology. Apart from the scientific activities of the school, there was a two-day hiking excursion to the enchanting Dragon Lake on Mt Tymfi, with an overnight stay at Tymfi's mountain refuge and a walk by Voidomatis river (Fig. 1). Another GSS highlight, offering lifetime memories to both students and teachers, was the school's "gastronomy" evening, where members of the international group had a chance to introduce fellow participants to their own country's culinary delights. Participants could also experience other aspects of local culture, such as history, folklore and dance.

Figure 1
Research at Voidomatis riparian forest, 2012, © V Kati.

Figure 2
Some GSS posters.

The three phases of GSS

In the first phase (2008 - 2009) GSS was a free international school in Europe. The initiator was the first president of the Environmental Education Committee (EC) of the Society for Conservation Biology-Europe (SCB), Renato Massa from the University of Milan. The initiative had been enthusiastically received by the committee but could not be realised due to lack of resources. It was the second president of the EC-SCB, Vassiliki Kati, who realised the vision of the Commission and organised the first GSS, in the year 2008: a week-long school under the title I*ntroduction to Conservation Biology*. The venue was Papingo, the iconic traditional village located in the heart of the Vikos - Aoos National Park, offering an ideal environment of inspiration and challenge for the GSS. It received over 150 applications a year and offered life experiences to 15 - 20 undergraduate and postgraduate students from all over Europe. It operated under the responsibility of the Environmental Education Committee of the European Section of the Society for Conservation Biology (SCB-Europe). Professors came voluntarily from all over Europe to teach and support the GSS, from eight universities and six countries: University of Ioannina & University of Patras (Greece), University of Malta, University of Cumbria (UK), University of Aarhus (Denmark), Universität Hohenheim (Germany), Università degli Studi di Milano-Bicocca & University of Siena (Italy). The Ministry of the Environment, the Prefecture of Ioannito and the Municipality of Zagori financially supported the GSS, in conjunction with two hotels in Papingo, the Center for Biological &

Cultural Diversity (a local NGO) (To Spiti Mas and agriogido-Rupicapra Villas) and SCB. In the second phase (2010 - 2012), the GSS developed into an intensive Erasmus IP program of the University of Ioannina, coordinated by V Kati and with the participation of a total of five European universities. GSS continued to be a free school funded by the State Scholarship Foundation - IKY under the title: *Conservation Biology in Europe: building a coherent strategy for the future*, under the auspices of SCB-Europe.

After a period of inactivity due to the financial crisis in Greece, the third five-year phase of the GSS (2014 - 2019) began, under JM Halley (2014 - 2015) and then under AS Kallimanis from the Aristotle University of Thessaloniki (2016 - 2019). In 2014, GSS changed its headquarters and emphasis. It was transferred from Papingo to Ano Pedina, to PALASE research station, as a self-financed program with a registration fee for participants. Now entitled *Biodiversity Theory and Practice*, it continued to operate under the aegis of SCB-Europe and received significant support from SCB every year. Its curriculum changed substantially with a greater emphasis on the analysis of ecological data in the R programming environment. GSS continued to offer experiential education in nature, training participants in sampling techniques for various taxonomic groups, with relevant workshops, and to adapt the content of theoretical lectures to topical conservation biology topics such as nature restoration, invasive species and

Figure 3
Species identification, 2012, © V Kati.

Figure 4
Night session moth trap, 2016, © JM Halley.

Figure 5
(a) Outing to Dragon Lake, 2010, (b) Butterfly identification, 2016, © JM Halley.

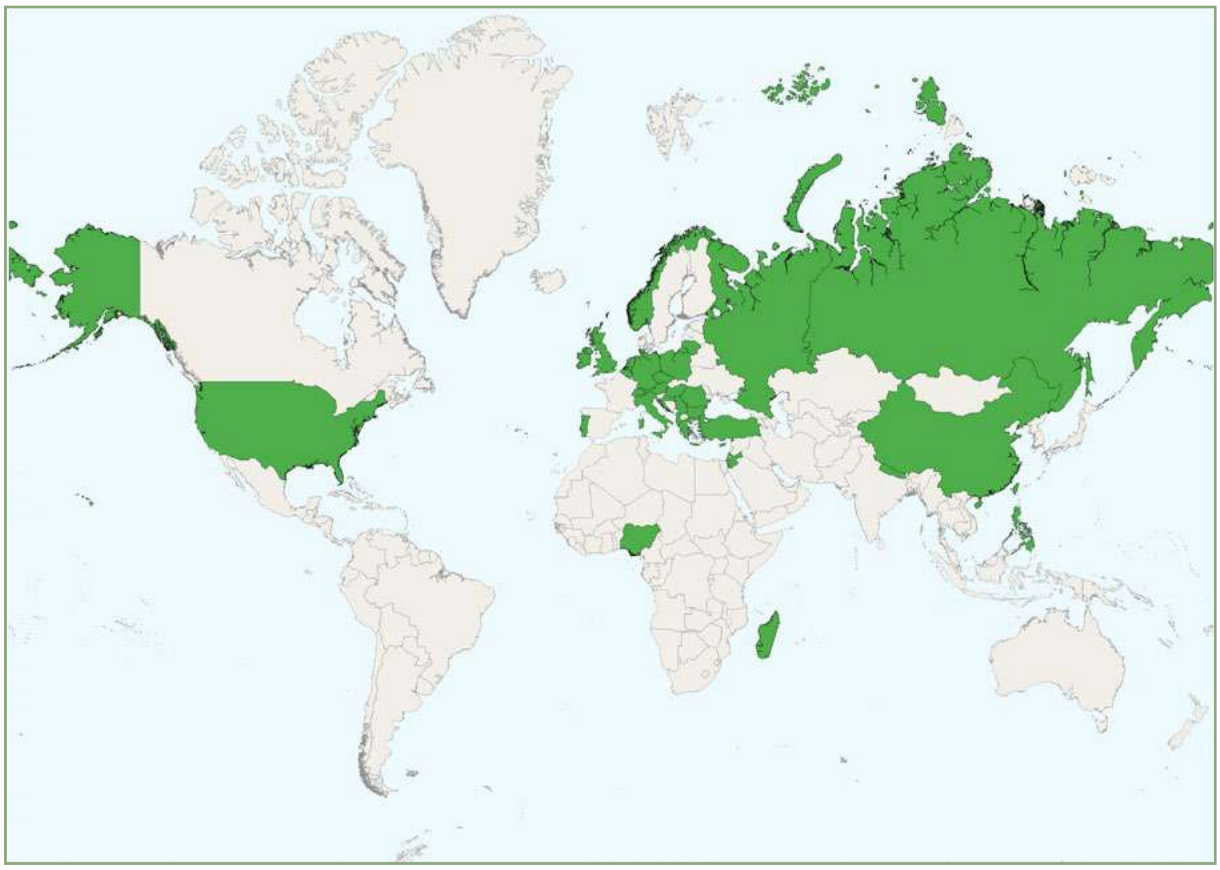
ecosystem services as before (Figs 2 - 5). Annual debates were introduced on topics of conservation importance, while other activities of the school were maintained, such as the gastronomy event and hiking excursion at Papingo. During this period, until the 2019 pandemic, GSS welcomed 10 international teachers and 64 participants from 23 countries.

Each year, the GSS published a report in SCB's annual newsletter. GSS human resources also contributed to the development of the *Field Ecology* course at the Department of Biological Applications and Technology of the University of Ioannina. A number of GSS instructors such as Andrew Ramsey (University of Cumbria, UK), Gabor Lovei (Aarhus University, Denmark) and Alessandro Chiarucci (University of Bologna, Italy) as well as organisers V Kati and JM Halley were present for most of the ten-year life of the GSS.

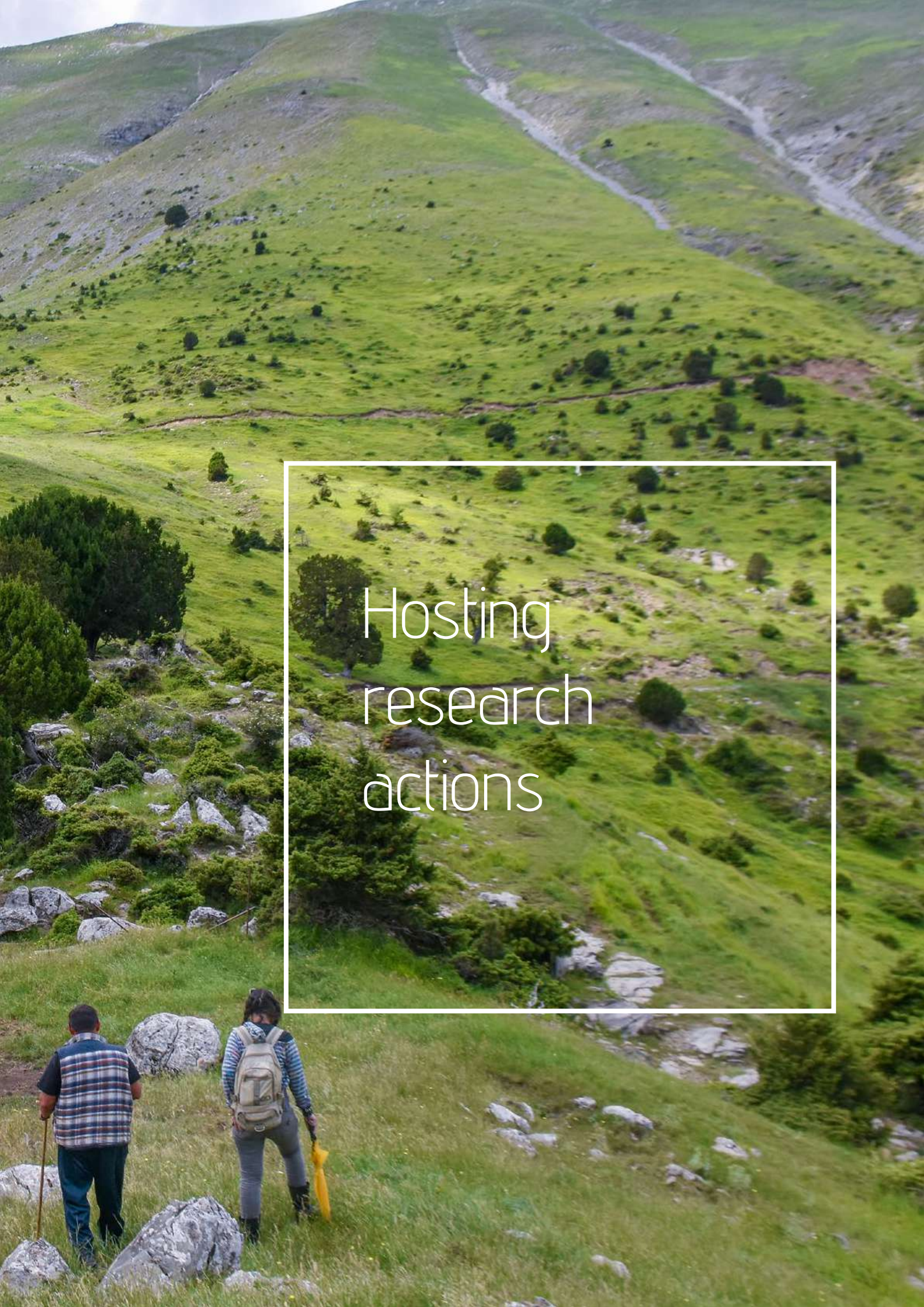
Conclusions

The GSS was a highly influential landmark summer school, further promoting the Zagori region internationally in Europe and the world. This pioneering international school was well received, with over half a million hits on its website. Over its duration, the GSS welcomed more than 20 instructors and inspired over 150 participants from 33 countries to discover the world of Conservation Biology (Fig. 6). It was a truly a "nursery" of future conservation biologists in Europe and the world.

Figure 6
International character of the GSS, expressed through a map of the world. Countries in Green are those that have sent participants to the GSS,
© Map: M Charitonidou.



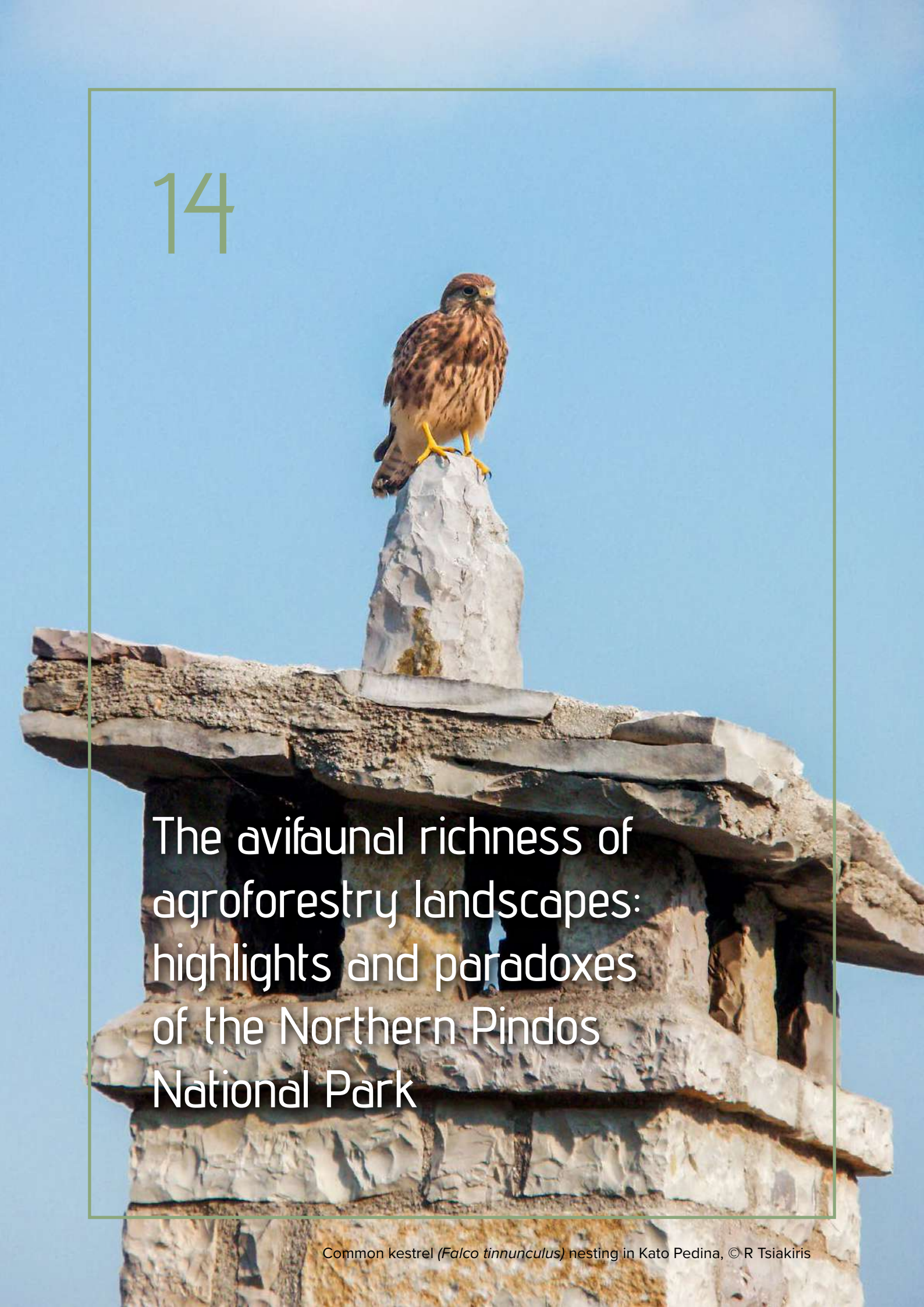
Studying the orchids used for salep in Pindos, 2018, © K Stara



Hosting research actions

14

The avifaunal richness of agroforestry landscapes: highlights and paradoxes of the Northern Pindos National Park



Common kestrel *(Falco tinnunculus)* nesting in Kato Pedina, © R Tsiakiris

The avifaunal richness of agroforestry landscapes: highlights and paradoxes of the Northern Pindos National Park

Rigas Tsiakiris

Anyone would expect that Greece's largest montane National Park, an area full of inaccessible gorges, lofty peaks, whitewater torrents, alpine lakes and vast forests of all kinds, and at the same time one of the most sparsely populated and remote areas in the country, should be very rich in bird diversity. But is it really so?

The area had been well-explored by ornithologists, by the standards of a country whose many mountains remain mostly unexplored, from the time when the Vikos - Aoos National Forest was established in 1973. The area was indeed of great ornithological interest, for raptors and species found only on high mountains as well as for forest species. A compilation of all published and unpublished data 25 years ago [1,2] revealed a total of 185 recorded species (a list which needs to be updated). Comparative data from the Cornell Lab of Ornithology's global platform *eBird*[15], which includes birdwatchers' records from various montane regions of southeastern Europe, reveals an interesting paradox. Although one finds a remarkable species richness here (in their "Papingo" village and adjusted area alone, which apparently includes both the Vikos gorge and Mt Astraka), one finds 113 species from only 31 visitor lists as early as 1980, this region is no longer among their top preferences (Fig. 2).

Why is this? Which are the most important, rare, endangered, iconic or beautiful species to photograph in the country's largest mountain National Park, and why is the area no longer considered a top priority for birdwatchers? It seems there are several different explanations for this [3]. Of course, the high mountain landscapes of Tymfi remain very interesting for their unique spe-

15 See https://ebird.org/home (Accessed 28-11-2023).

Figure 1

Three of the four species of shrikes occur on the plateaus of the region: (a) the great grey shrike (*Lanius excubitor*) that visits them in the winter, (b) the lesser grey shrike (*Lanius minor*) and (c) the red-backed shrike (*Lanius collurio*) that nest here. All are protected, as they are declining in Europe due to land use intensification, monoculture and the destruction of landscape mosaics, © R Tsiakiris.

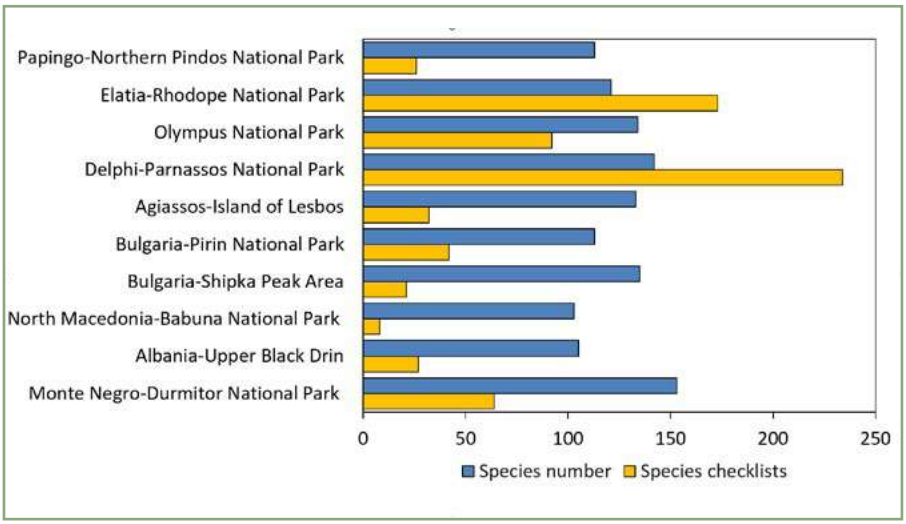


Figure 2
Ornithological interest, in terms of numbers and species lists, recorded by visitors in mountainous areas of Greece and the Balkans.

cies, such as the wallcreeper (*Tichodroma muraria*) that hides among the vast rocky slopes, or the white-winged snowfinch (*Montifringilla nivalis*), the horned lark (*Eremophila alpestris*) and the rufous-tailed rock-thrush (*Monticola saxatilis*) that are found in mountain summer pastures. However, the recent replacement of sheep with cows in areas that were traditionally used by transhumant shepherds and their flocks, makes their conservation (which depends on upland grassland biodiversity) problematic, the same is probably true also for the locally rare red-billed chough (*Pyrrhocorax pyrrhocorax*). Nevertheless, foreigners who come looking for new Mediterranean or Eastern European species, such as the sombre tit (*Poecile lugubris*), the lesser grey shrike (*Lanius minor*) and the woodchat shrike (*Lanius senator*), for photographs or for their bird lists, should look for them here in the vicinity of settlements, as these birds prefer pastoral woodlands for breeding (Fig. 1). Such areas are also rich in raptors and agricultural species that are declining in Europe (Fig. 3).

Figure 3
Farmland in the area is situated on two plateaus, Kato Pedina - Elafotopos (pictured) and Vitsa - Ano Pedina. These contain a mixture of pasture, cultivation and agroforestry areas in an impressive mosaic of land-use and habitats important for many endangered and rare bird species of the Northern Pindos National Park,
© R Tsiakiris.

PALASE at the center of Europe's agricultural biodiversity

This results in a paradox: within a generally densely forested area, most "interesting" and "important" species are found in open areas around villages, where a mosaic of land uses constitutes a magnet for birds, a kind of "biodiversity islands for birds" (Fig. 4). In particular, the plateaus of Vitsa – Ano Pedina and Kato Pedina – Elafotopos (i.e. areas close to the PALASE facilities) concentrate more diversity and European "conservation priority" species than all the rest of the Vikos - Aoos National Forest [4]. This fact has been already noted at the time of the preparation of the Special Environmental Study of Pindos, 25 years ago, even before the designation and the establishment of the Northern Pindos National Park! There, agroforestry landscapes still hold a variety of species rapidly declining in the European continent, such as the corn bunting (*Emberiza calandra*), the common whitethroat (*Sylvia communis*), and the red-backed shrike (*Lanius collurio*) [5]. In addition, species that used to be very common and are now very rare in agricultural areas elsewhere, such as the European turtle dove (*Streptopelia turtur*) and the quail (*Coturnix coturnix*) (Fig. 5) are still breeding here. Historical studies show that those landscapes were maintained stable over time but required a special and dynamic vegetation management system to be suitable for the above "typical agricultural" species [5].

Figure 4
(a) On the periphery of the settlements of Zagori, the short-toed eagle (*Circaetus gallicus*), a species classified in the relevant Special Protection Area of the NPNP, is observed hunting, while (b) large concentrations of white storks (*Ciconia ciconia*) are seen near Kato Pedina just before the autumn migration, © R Tsiakiris.

Figure 5
(a) The European turtledove (*Streptopelia turtur*) now endangered in Europe, still nests in the trees near Ano Pedina while (b) for the common linnet (*Linaria cannabina*) the uncultivated areas and pastures are of great interest, as for most species of seed-eating passerine birds, because they provide food in autumn and winter, © K Stara.

A variety of breeding raptors can also be found in these plateaus, such as the short-toed eagle (*Circaetus gallicus*), the common kestrel (*Falco tinnunculus*) and the peregrine falcon (*Falco peregrinus brookei*). Large groups of white storks (*Ciconia ciconia*), sometimes with more than 100 individuals, as well as the elusive black storks (*Ciconia nigra*) also visit the area every day, looking for grasshoppers and amphibians in the ponds that water the free-range livestock. In addition, the remaining wet meadows attract stonechats (*Saxicola torquatus*) and most of the rare migratory species, such as the red-footed falcon (*Falco vespertinus*) and several species of herons, egrets and waterfowl, especially in winter (Fig. 6).

While some species disappeared from the wider region decades ago, such as the black grouse (*Lyrurus tetrix*) and hazel grouse (*Tetrastes bonasia*), we also see worrying signs of an impending collapse of the emblematic avifauna of the area, as the ancient cultural landscapes of Zagori are lost through the steady abandonment of its villages [6]. Already since the late 1980s, both the bearded vulture (*Gypaetus barbatus*) and the colony of griffon vultures (*Gyps fulvus*) have disappeared from the Vikos gorge, although the latter continues to appear here sporadically [7]. The Egyptian vulture (*Neophron percnopterus*), well-known locally as the “cuckoo’s horse”, was formerly very numerous but has now abandoned the area. While it numbered over six pairs in the Vikos - Voidomatis gorges until recently, none are still nesting there. Unfortunately, it is no longer seen searching for carcasses and turtles in the pastures of Vitsa-Ano Pedina or watching for fresh road-kills on the asphalt near the famous Kokoris bridge, though it can be observed in the Konitsa plain as it still nests near the Albanian border. Thus, while the Northern Pindos National Park includes 4 out of 207 Special Protection Zones in Greece and the Vikos - Aoos National Forest, established 40 years ago is part of the European NATURA 2000 network for the protection of rare birds, those very bird species seem to be gradually disappearing due to rapid natural reforestation and abandonment of livestock farming.

The newly forested landscapes with dense shrubs and young impenetrable forests do not seem to hold many ornithological surprises, unlike the old-growth forests, which still host some species of e.g. woodpeckers that are rare in Europe, but still relatively common in Greece. Such species nest mainly in inaccessible sites with many old or dead trees, as well as in the villages’ “sacred forests”, several of which are more than 300 years old (see Chapter 9). The latter had been managed and protected

through religious edicts and taboos and were associated with strong prohibitions on woodcutting [8]. Some of these forests border the plateaus near PALASE and are of particular interest for avian diversity, mainly as breeding sites for nocturnal and diurnal raptors.

Rapid landscape changes due to the abandonment of agricultural activities

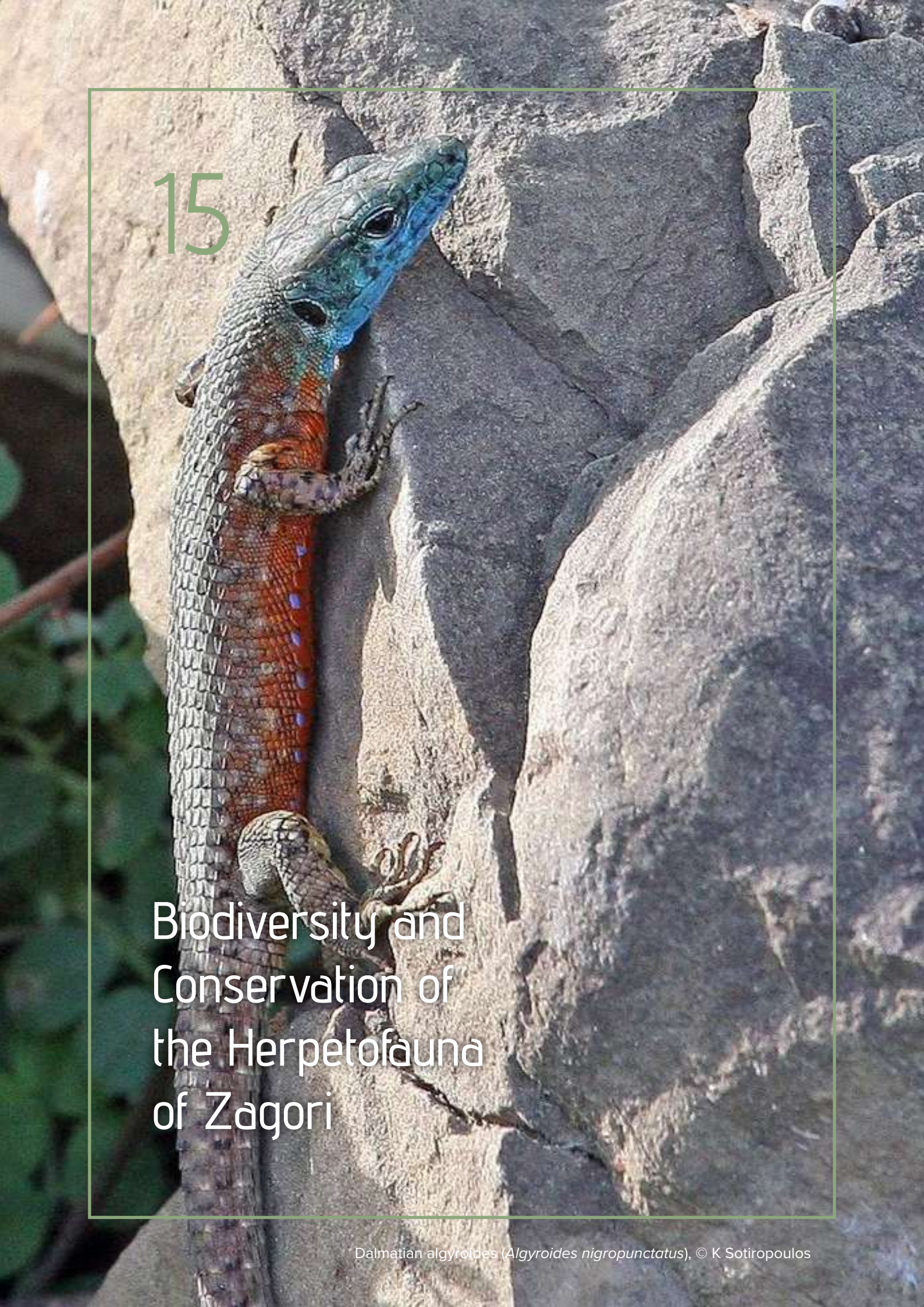
Over the last 30 years, the wider area of the NPNP has been heavily modified by the abandonment of agricultural land [9], so much so that it is virtually impossible for the untrained eye to penetrate the dense young scrublands and perceive the recently-abandoned cultural landscape hidden beneath. This phenomenon is not local but has been ongoing in most reforested mountain areas of Greece and elsewhere in the Balkans [11]. However, much of this ancient cultural landscape is still preserved today on the plateau where PALASE is located, which gives it extra value internationally [10]. Here local people, who continue to live permanently in the nearby villages, are still engaged in small-scale agriculture and livestock farming and in these areas most bird species still thrive. Indeed, it seems that some characteristic species of agroforestry landscapes, such as red-backed shrike (*Lanius collurio*) prefer “stable and productive” landscapes over long time, as they show the highest productivity in those areas that have not changed since 1945 according to the oldest available aerial photographs of the area [5]. At that time, agroforestry landscapes were dominated by herds of hundreds or even thousands of sheep and goats (some owned by transhumant and others by permanently settled inhabitants), that shaped the landscapes we see today, and every flat surface, even terraces, were sown to feed people in difficult times.

So don’t be surprised if you see a short-toed eagle gliding even over the central square of some village in Zagori. The last open areas where it can easily spot accessible prey, snakes and lizards, are now either in or on the periphery of the villages, or near forests that are still grazed all year round [12]! It is therefore important that young researchers at PALASE examine more precisely the impact of active management of agroforestry landscapes on bird biodiversity and propose measures to recover the rich bird community that is slowly being lost along with the local communities in the mountains.

Figure 6
(a) For the stonechats (*Saxicola torquatus*) which are nesting on the periphery of the wet meadows of Ano Pedina, uncultivated areas and pastures are of great interest, as they provide food in autumn and winter, while (b) whinchats (*Saxicola rubetra*) is mainly present during migration, © K Stara.

15

Biodiversity and Conservation of the Herpetofauna of Zagori



Dalmatian algyroides (*Algyroides nigropunctatus*), © K Sotiropoulos

Biodiversity and Conservation of the Herpetofauna of Zagori

Konstantinos Sotiropoulos

Nose-horned viper (*Vipera ammodytes*),
© K Sotiropoulos.

Amphibians and reptiles play an important role in ecosystems and food webs, while also being considered important bioindicator organisms, as they indicate the health of both terrestrial and aquatic ecosystems in which they live [1,2]. The constantly deteriorating state of ecosystems, either due to climate change or due to human activities, often cause modification of the behaviour of these species (e.g. shift of activity periods or movement to different microhabitats), or less often changes in their phenotypic characteristics [3].

Amphibians in particular, due to the dramatic reduction of their populations on a global scale, as a result of the degradation and destruction of their habitats due to climate change and human activities, are often target species for conservation and management programs.

In the context of the *Field Ecology* course (Department of Biological Applications and Technology, University of Ioannina), held at PALASE, students are trained in species identification, application of sampling methods and techniques, experimental design, and production and interpretation of ecological data, in the direction of the study and protection of the biodiversity of amphibians and reptiles.

The amphibian and reptile fauna of Zagori includes 13 and 28 species respectively, and is considered one of the richest in Greece. Both the significant diversity of habitats and the microclimatic characteristics of the area contribute to this. Here one can meet the alpine newt (*Ichthyosaura alpestris*) in ponds at the highest altitudes, salamanders (*Salamandra salamandra*) in the moist -mostly deciduous- forests, while the common Greek newt (*Lissotriton graecus*) and the Macedonian crested newt (*Triturus macedonicus*) breed in the numerous ponds and ditches of the plateaus, the tree frog (*Hyla arborea*), as well as the two species of toads (*Bufotes viridis* and *Bufo bufo*). Finally, in the brooks and

Figure 1
Characteristic species of the herpetofauna of Zagori: Dalmatian algyroides (*Algyroides nigropunctatus*), yellow-bellied toad *(Bombina variegata)*, leopard snake (*Zamenis situla*), nose-horned viper (*Vipera ammodytes*),
© K Sotiropoulos.

seasonal streams, one meets the Greek stream frog (*Rana graeca*) and the yellow-bellied toad (*Bombina variegata*). Regarding reptiles, characteristic species are the Dalmatian algyroides (*Algyroides nigropunctatus*), common inside and outside villages, on dry rocks and in shady stands of trees, as well as the Greek slow worm (*Anguis graeca*), while from the snakes one can meet the four-lined snake (*Elaphe quatuorlineatta*), the Aesculapian snake (*Zamenis longissimus*), the Balkan and Caspian whip snakes (*Hierophis gemonensis* and *Dolichophis caspius*), the leopard snake (*Zamenis situla*) and the nose-horned viper (*Vipera ammodytes*) (Fig. 1).

Figure 2
Male Macedonian crested newt, © T Danelis.

Among the species found in the area is the Macedonian crested newt (*Triturus macedonicus*) (Fig. 2), which is a priority species for the European Union (ANNEX II, 92/43 EC) and whose presence requires the designation of Special Conservation Zones.

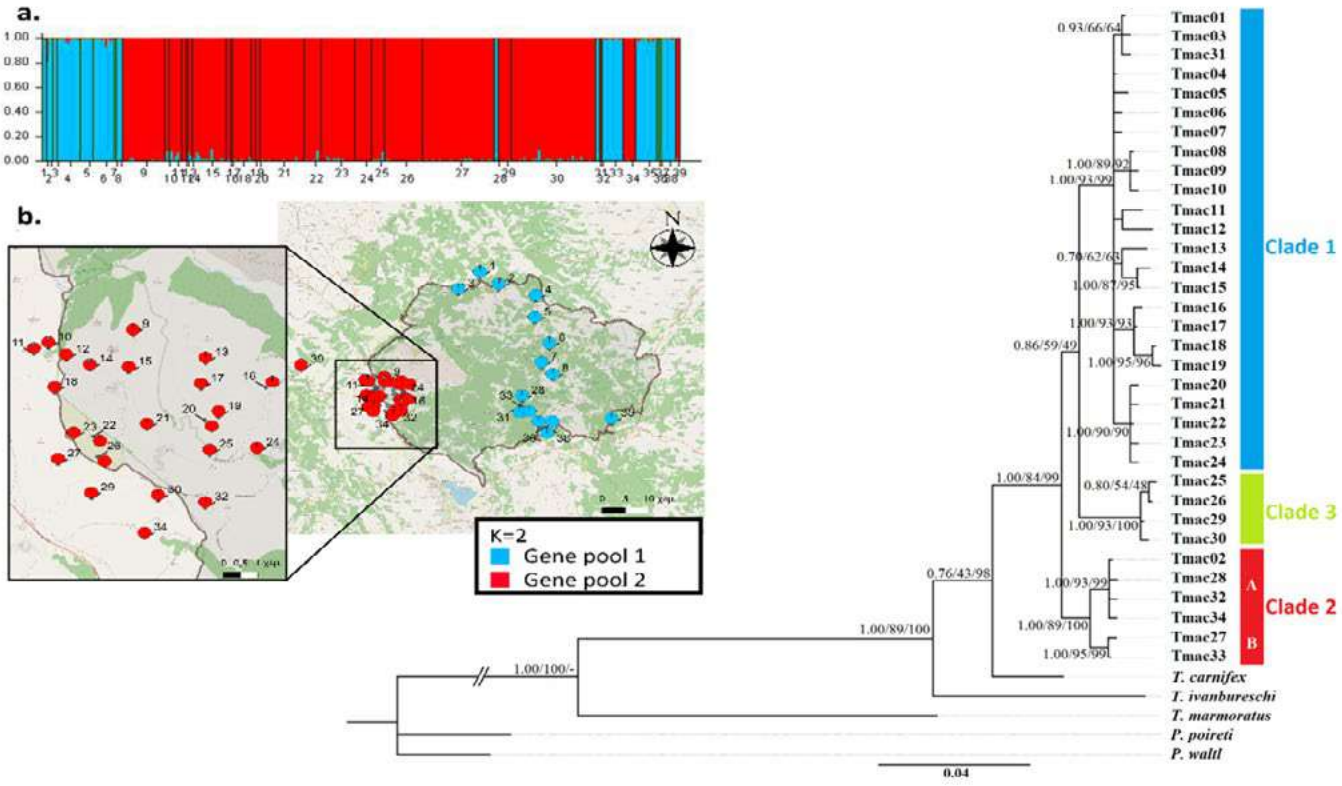
During the last decade, the species has been the subject of research by the Laboratory of Molecular Ecology and Conservation Genetics at BET - University of Ioannina, both in the area of Zagori and in other areas of the Northern Pindos National Park, where its presence has been recorded in a third of active water bodies [4,5] (Fig. 3).

Figure 3
Sampling of amphibians by BET students, on the *Field Ecology* course, © K Sotiropoulos.

The results of genetic analyses showed that the populations of the species from Central and Western Zagori belong to the oldest phylogenetic clade ("Zagori Clade", Clade 2), which is characterised by long demographic stability in the region. In contrast, the populations of Eastern Zagori and the northern and eastern parts of Northern Pindos National Park constitute peripheral populations at the SE end of the distribution of the geographically widespread, phylogenetic or "northern" Clade 1 [6,5] (Fig. 4).

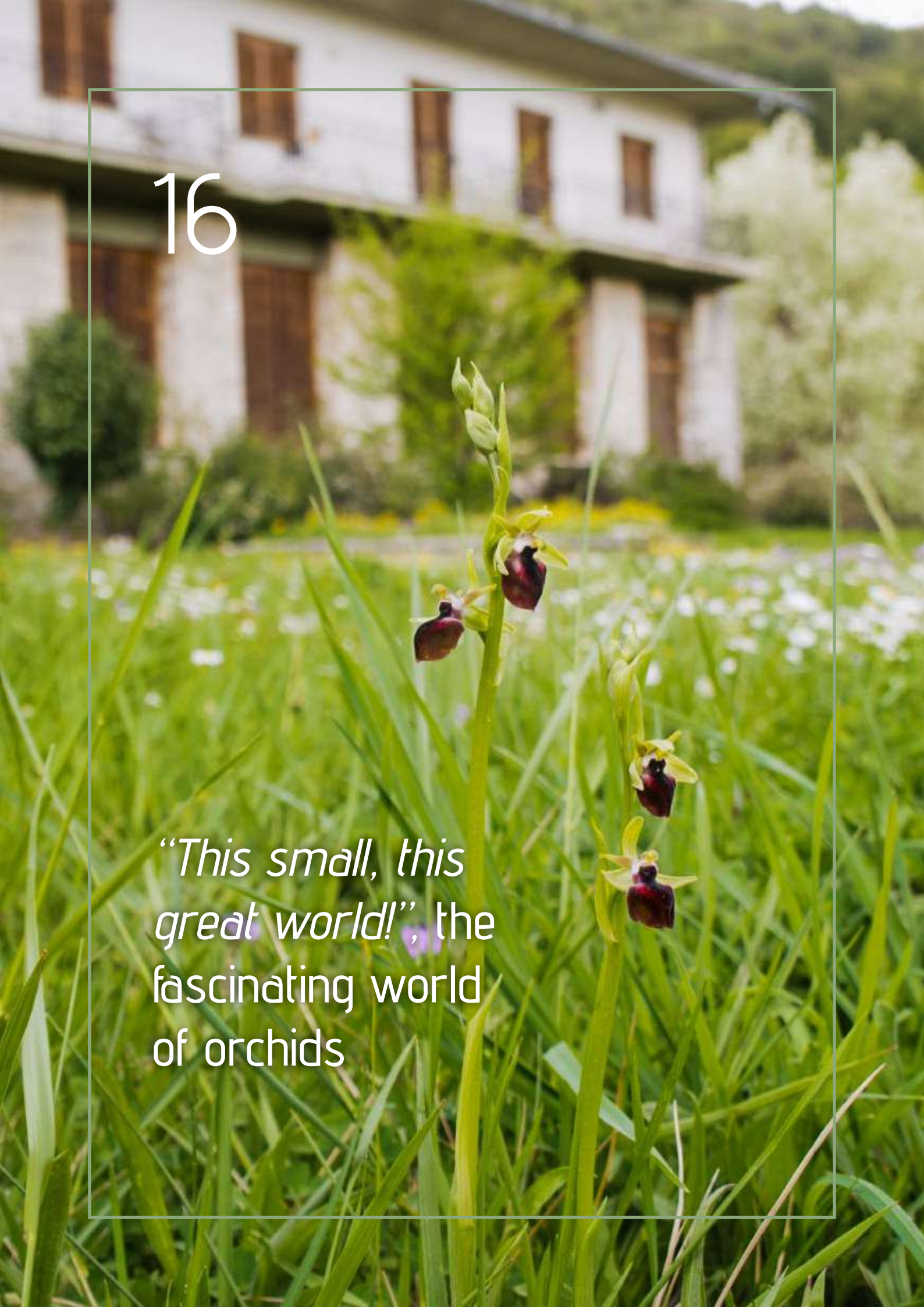
These two population groups of the Macedonian crested newt constitute two distinct and highly differentiated gene pools with significant diagnostic diversity, both in mitochondrial and nuclear markers (Fig. 4), meeting the criteria to be designated as two distinct "Evolutionary Significant Units" (ESUs), which deserve separate conservation status [7]. However, local populations show significant local isolation and high genetic differentiation among them, as a result of low or even absent connectivity in terms of gene flow [8]. The fact that the Macedonian crested newt in the region of central and western Zagori is found and reproduces almost exclusively in artificial livestock ponds and reservoirs, highlights the importance of these habitats both for the presence and conservation of the species, especially in the areas where the availability of permanent natural water bodies is limited [5].

Figure 4
Phylogenetic tree (right), constructed based on mtDNA markers, and genetic structure analysis (left) based on nuclear DNA markers. Both approaches highlight the high degree of differentiation between the two population groups of the Macedonian crested newt in the Northern Pindos National Park area [5-6,8].



Of particular concern is the fact that these habitats are subject to significant threats and pressures, such as the introduction of fish and their intense -often uncontrolled- use by cattle, significantly undermining the survival of both the species and the multitude of other species that use these habitats as breeding grounds (Fig. 5). For these reasons, it is deemed necessary to take actions to protect and conserve both the populations of the species and its habitats in the area.

Figure 5
(a) Semi-natural pond in the area of Ano Pedina, Zagori, in 2006, where it is used by sheep. The site hosted a robust population of the Macedonian crested newt, serving as a “source” population for a large number of other populations in the wider area [4], (b) the same pond in 2021, when used by cattle. Its significant degradation, due to changes in animal husbandry practices, is evident. In addition, fish (carp) have been introduced to the pond in recent years. The result of the above changes in its usage is that it no longer hosts Macedonian crested newts, © K Sotiropoulos.



16

"This small, this great world!", the fascinating world of orchids

"This small, this great world!", the fascinating world of orchids

Martha Charitonidou

The summer of 2016, having graduated with a master's degree in the conservation of biodiversity, I visited the University of Ioannina Labriadeios Field Station (PALASE) in order to attend the Greek Summer School in Conservation Biology (see Chapter 13), organised by Dr John Halley, professor of Ecology at the Department of Biological Applications and Technology. Even if it wasn't the peak of the season for orchids, it was a pleasant surprise to find a robust population of lizard orchids (*Himantoglossum jankae*) - a species that I studied for my master's dissertation - in the cherry orchard, right next to PALASE. What was more pleasant though was my acquaintance with prof. Halley, with whom I seem to share the same interest in the fascinating world of orchids. Later that same year, I started my doctoral research under his supervision, focusing on two orchids of the genus *Ophrys*, one of the most diverse genera in Greece (91 taxa; Atlas of Greek Orchids [1] and one of the great examples of plant-pollinator interactions and co-evolution[16].

Why are orchids so special? Being one of the largest and most diverse plant families in the world (>30,000 species in >700 genera, [2]), orchids can be found nearly everywhere, with the exception of deserts and the poles. It is believed that the Greek philosopher Theophrastus was the first to name these plants as "ὄρχις" (órhis), driven by the resemblance of their tubers with the male reproductive organ[17], and inspired by the myth of Orchis[18]. The first thing to observe on an orchid is its physical traits; monosymmetrical flowers, thousands of colours, shapes, and forms;

Figure 1
Two individuals from the PALASE field station population of *Ophrys helenae*, © M Charitonidou, April 2018.

16 The majority of *Ophrys* use sexual deception as their principal pollination strategy to attract pollinators. By employing various (primarily) visual and tactile signals, and also by emitting a pheromone blend similar to that of females, they lure naïve male insects (mainly *Hymenoptera*) to pseudocopulation, and achieve pollination.

17 Many terrestrial orchid taxa have ovoid or palmate tubers, while others have rhizomes of different shapes (coral- or nest-shaped roots etc.).

18 Orchis was the son of a nymph and a satyr. During the bacchic feast, a severely drunk Orchis committed sacrilege by sexually assaulting a priestess of the god Dionysus. The gods punished him with dismemberment and turned his parts into orchids. Orchis is the genus that gives his name to the whole family (Orchidaceae).


a


b


c

an "endless diversity of structures", as Charles Darwin wrote of them [3]. However, the key characteristic of orchids that always intrigued scientists, is their highly complex reproduction system: they are the "queens of deceit and exploitation"! From tiny seeds to mature plants, orchids need to form partnerships with other organisms both above [4] and below the ground [5] in order to survive and grow. The vast majority of orchid species have formed complex pollination systems, by employing extremely smart mechanisms of deceit (from food deception and shelter mimicry to the famous sexual deception) to lure their pollinators and achieve fertilisation [6]. Every orchid fruit (capsule or pod) contains hundreds, thousands or even millions of dust-like seeds that lack an endosperm [7]. This deficiency of nutrients in their seeds has forced orchids to form strong (mutualistic or parasitic) partnerships with mycorrhizal fungi [8], in order to be able to obtain the nutrients they need to grow into mature plants [9].

Studying the orchids of PALASE field station

One of the species I studied during my PhD was Helen's bee orchid (*Ophrys helenae*), known in Epirus with the vernacular name "kalógria" (meaning "the nun"). It is a Balkan endemic species, with its centre of distribution lying in NW Greece. Here, it can be found in large populations, mainly in open habitats (grasslands, forest openings). Helen's bee orchid is one of the most striking and easily identifiable bee orchids, especially due to the colour of its flowers: a characteristic deep red labellum, completely lacking a speculum[19]. Most of the *O. helenae* populations that I monitored for my PhD were located in Epirus. As luck would have it, one of these was located literally in PALASE's yard (Fig. 1)!

Thus, since 2017 (my first year of fieldwork), I spend a few days every spring at the field station, in order to do all the required fieldwork and measurements for the PALASE population of Helen's bee orchid. My visits to PALASE were scheduled and divided into two periods: the first one during the peak of flowering, and

19 *Speculum:* a characteristic design observed on the labellum of *Ophrys* orchids, specifically used as a visual signal to lure insect pollinators. Note the characteristic absence of this in Helen's bee orchid, Figure 1(b) in contrast to the other *Ophrys*.

Figure 2
Orchid species that can be found in PALASE field station:
(a) *Orchis purpurea*,
(b) *Ophrys helenae*,
(c) *Ophrys mammosa*,
(d) *Ophrys epirotica*, (e) *Ophrys reinholdii*,
(f) *Anacamptis morio*, (g) *Himantoglossum jankae*,
© M Charitonidou (b, c, f), K Stara (a, c, e), A Hardenbol (g).

the second during the fruiting period. Since my first visit and until the moment of writing this text, the PALASE population has shown quite encouraging population trends; it is a healthy, robust, and increasing population. Added to that, it is one of the most successful ones, since in all years its pollination success rate was high (~20%), and this population had among the highest numbers of seeds per capsule (>20,000 seeds in a single fruit [10]!).

In parallel with my doctoral research, the PALASE *O. helenae* population was selected as one of the sites for a study on the pollination ecology of the species in Epirus, conducted in the undergraduate dissertation of Niki Pirovolaki, of the Laboratory of Ecology, Department of Biological Applications & Technology (BET) [11]. Apart from my "Helen of Troy", PALASE field station is home to several other orchid species that emerge gradually between mid-April to early July. In total, seven different species have been recorded in the station's yard, four of which belong to the genus *Ophrys* (*O. epirotica, O. helenae, O. mammosa, O. reinholdii)* and three to the sister genera *Anacamptis*, *Himantoglossum* and *Orchis* (Fig. 2). This is also a great opportunity for students from the BET Department, during the fieldtrip of the elective course *Field Ecology*, to learn about orchids and study them *in situ*.

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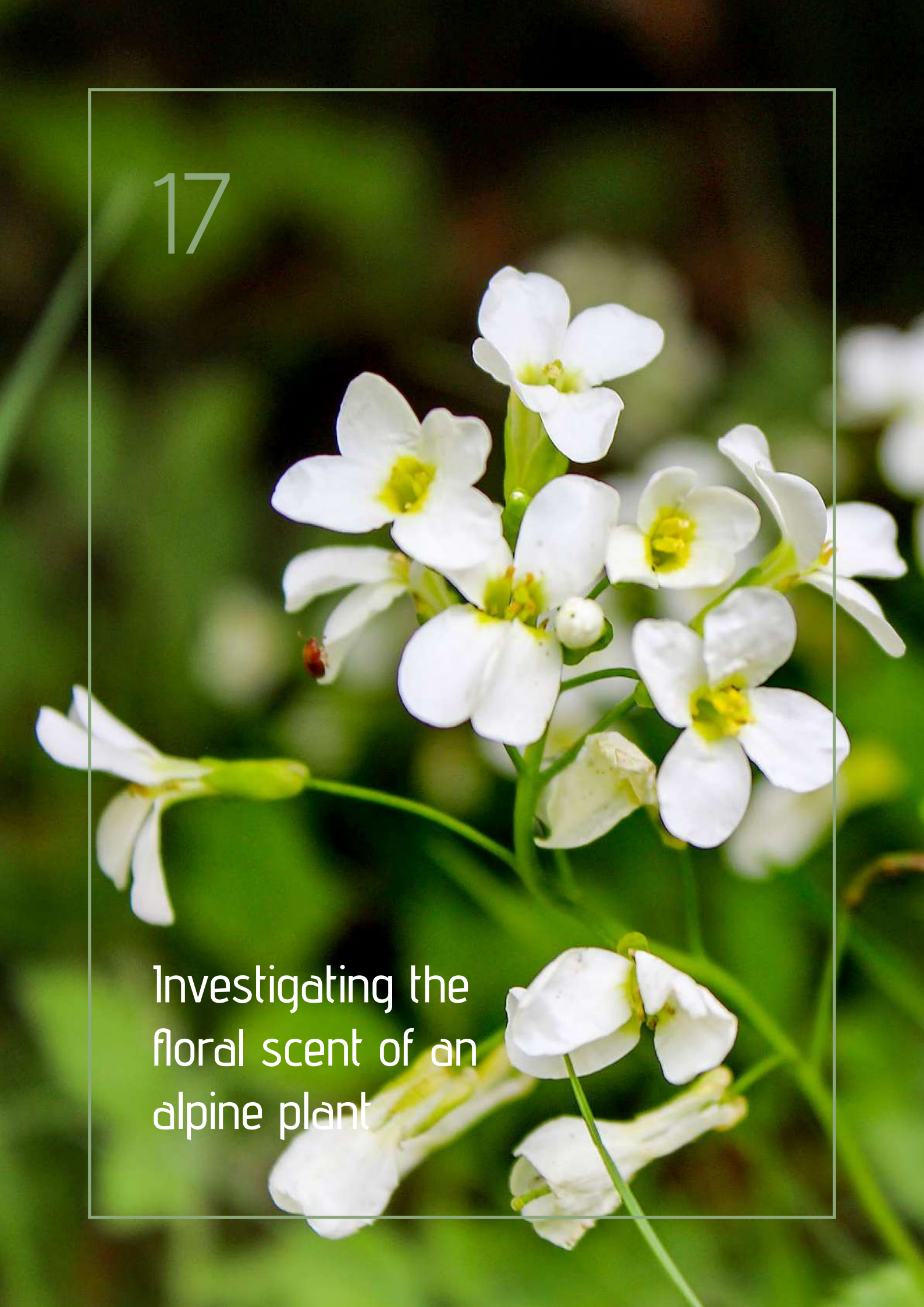
Investigating the floral scent of an alpine plant



Investigating the floral scent of an alpine plant

Hampus Petrén & Magne Friberg

Introduction

The Pindus Mountains in the Zagori region of Greece is one of the most plant species rich areas in Europe. As researchers in plant ecology, we were, however, especially interested in finding a very particular species of plant, the alpine rock-cress (*Arabis alpina*; Fig. 1). This plant is not special because it is rare or because it has a particular colour or shape. In fact, one could argue that it is interesting partly because it is widespread, and because it attracts many different kinds of pollinators. In Europe, it can be found in almost all mountain regions, including parts of Greece. One goal with our studies was to investigate how the plant and its environment varies across European regions, and if the interaction with different local pollinators have affected the evolution of the flowers in different ways in different areas. Therefore, between 2017 and 2019, with the help of four devoted field assistants (Joseph Anderson, Sotiria Boutsi, Petroula Botsidou and Gabriele Gloder), and assistance by professor John Halley at University of Ioannina, we performed a three-year long project to study this plant across the Zagori region.

Figure 1
A flowering *Arabis alpina* plant, © H Petrén.

Examining the ecology of A. alpina

The first task of studying an organism in its natural environment is to find it. *Arabis alpina* is widespread and common, but populations are often small, and since the plant grows in rocky and steep areas, often along streams, it is not always easy to find. During our first year in Zagori, we spent days walking up and down mountain sides in search of the plant. Eventually, we managed to locate several suitable populations, and focused our work on a large population close to Kipoi village (Fig. 2), conveniently located just a short drive from the PALASE field station.

Arabis alpina flowers bloom early in spring, so our work began in April each year. One of our major goals was to study how the flowers of *A. alpina* smell, and investigate if plant individuals that emitted more or less of certain scent compounds were more successful in producing seeds. To collect scent from flowers, we used a method where the flowers of individual plants are enclosed in plastic bags (Fig. 3). Then, air is sucked through a filter in a tube, which catches the mixture of molecules that make up the floral scent. Later, in the lab, the samples were analysed with a gas-chromatograph coupled to a mass-spectrometer, and this machine then told us how many different compounds were present in the scent bouquet of each plant individual. We also noted

Figure 2
The location of a major *Arabis alpina* population. The plant is often found on north-facing slopes or along streams, in rocky areas with calcareous soil, © H Petrén.

Figure 3
One of the authors (HP) collecting floral scent from plants in the field, © P Botsidou.

when plants started flowering, measured the size of their flowers, and examined what insects pollinated the *A. alpina* plants. For this, we observed groups of plants, photographing and identifying pollinators, and noting how often plants were visited by different kinds of insects.

About a month after the first plants opened their flowers, most individuals had finished flowering, and the first part of our field work came to an end. After flowering, fertilised flowers slowly develop into fruits containing seeds. In *A. alpina* this takes about two months, which meant that we returned to the plants in June. We then counted how many fruits and seeds the plants had produced, to compare how successful they were at reproducing. We repeated our work each season from 2017 to 2019, and made similar investigations in *A. alpina* populations in the Apennine Mountains in central Italy. In this way, we could examine if plants from the different regions smelled differently, and if they attracted different pollinators. By counting how many seeds were produced by the same individuals, we could test if any particular compounds in the scent were important for seed production, which likely means that they are the most efficient in attracting pollinators.

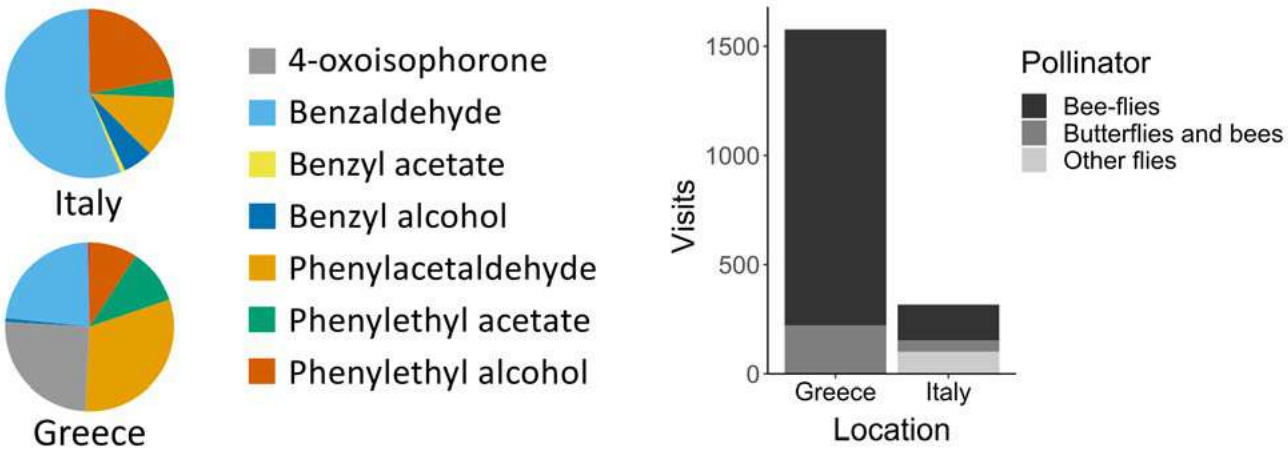


Figure 4
Differences in floral scent and pollinator visits for *Arabis alpina* plants in Greece and Italy. The pie charts illustrate the composition of the floral scent, with different colours representing different compounds. The bar plot shows the total number of observed visits of different types of pollinators on *A. alpina* flowers.

How pollinators may affect the evolution of plants

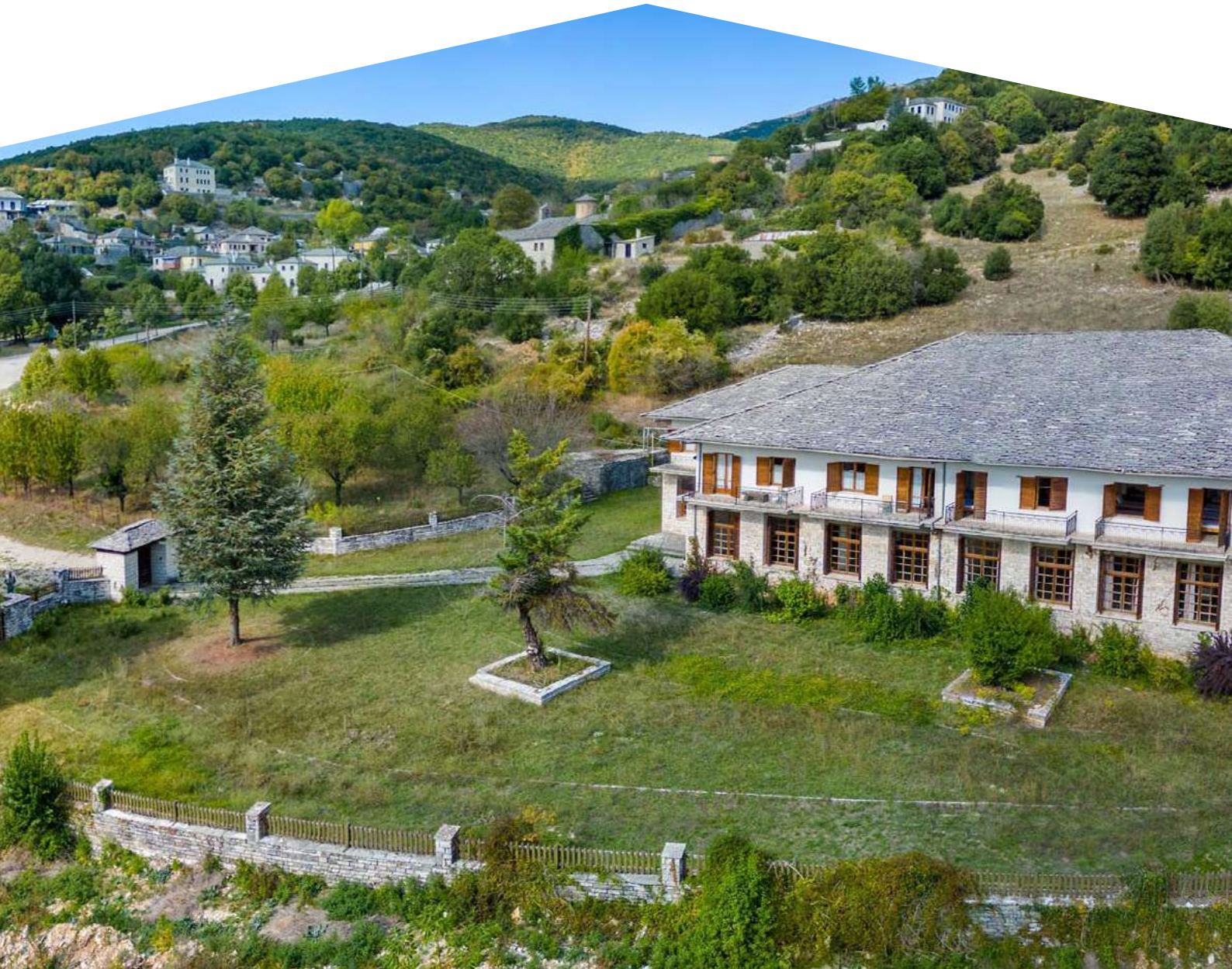
After collecting hundreds of scent samples and counting thousands of seeds over three seasons, we learnt a number of things about our study species. First, it turns out that Greek and Italian *A. alpina* smell quite differently (Fig. 4). Flowers from Italian plants emit a large proportion of the compound benzaldehyde. In contrast, the scent emitted from Greek plants is more mixed, with a few compounds making up most of the scent composition. This difference is large enough that even a human nose can tell the difference. We also noted that the pollinators were quite different in the two regions (Fig. 4) [2]. In Greece, flowers were often visited by bee-flies, a type of large fly (family Bombyliidae). In the Italian population, flowers received less visits by pollinators. From our analyses of the link between scent emission and seed production, we could see that in Italy, but not in Greece, plants that emitted more benzaldehyde produced more seeds.

By combining our results, we can make several conclusions. It is well known that different pollinators can be attracted to different floral scent compounds. Therefore, the pollinators, which were different in the Greek and Italian populations, may be responsible for generating the differences in floral scent. For example, if pollinators in the Italian (but not Greek) population are attracted to benzaldehyde, then natural selection may have favoured plants that emitted more of this compound in Italy. In this way, Greek and Italian *A. alpina* plants have eventually come to smell differently. On a general level, this shows how pollinators may affect the evolution of many different floral traits, generating the vast diversity of shapes, colours and scents we find among flowers in nature.

The value of a research station

The value of field stations for researchers working on ecology, evolution and conservation cannot be overstated. Often, this work needs to be performed in remote areas, close to nature, that may lack other lodging facilities or places where samples can be stored, experiments be performed, and researchers can meet. For our project, the PALASE field station has been invaluable (Fig. 5). Having access to a field station meant that we could efficiently do our work, even when working with a species of plant found only in remote mountain regions. We hope to return soon to the PALASE station and the wonderful nature of Zagori to continue our studies.

Figure 5
PALASE station, from the air, © C Zissis.



PALASE on the edge of the Ano Pedina plateau, © C Zissis

Hosting educational activities and events for the general public

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Actions to promote and protect the wild mushrooms of Zagori

Actions to promote and protect the wild mushrooms of Zagori

Thanasis Dinos

Figure 1
Bronze bolete (*Boletus aereus*), © G Konstantinidis.

The last twenty years have seen remarkable progress in mushroom knowledge and enthusiasm in Greece. Mycologists, researchers and many amateur mushroom lovers and mushroom societies, have recorded a multitude of species, thus highlighting the country as one of the important mushroom habitats in Europe.

In Greece, a wide variety of ecosystems, mainly Mediterranean, host thousands of species of fungi. Over 3,000 recorded species in 20,000 specimens are just the start of this ever-evolving effort to highlight the mycological wealth of Greece [1]. Zagori is very important for fungi and hosts about 700 recorded species[20]. However, since extensive areas of forest have not yet been explored, this number might exceed 5,000. The natural environment of Zagori, with its extensive forests of prickly and deciduous oaks, hornbeam, hazel, pine, beech and other species, as well as its pastures and meadows, contain many suitable places for fungi. In fact, Zagori is among the best places in the country for mushrooms. In addition, Zagori is one of the few places in Greece where the collection of wild native mushrooms for consumption was traditionally practised widely in the local community. Only 3-4 species were eaten, but these were identified with confidence and used in soups, pies and stir-fries.

The most important edible species in Zagori are as follows. In oak forests: boletes (*Boletus reticulatus* and *B. aereus*), chanterelles (*Cantharellus palens*), edible amanitas (*Amanita caesarea* and *A. rubescens*[21]), black trumpets (*Craterellus cornucopioides*),

20 G Konstantinidis, pers. commun.
21 Edible if well cooked.

Figure 2
Pale chanterelles (*Cantharellus palens*) in an oak forest in Zagori, © K Stara.

Figure 3
Parasol mushrooms (*Macrolepiota procera*) at a forest edge in Zagori, © K Stara.

ramarias (*Ramaria botrytis*), oyster mushrooms (*Pleurotus ostreatus*), russulas (*Russula aurea, R. cyanoxantha, R. virescens*) and wood hedgehogs (*Hydnum* spp.). In pine forests: milk caps (*Lactarius deliciosus*), forest agarics (*Agaricus silvicola*), pine-loving boletes (*Boletus pinicola*) and golden trumpets (*Craterellus lutescens*). In firs: milk caps (*Lactarius salmonicolor*) and different species of morels (*Morchella* spp). In meadows: agarics (*Agaricus* spp.), parasols (*Macrolepiota procera, M. mastoidea, M. excoriata, M. conradi*), fairy ring champignons (*Marasmius oreades*), king trumpet mushrooms (*Pleurotus eryngii*), St George's mushrooms (*Calocybe gambosa*) and ink caps (*Coprinus comatus*). In beech forests: boletes (*Boletus edulis*), wood hedgehogs (*Hydnum repandum*) and the March fungus (*Hygrophorus marjuolus*), (Figs 1-3 and Fig. 6d).

The Mushroom Association of Epirus (MAE) was founded in Ioannina in 2007. The MAE has been very active in the study and protection of mycoflora, organising a variety of events such as book presentations, scientific talks, photo exhibitions, media briefings, as well as events in schools and environmental education centres, all about the world of fungi. It also proceeds with the identification and recording of collected specimens in collaboration with

the Mushroom Association of Greece, especially with the association's president Giorgos Konstantinidis, a leading researcher of the Greek mycoflora. These activities have been contributing to the knowledge and protection of fungi as well as ensuring consumer health. The MAE additionally is participating in the cultural development of our region. Starting in 2009, it has co-organised, together with the municipalities of Epirus, 12 Epirus Mushroom Festivals at the national level, drawing a wide participation of visitors, including mycologists from Italy, Serbia and Bulgaria.

The collaboration between our association and the Department of Biological Applications and Technology (BET) of the University of Ioannina began when the MAE applied in 2013 to PALASE to organise the *Epirus Mushroom Festival* (Fig. 4). This celebration at Ano Pedina in Zagori quickly became the focus of mushroom lovers in Greece. The festive nature of the event combined with the information about fungi and the Environment (seminars, children's workshops and excursions to the forest), are some of the reasons for the great success of this event. This contributes to the aims of PALASE, both the hosting of the big mushroom festival of Epirus and also extending the station's environmental interests in fungi.

The Association's collaboration with PALASE and the University of Ioannina was sealed in 2013 with an excursion to the beautiful oak forests of Dilofo, a village in central Zagori, where students and teachers had the opportunity to come into contact with the magical world of fungi and the natural role of these still-poorly understood organisms (Fig. 5). The interaction of trees and other plants with mushrooms is unique and profound. The relationship, which is manifest from the level of individual trees all the way up to the biogeochemical cycles at the planetary level, can be seen and experienced in such educational excursions.

Zagori is considered a "mushroom friendly" area of Epirus, along with some others like Peta (near Arta). In the last 15-20 years, the image of Greece has changed radically, becoming more like other European mycophile countries, such as Italy, France and Spain. The establishment of mushroom associations (nine regional and one at the national level), the publication of books on mushrooms, the organisation of seminars and celebrations, and especially the appearance of respected mycological researchers, all attract much interest in Greece.

In April 2016, as part of the COST FP1203 project on Non-Wood Forest Products, the MAE co-organised a meeting with BET on the management of wild mushrooms, which highlighted challeng-

Figure 4
Some posters from the Epirus mushroom festival, which takes place every year in PALASE.

Figure 5
Members of the mushroom community, students and professors of the BET department in a joint visit to the oak forests of Zagori to collect and identify mushrooms in the field,
© Epirus Mushroom Association, 2013.

es for the collection and marketing of wild mushrooms in Epirus. The conclusions called attention, among other things, to how the highly prized early chanterelles were being collected by unskilled pickers and transported in plastic bags without any controls and then sold (or exported illegally) at basement prices [2]. Fortunately, in the last decade both small family businesses and larger operations have started to standardise processing and marketing of wild mushrooms in Greece as in many other countries. MAE also collaborated with BET on a programme called INCREdible. In June 2019, at the 11th Epirus Mushroom Festival in PALASE, participants from Mediterranean countries were hosted as part of a two-day interregional meeting where management and trade issues were discussed. In addition, in collaboration with the Forestry Department of Ioannina in November 2019, the first seminar on identification of edible mushrooms was held, which included theoretical training and practical training in the forests of Pogoni, where dozens of edible and poisonous mushroom species were collected and sorted. Finally, the event *Mushrooms and truffles: From the forest to the table* was held for the public of Ioannina in February 2020, also within the framework of INCREdible. The public had the opportunity to learn about the main types of underground mushrooms, as well as the discerning of edible and poisonous species in Greece (mainly Epirus) and to attend tasting courses with the support of the vocational training institute, IEK DELTA 360 (Fig.6).

While waiting for a national legislative framework on the management of wild mushrooms in Greece, I would like to congratulate the members of the BET Department of Ioannina University, who have shown in word and deed, that ordinary citizens like our Association can join educational institutions to produce important work, such as in the field of wild mushrooms.

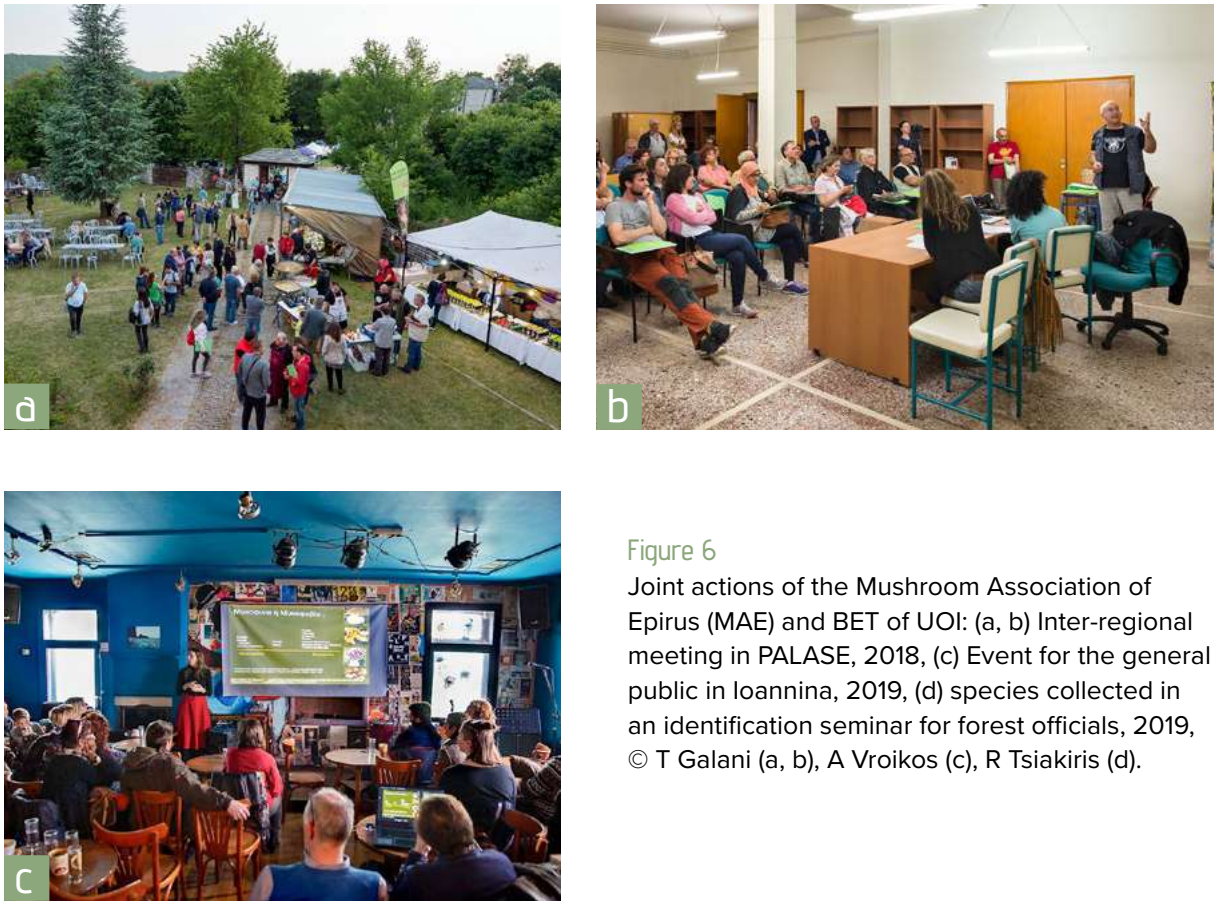

Figure 6
Joint actions of the Mushroom Association of Epirus (MAE) and BET of UOI: (a, b) Inter-regional meeting in PALASE, 2018, (c) Event for the general public in Ioannina, 2019, (d) species collected in an identification seminar for forest officials, 2019, © T Galani (a, b), A Vroikos (c), R Tsiakiris (d).

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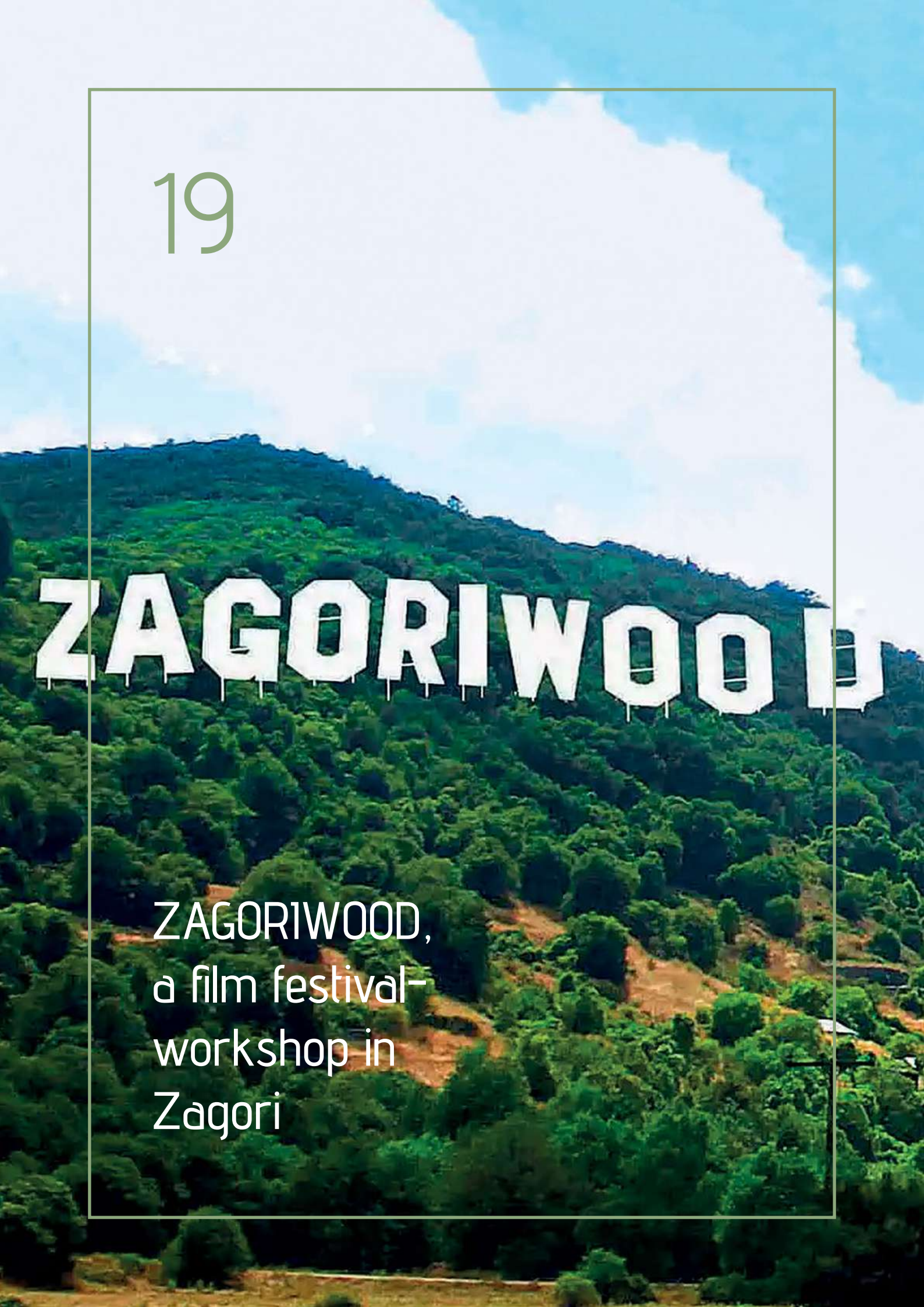

ZAGORIWOOD, a film festival-workshop in Zagori

Giorgos Makris

Figure 1
Graphic design illustration and logo (inset) for the festival-workshop.

Zagoriwood is a special film-festival and filmmaking workshop. It takes place every summer in the mountains of Epirus at about 1,000 metres in central Zagori in the village of Kato Pedina. Since 2010, the year of the first Zagoriwood, and every July since then, a group of friends and professionals of the field arrives in Kato Pedina and takes part in the screenings, the workshops, and the music and drama events that liven up the village (Fig. 1).

Creators of the contemporary film industry come to screen their work for the first time (as "works in progress") even before these works find their way into the international film festivals and cinemas. New filmmakers, on their first steps, come to delve into more advanced aspects of their art. Amateur film enthusiasts expand their knowledge and learn the complex language of filmmaking. Screenings cover a wide spectrum of audiovisual means of expression and a vast range of film genres. They are of a unique colour and rhythm, as the audience is made up not only of the workshop students, cinema-loving visitors and professional filmmakers, but also beekeepers, farmers and shepherds, villagers and university students from nearby Ioannina (Fig. 2).

Zagoriwood was developed on the basis of a philosophy of "1 person + 1 camera + 1 computer = a complete filmmaking unit". The work that is being done in the classes focuses more on practical applications, with theory just a starting point (Figs 3-4).

The teachers are all active film professionals: directors, scriptwriters, directors of photography, producers, filmmakers, producers, musicians etc. The combination of the above with a method developed over the 15 years of the festival's existence is so effective that about 50 short films (fiction and documentaries) have already been produced there.

Figure 2
Screening a film under the stars in the square of Kato Pedina,
© D Daras.

These are some of the workshops Zagoriwood offers: documentary, composing music for films, scriptwriting, sound as a storytelling tool, acting for the camera, from concept to film, animation as a tool for filmmaking, etc. Important for development are collaborations with organisations that are active in the region. The board of directors of PALASE and professor JM Halley in particular, as representative of the Department of Biological Applications and Technology of UOI supported Zagoriwood's "rooting" in the area, through a partnership that has lasted over a decade: a partnership of projects and laboratories that combine common aims of the two institutions and joint screenings of films of ecological interest such as Otto Bell's "The Eagle Huntress" and "Honeyland" by Tamara Kotevska and Ljubomir Stefanov, make up this special dialogue of Science and Art.

Figure 3
Theoretical courses in the old school of Kato Pedina,
© ZAGORIWOOD.

Figure 4
Filming on the plateau of Kato Pedina,
© ZAGORIWOOD.

The location in Zagori has played a decisive role in the development of the profile of Zagoriwood from the very first days. The aesthetics dictated by the landscape - together with the existing human interactions - defines a pattern that cannot be ignored and encourages the creation of a new model that wouldn't fit anywhere else. The activities of Zagoriwood are not limited to the classrooms of the old stone school (built in 1901) of Kato Pedina (Fig. 5). They are spread out in squares and fields, rivers but also in the nearby villages. The unique beauty of Zagori's nature offers to Zagoriwood a truly special breath, making participation in the festival an experience of a lifetime. Everyone who has experienced the frenzy of cinema during the days and nights of ZAGORIWOOD in the sweet breeze (and occasionally cold) of the Epirus mountains simply... craves for more! (Fig. 5).

Figure 5
Students and teachers at the entrance of the school of the Kato Pedina,
© ZAGORIWOOD.

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The project "Reappearances" in Aristi, Zagori

The project "Reappearances" in Aristi, Zagori

Ionas Sklavounos, Panagiotis Kostoulas, Grigoris Koutropoulos, Christoforos Theoharis and Faidon Moudopoulos-Athanasiou

The first summer of the coronavirus pandemic (2020) was one of the poorest for cultural events in Zagori, due to the health crisis and the restrictions imposed throughout the country. Among the few initiatives that took place in the region was the project "Reappearances. New Kalderimi (cobbled pathway) in Artsista, Zagori" [1], which took place in the village of Aristi from the 24th of August to the 13th of September (Fig. 1). "Reappearances" was organised by the research collective "Boulouki" and the Aristi Youth Club with the support of the Region of Epirus, the Greek Ministry of Culture and Sport and the Greek National Committee for UNESCO.

One of the main objectives was the involvement of the local community in the management of the public space and its active participation in the development. Through this process, the response of the community in taking ownership of the cultural heritage and the renewal of the heritage of the traditional settlement of Aristi could be observed. Here, the action focused on the people of Aristi: both permanent residents and members of the communal diaspora, originating in the village but living elsewhere in Greece and abroad. With the title "Reappearances", the intention was to involve those who retain family/kinship relations with Aristi and Zagori, and to explore the potential that seems to exist in such ties.

"Reappearances" was designed as a participatory workshop with the aim of restoring a forgotten cobbled pathway of Aristi, part of the network of kalderimia in the traditional settlement. The choice of designing the specific project resonates with the desire to recreate the network of pathways within the settlement, as a fundamental aspect of dwelling [2], while its broader goal was to highlight the dry-stone typologies of the traditional pathways, nowadays tending to disappear from the settlements of Zagori and Epirus.

Figure 1
Part of the cobblestone pathway, which was reconstructed during the participatory project "Reappearances"; snapshot from the work,
© E Mitropoulou, Boulouki 2020.

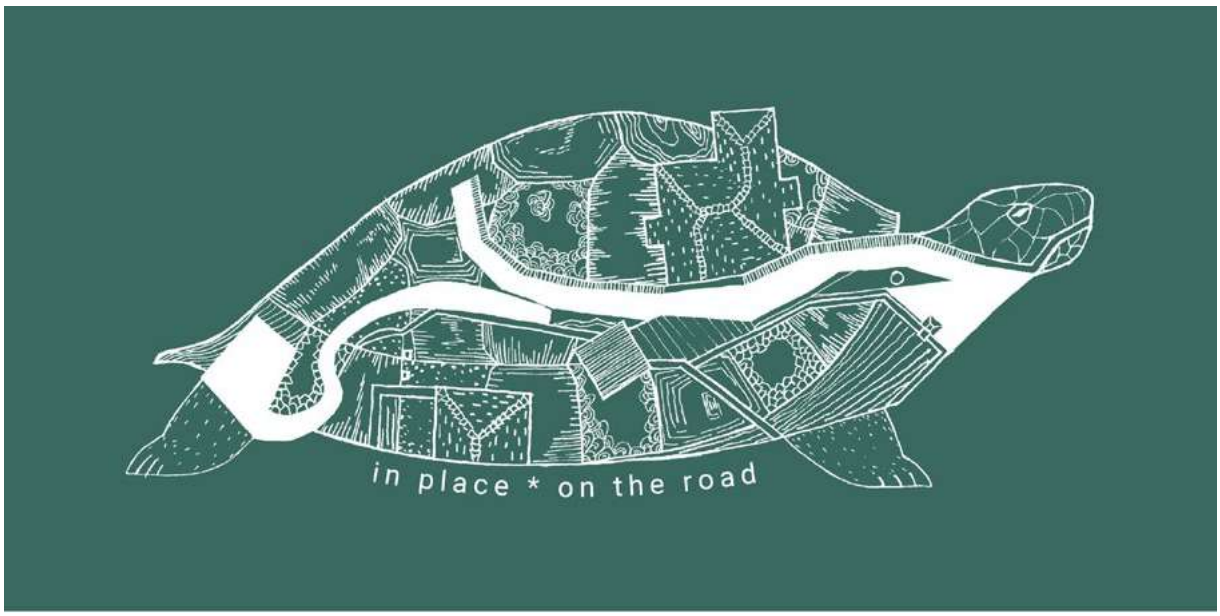

Figure 2
Commemorative card[22] with the logo of "Reappearances", © G Koutropoulos, Boulouki 2020.

During the workshop, twenty volunteers from Aristi and elsewhere in Greece or abroad, reconstructed the forgotten cobbled pathway (Fig. 2), the adjacent dry-stone retaining walls and a public fountain (Fig. 3). The participatory project was carried out under the guidance of four experienced craftsmen-trainers and three "apprentice" assistants, functioning at the same time as a hands-on workshop focusing on the art of dry-stone walling and cobblestone techniques (Fig. 4).

22 The card depicts the path of "Reappearances" as a dynamic relationship that develops between posture and movement within it. It was designed as one of the gifts in return for a token monetary contribution to the crowdfunding campaign of the "Reappearances" project in Aristi. https://chuffed.org/project/reappearances-new-kalderimi-in-artsista-zagori-nw-greece

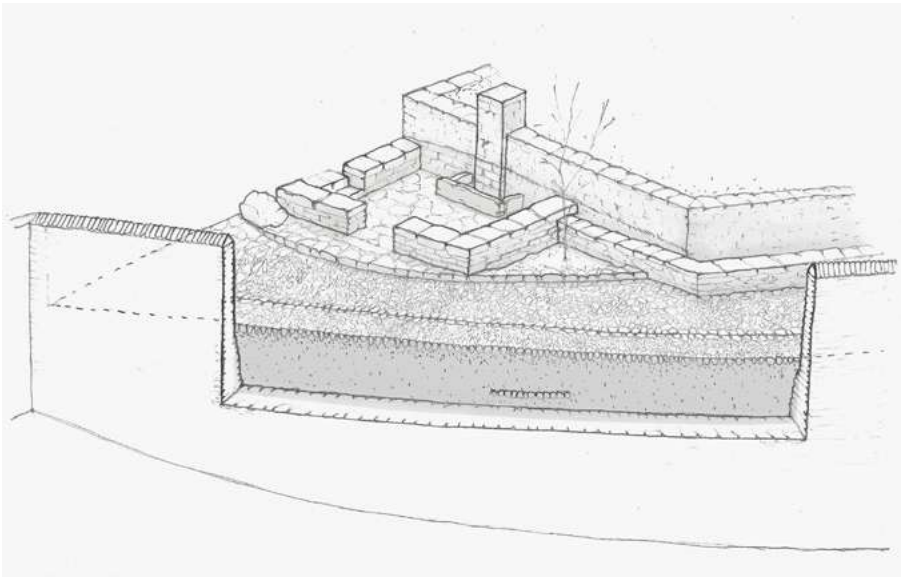

Figure 3
Axonometric drawing of part of the completed project of "Reappearances", © G Koutropoulos, Boulouki 2020.

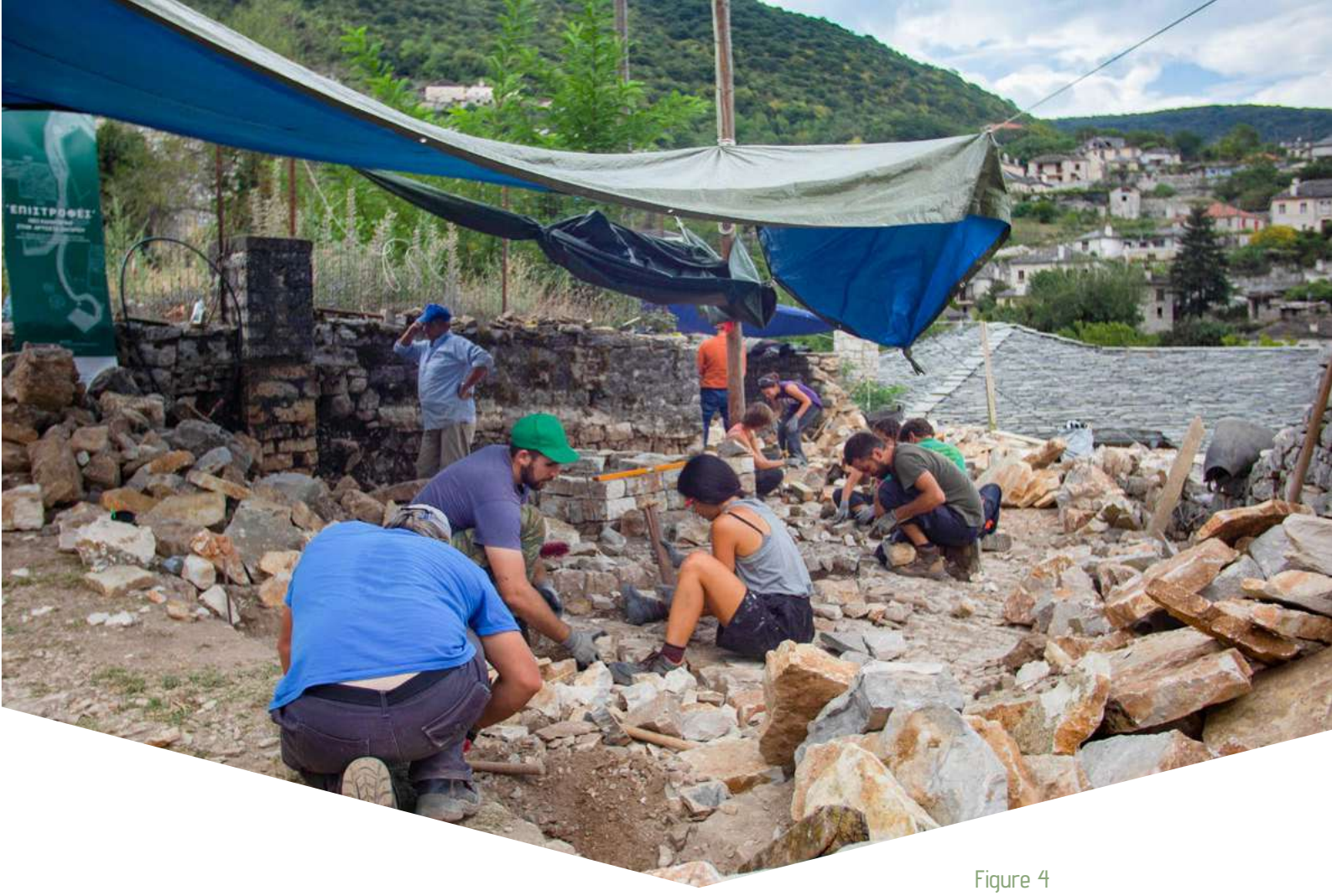

Figure 4
Snapshot from the work of the project “Reappearances” in Aristi,
© E Mitropoulou, Boulouki 2020.

The need for the participatory restoration and protection of cultural landscapes raises a series of questions of an institutional nature. While working on the restoration project we encountered two such issues: the necessity (and feasibility) of extracting local stone and the technical specifications for the well-known traditional dry-stone constructions. In an effort to highlight these issues, in the context of “Reappearances”, representatives from all relevant public agencies were invited to meet and discuss the issues in question. For this purpose, we organised two roundtables on Saturday the 5th of September 2020, under the theme “Cultural Landscapes and the Dry-stone technique”.

The first discussion, entitled “The use of local materials in cultural landscapes”, addressed the absence of stone quarrying activity in the wider area of Zagori and argued for preserving the identity of cultural landscapes through the use of local rather than imported building materials. A documented proposal was presented for the sustainable operation of a quarry in Zagori, while preserving the identity of the historical and natural landscape [3,4].

The second discussion, entitled "Institutional provisions for the preservation of the art of dry-stone masonry", the role of the State in the protection of dry-stone heritage was evaluated. Proposals were discussed, such as the operation of a professional school for the craft of traditional building with the aim of preserving the dry-stone heritage of the Greek countryside, as heritage - but mainly as a local craft. It was agreed that to ensure the quality of dry-stone constructions, specific additions and corrections to the relevant articles of the Descriptive Tariff of Construction Projects are necessary. Finally, gaps in the current institutional framework for the voluntary participation of citizens in public projects were identified and the prospects for reforming this framework through examples from other countries were discussed. Following the two discussions that took place in the context of the conference, two decrees of multilateral understanding were written[23], one for each roundtable, with the aim of serving as an occasion for further public debate as well as action plans for institutional reforms on the specific issues.

Figure 5
Snapshot from the discussions of the group with Vassilis Nitsiakos, professor at the University of Ioannina, in the courtyard of PALASE,
© E Mitropoulou, Boulouki 2020.

23 The two resolutions are uploaded on the website of Boulouki, https://el.boulouki.org/projects-reapperances (Retrieved: 30.11.2022). See also [6].

In the context of "Reappearances" we also organised a series of open activities and events. Among other things, two open discussions were held with invited scholars. One of these took place in the courtyard of the Labriadeios Research Station (PALASE) of the University of Ioannina at Ano Pedina, which also served as the main accommodation area for the craftsmen and apprentices of the project (Fig. 5).

At the end of the work, we organised a three-day event dedicated to the 80th anniversary of the battle of Grambala and included a visit to the sacred forest of Agia Paraskevi in Aristi [5] (Fig. 6), screenings of short films, a tour of the battle-ground and the peak of Grambala as well as a visit to the cemetery of the Italians soldiers.

Figure 6
In the forest of Agia Paraskevi in Aristi during an educational tour with Kalliopi Stara, © E Mitropoulou, Boulouki 2020.

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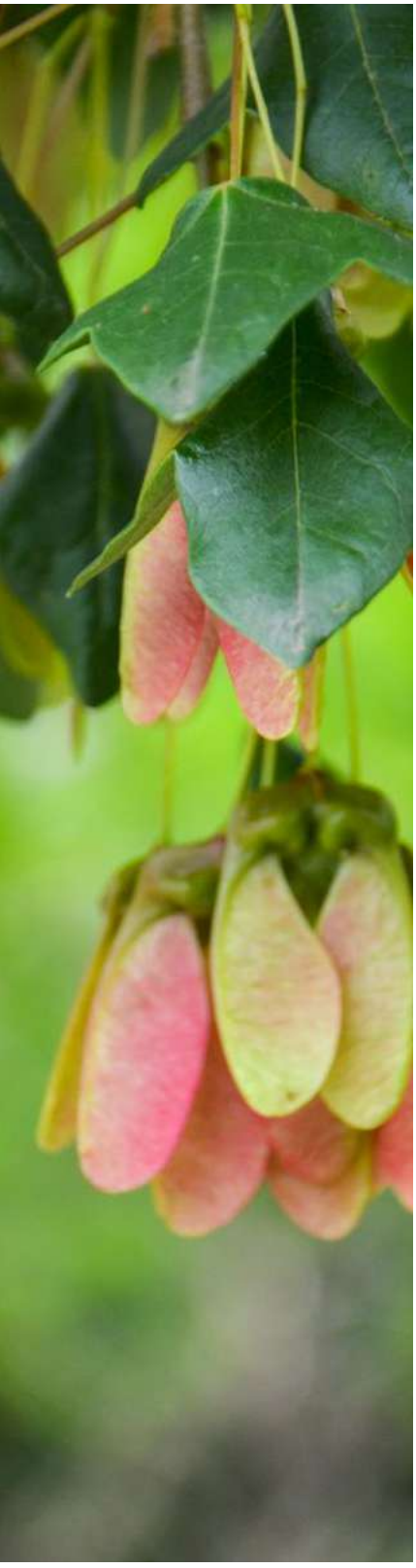

Montpellier maple *(Acer monspessulanum),* © K.Stara.

Chapter 1 University of Ioannina's Research Station (PALASE) completes 10 years of operation

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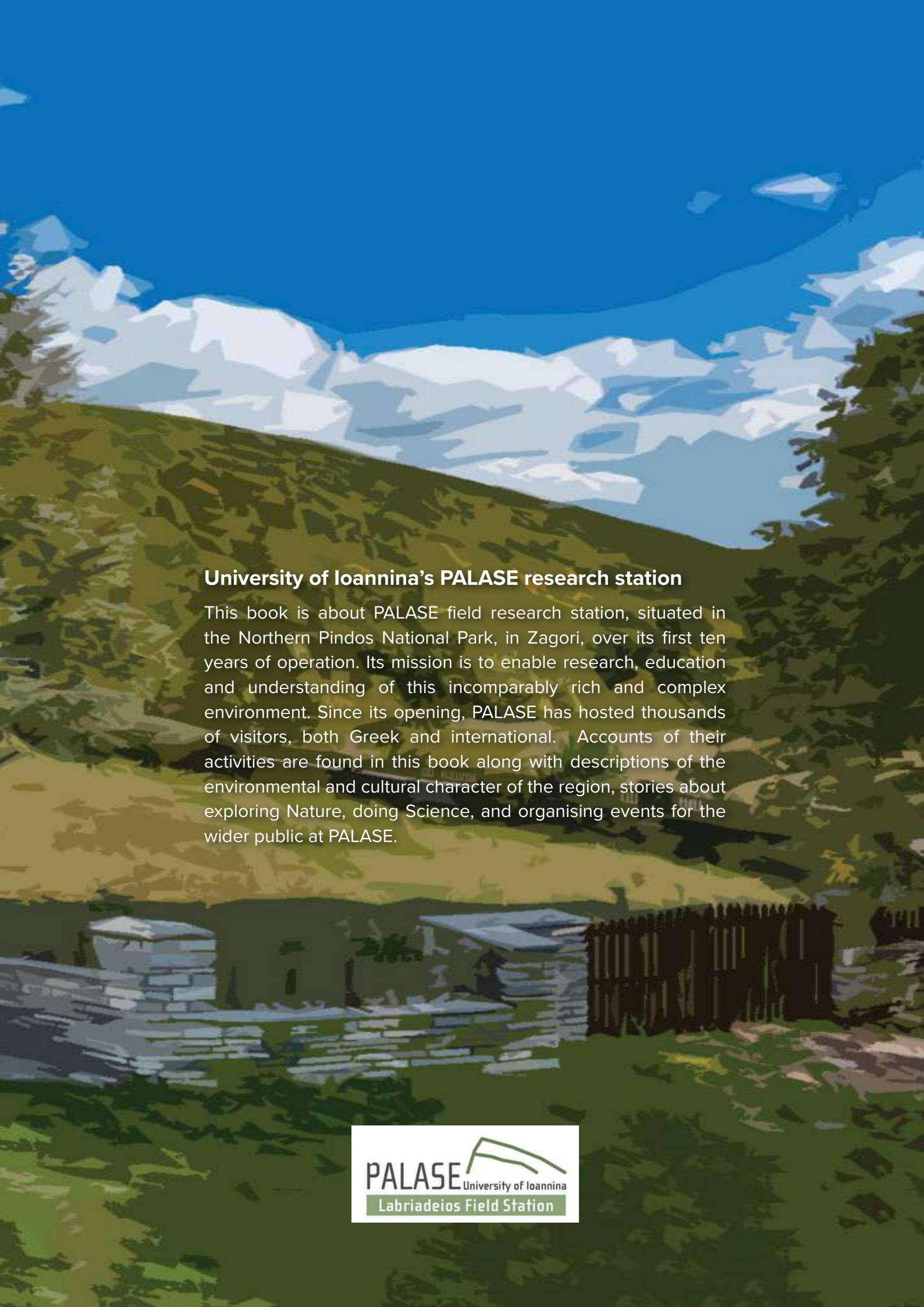

University of Ioannina's PALASE research station

This book is about PALASE field research station, situated in the Northern Pindos National Park, in Zagori, over its first ten years of operation. Its mission is to enable research, education and understanding of this incomparably rich and complex environment. Since its opening, PALASE has hosted thousands of visitors, both Greek and international. Accounts of their activities are found in this book along with descriptions of the environmental and cultural character of the region, stories about exploring Nature, doing Science, and organising events for the wider public at PALASE.

PALASE University of Ioannina
Labriadeios Field Station