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CONTENTS

LIFE08 NAT/GR/000539

INTRODUCING THE AmiBio TEAM

AmiBio Team

THE UNIVERSITY OF PATRAS, WIRE COMMUNICATIONS LABORATORY (WCL)

Wire Communication Laboratory at the University of Patras is the coordinator and the main contributor to the AmiBio project, providing the overall framework for acquisition, communication and processing of environmental and bioacoustic information from the target areas at Hymettus. The WCL participates in AmiBio through its Artificial Intelligence Group (AIG), which has proven expertise on speech and audio processing and machine learning technologies. The recent technological advances in automatic identification of species and detection of pests from their sound emissions, constitute the foundation for the development of an automated bioacoustics surveillance system in open-air environments, such as those at Hymettus. The AIG is an international team of Greek, Bulgarian, Romanian and English research staff, which has academic degrees in electrical engineering, computer science, physics and mathematics, with over than 350 scientific publications in both basic and applied research. The know-how in the area of Artificial Intelligence, and specifically on topics such as: Acoustic Biodiversity Monitoring, Sound Event Recognition, Rule Based Systems, Knowledge Representation, Search Methods, Machine Learning, Intelligent Human-Machine Interaction, are of great support for the development of autonomous technology for biodiversity monitoring, intelligent information filtering, and management of danger, emergency or crisis events.

THE TECHNOLOGICAL EDUCATIONAL INSTITUTE OF CRETE

The technology at the core of the AMIBIO project essentially is automatic processing of generalized audio signals. As the problem is an emerging one, new techniques need to be developed and tested extensively so as to evaluate the applicability of the proposed technique with respect to biodiversity assessment task. This comprises the basic responsibility of TEIC in the AMIBIO project. TEIC has established strong collaborative research links with a large number of European and international Universities, research institutes and industrial companies. Its mission includes Under- and Post-Graduate Education, LLL and RTD in Engineering/Informatics, Agriculture/Environment, Health/Welfare, Management/Economics, spanning 18 Undergraduate and 3 MSc Courses, with 17.500 students. Ca. 50 PhD students carry out their research at TEIC. Staff includes ca. 750 FTE for teaching/research, 210 clerical and 75 technical. Projects span information and communication technologies, anti-pollution materials, renewable energy sources, laser technologies for the production of clean energy, waste recycling, seismology and geophysics, acoustics, biotechnology and quality in agriculture and the environment, natural resources, sociological affairs, environmental pollution and remedies.

THE SPAY – ASSOCIATION FOR THE PROTECTION AND DEVELOPMENT OF HYMETTUS MOUNTAIN

SPAY is an association of the 15 municipalities that surround the mountain Hymettus of 81.000.000 sqm area. The scope of the association is to take action in protecting the mountain forest from fire and other dangers and to coordinate similar actions from the municipalities-members. Also to coordinate the actions of the volunteer organizations in the event of fire in assistance to the fire brigade. Major part of the association activities is the reforestation of the burned areas and the irrigation of the newly plants. Since the equilibrium of trees and animals living in the mountain is vital for the survival of the forest, the project is giving the opportunity to study the animal life on the mountain, in order to assist as to the measures to be taking for the protection of the forest.

THE ZFMK – ZOOLOGICAL RESEARCH MUSEUM ALEXANDER KOENIG, BONN

Automated acoustic monitoring of wild animal species at Hymettus would not be possible without a good knowledge of the biodiversity present there. Species have to be inventoried and recordings of their vocalizations have to be gathered, identified, tagged, and archived in order to calibrate the sound identification software. These tasks are the main responsibilities of the Zoological Research Museum A. Koenig (ZFMK, Bonn, Germany) in the AmiBio Project. Founded as a private research and exhibition institute by Alexander Koenig (1858-1940), it is one of the major natural history research museums in Germany and a member of the Leibniz Association (WGL). The museum has earned its reputation as a leader in the documentation, research, and interpretation of biodiversity. Its scientific collections comprise an estimated 350,000 specimens of vertebrates (80,000 mammals; 136,700 birds; 40,000 fishes; more than 77,000 reptiles and amphibians) and several million specimens of insects. These collections form the basis for the diversity of research conducted by the museum. The national and international significance of the institution's research, and hence its trend-setting work, conforms to national interests. The museum maintains 49 permanent positions (14 of which are held by scientists), as well as 130 additional employees (comprising 15 researchers in externally funded projects, 100 doctoral, masters, and undergraduate students, and 15 volunteers). The ZFMK is promoting biodiversity conservation by combining technological innovation with expertise in species identification.

Protecting Hymettus

Fig. On site panel

In February 2010, we started with excitement the implementation of the AmiBio project, which is a 41-months effort aiming at the preservation of the biodiversity of species at Hymettus, co-funded by the LIFE+ Unit at the EC and the consortium of beneficiaries from Greece and Germany involved in the project.

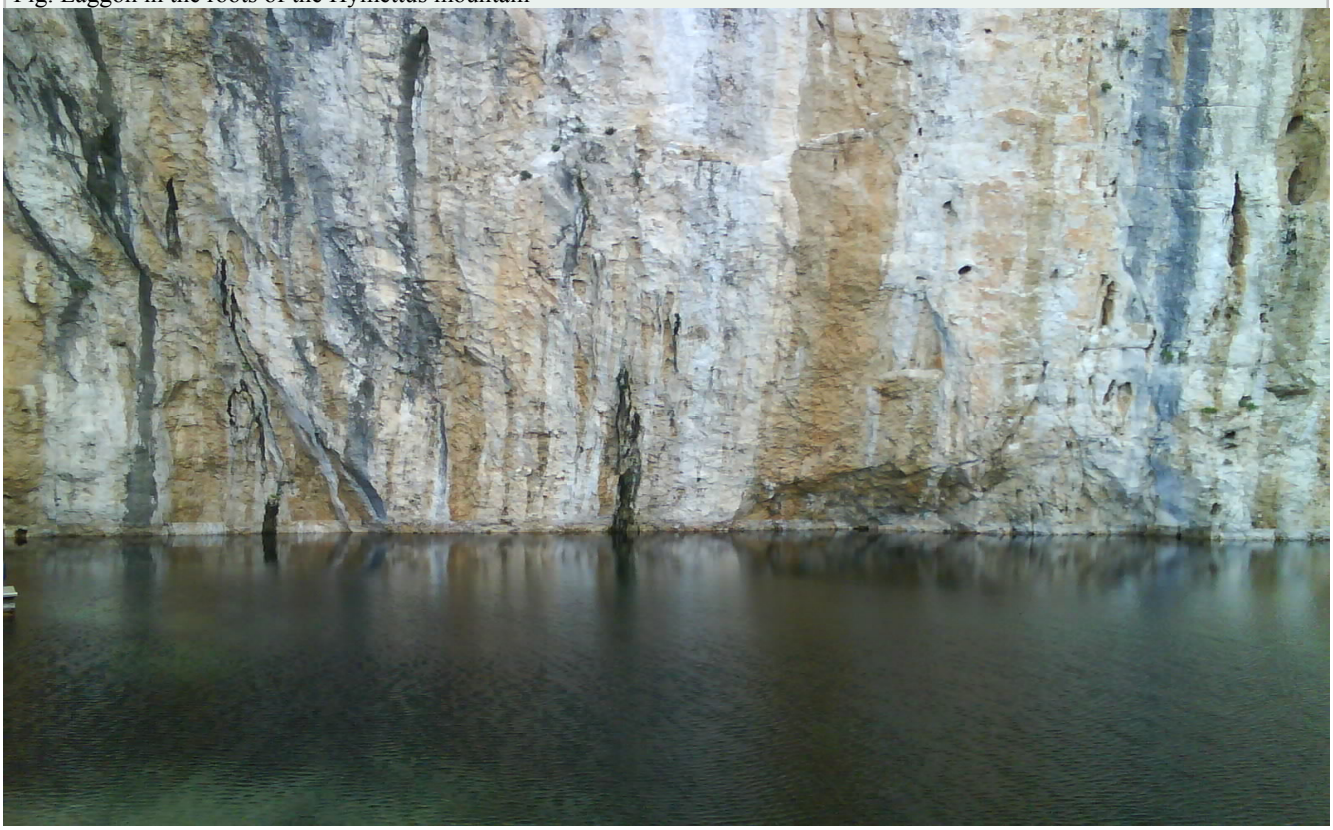
At present (Autumn 2010) we are proud to report significant progress of work and successful completion of a number of AmiBio preparatory actions. These actions were aimed at studying the existing species and the areas of primary interest and at establishing a solid ground for the technology development activities, which will start in the beginning of year 2011.

Among the major achievements of this first phase of the project is the successful completion of the biodiversity assessment at Hymettus and the collection of genuine acoustic emissions from most of the species active during late spring, summer and autumn. The supervised data recording efforts continue, and we are planning the next campaigns which will cover the species which are acoustically active during the winter and the early spring.

During the second phase of the project, which will be lasting between January 2011 and April 2012, these data will be analysed and used in a multi-fold manner: (i) depending on the characteristics of the various bioacoustic emissions we will identify the technological requirements for the permanent autonomous data collection stations, (ii) utilise the data in the development of acoustic models for the species of interest, (iii) develop a comprehensive reference library of sounds and species data needed for automatic monitoring and statistical analysis of trends for the primary areas of interest.

Besides, our efforts reached far beyond the broad range of technological goals agreed in the AmiBio contract and we were in the position to define the baseline information for a future conservation plan and preserving the biodiversity at Hymettus (details on page 4).

Fig. Laggon in the roots of the Hymettus mountain



Putting Biodiversity Data at Work – AmiBio Provides Baseline Information for a Future Hymettus Conservation Plan

by O. Jahn, K. Riede, G. Lehmann, U. Marckmann, K.-L. Schuchmann, and A. Weller

The development of a widely accepted conservation plan and its effective implementation in the management practice must be based on a participative stakeholder process, including expert assessments, public hearings, and broad media coverage. Relevant international and national laws, conventions, and initiatives have to be considered and weighted against the needs and interests of particular stakeholder groups affecting the Hymettus Mountains in one or the other way. Evidently, this task would be far beyond the scope of our AmiBio Life+ Project. However, thanks to the biological inventories of sound-emitting animals meant to prepare the ground for the implementation of an automated remote monitoring scheme at Hymettus (see AmiBio Newsletter July 2010) we were able to provide biodiversity-related baseline information for a future conservation plan. The report summarizes the work and achievements of the biological inventories, determines the micro-sites for the monitoring stations, and identifies the conservation needs of the study area.

Regarding the acoustically active species, 22 Orthoptera, 3 cicada, 1 amphibian, 116 bird, 7 bat, and at least 8 non-chiropteran mammal species are known to occur at Hymettus. Furthermore, 11 reptile species were reported, all of which rarely emit identifiable sounds. Unfortunately, the information on the ecological requirements and status of Greek insects is insufficient to allow conservation-related interpretations. However, the situation is much better for the vertebrates. Excluding the non-breeding visitors among the birds, Hermann's Tortoise *Testudo hermanni*, European Rabbit *Oryctolagus cuniculus*, Common Bent-wing Bat *Miniopterus schreibersii* are Near Threatened and the Lesser Kestrel *Falco naumanni* Vulnerable at the global level (IUCN 2010). On the regional level of the European Community 16 non-bird vertebrates are regarded in need of strict protection under the FFH Directive, among them 1 amphibian, 8 reptile, and 7 bat species (EC 1992, Annex IV). Of these species, European Ratsnake *Zamenis situla*, Hermann's Tortoise *Testudo hermanni*, Marginated Tortoise *Testudo marginata*, Common Bent-wing Bat *Miniopterus schreibersii*, Lesser Horseshoe Bat *Rhinolophus hipposideros*, and Blasius's Horseshoe Bat *Rhinolophus blasii* require the designation of special areas of conservation as additional measure (EC 1992, Annex II). Furthermore, 21 bird species are listed in Annex 1 of the Bird Directive (EC 2010), and thus depend on the protection of certain habitats (special protection areas). Of the latter group, 9 species are breeding at Hymettus, whereas 12 are non-breeding visitors.

Of particular relevance for the design of habitat management measures is the fact that most animal species of conservation concern inhabit open and semi-open habitats rather than forests and woodland. For instance, the only amphibian species known to occur at Hymettus, the European Green Toad *Pseudepidalea viridis*, prefers semi-open, often disturbed, habitats over continuous forests. Likewise, the reptiles listed in Annex IV of the FFH directive live in habitats like calcareous rocky slopes, phrygana, maquis, and at forest edges but avoid dense continuous forests. In the case of birds, 15 species (71%) listed in Annex I of the Bird Directive live in open and semi-open habitats while only four are forest-dwellers (19%). In contrast, bats are extremely selective regarding their roost sites (e.g., crevices in rocky slopes or buildings, caves, and tree cavities) but opportunistic regarding their feeding habitat. However, it must be emphasized that pine forest is not well suited as bat feeding habitat, in difference to broadleaved forests that are used by many bat species.

Considering the aforementioned habitat requirements of threatened and otherwise sensitive species, we recommend the following preliminary measures for optimizing habitat management and reforestation efforts:

- Reforestation campaigns should be planned on the basis of ecological studies, considering the habitat requirements of endemic and threatened plant and animal species as well as the soils and hydrology of the sites.
- Where appropriate, only native tree and shrub species should be planted.
- Mixed forests of broadleaved and coniferous trees rather than monocultures of pines should be promoted.
- Trees should be planted in patches interspersed with open and semi-open (e.g., heath-like) habitats rather than in continuous forest stands to lower the risk of wildfires.
- Non-native plant species should be eliminated, with the exception of areas with a park-like character, such as parts of the Kaisariani Aesthetic Forest.
- Invasive plant species have to be controlled on the basis of an Action Plan.
- Hunting should be banned at Hymettus, not only to promote the recovery of larger mammals and birds but also to avoid accidents.
- Climbing activities in the numerous rocky cliffs of Hymettus have to be regulated to avoid adverse impacts on cliff-inhabiting birds, bats, and plants.
- Motor-biking activities should be allowed only in designated areas.
- Trails leading to caves with breeding and wintering bat populations should be displaced. Signs with information on restrictions should be placed at the cave entrances.
- Caves with breeding bats should be closed to visitors all year.
- Caves with wintering bats should be closed to visitors from October through April.
- Important roosts have to be locked with physical protection measures, such as grilles and fences.
- Vegetation growth in the entrances of caves has to be controlled in order to allow bats to get in and out of the caves; likewise, reforestation activities should be avoided in front of the entrances.

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