



**Research, Assessment, and
Development of Documents
on Biodiversity, the Impact
of Climate Change on
Biodiversity, Habitat
Restoration, and Long-Term
Habitat Management**



Field Research on Biodiversity

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**Empowering
Environmental Civil Society
Organizations
in Kosovo**



EXECUTIVE SUMMARY

This project “Research, assessment, and development of documents on biodiversity, the impact of climate change on biodiversity, habitat restoration, and long-term habitat management” offers an interdisciplinary approach by integrating spatial planning, legal frameworks, and ecological expertise alongside qualitative, scientific analysis. By combining knowledge from various fields, the aim is to create a comprehensive understanding of biodiversity challenges. The project emphasizes the importance of collaboration among environmental science, policy, and spatial design, creating a foundation for adaptive management strategies informed by both ecological data and spatial dynamics. This ensures that future actions are grounded in a well-informed, comprehensive perspective.

The project aims to identify and map key biodiversity areas at risk, focusing on Prizren, Suharekë, and the Sharr Mountains. Through field assessments, GIS data, spatial maps, spatial ecology analyses, and existing management plan reviews, critical habitats will be identified. These will be compared with historical and current climate patterns to predict future ecological changes and assess the impact of climate variability on biodiversity. Additionally, the project will evaluate the need for habitat restoration, documenting both the ecological and social benefits of restoration efforts.

This report focuses on aquatic insects as key biodiversity actors whose ecological roles and sensitivities make them valuable indicators of freshwater ecosystem health. Their study offers a concrete entry point into broader biodiversity dynamics. These findings complement spatial and climate analyses in other phases and lay the groundwork for resilience-based habitat restoration strategies.

BACKGROUND

1

Kosovo's freshwater and terrestrial ecosystems are under increasing pressure from climate change, land-use transformation, and fragmented or insufficient conservation frameworks. These pressures are particularly acute in ecologically sensitive zones such as cold-water springs, head-water creeks, riparian corridors, and upland forest buffers, where biodiversity plays a critical role in maintaining ecological stability. Despite their importance, these habitats remain understudied, and their biodiversity is poorly documented and monitored.

Freshwater macroinvertebrates—especially aquatic insects—are among the most sensitive indicators of ecological integrity. Their presence, abundance, and diversity reflect the condition of both aquatic and surrounding terrestrial environments, making them invaluable for detecting early signs of ecological stress. In Kosovo, data on these taxa remain sparse, and existing conservation planning does not fully account for rare or endemic species with narrow ecological tolerances.

This project was initiated to address these knowledge gaps by identifying, documenting, and supporting the protection and restoration of critical biodiversity hotspots. It integrates ecological survey data with spatial analysis, climate risk assessment, and policy review in order to inform adaptive conservation strategies. By connecting field-based evidence to broader spatial and policy contexts, it aims to highlight both the ecological value of these systems and the urgent need for targeted, habitat-specific conservation measures.

INTRODUCTION

2

This report presents the results of field surveys and laboratory identifications of aquatic insect communities across multiple freshwater habitats in Kosovo. Surveys targeted sites representing different habitat types—rivers, streams, small creeks, cold springs—and included both high-altitude and lowland systems. Each site was selected to capture variation in riparian structure, thermal regime, and human disturbance.

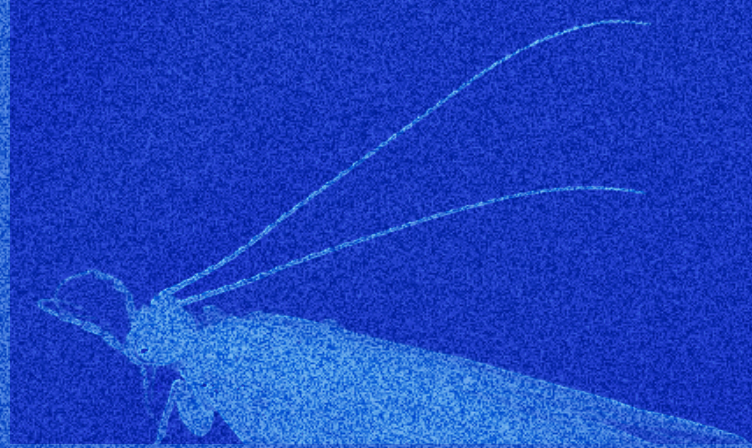
Species were identified to the lowest reliable taxonomic level and assessed in relation to habitat characteristics and ecological function. The findings reveal the presence of rare, endemic, and thermally restricted species such as *Drusus sharrensis*, *Notidobia vaillanti*, *Rhyacophila sarplana*, *Rhyacophila obtusa*, and *Chaetopteryx stankovici*, many of which are confined to low-temperature spring areas with narrow ecological tolerances. These taxa exhibit low dispersal ability, small population sizes, and high habitat specificity, making them particularly susceptible to environmental change.

By linking biodiversity patterns to habitat condition, the study identifies key threats including climate change, riparian habitat degradation, deforestation, water extraction, and pollution. The results show that conservation strategies must extend beyond aquatic channels to encompass adjacent riparian and terrestrial habitats, which play essential roles in providing shelter, maintaining microclimatic stability, and enabling dispersal.

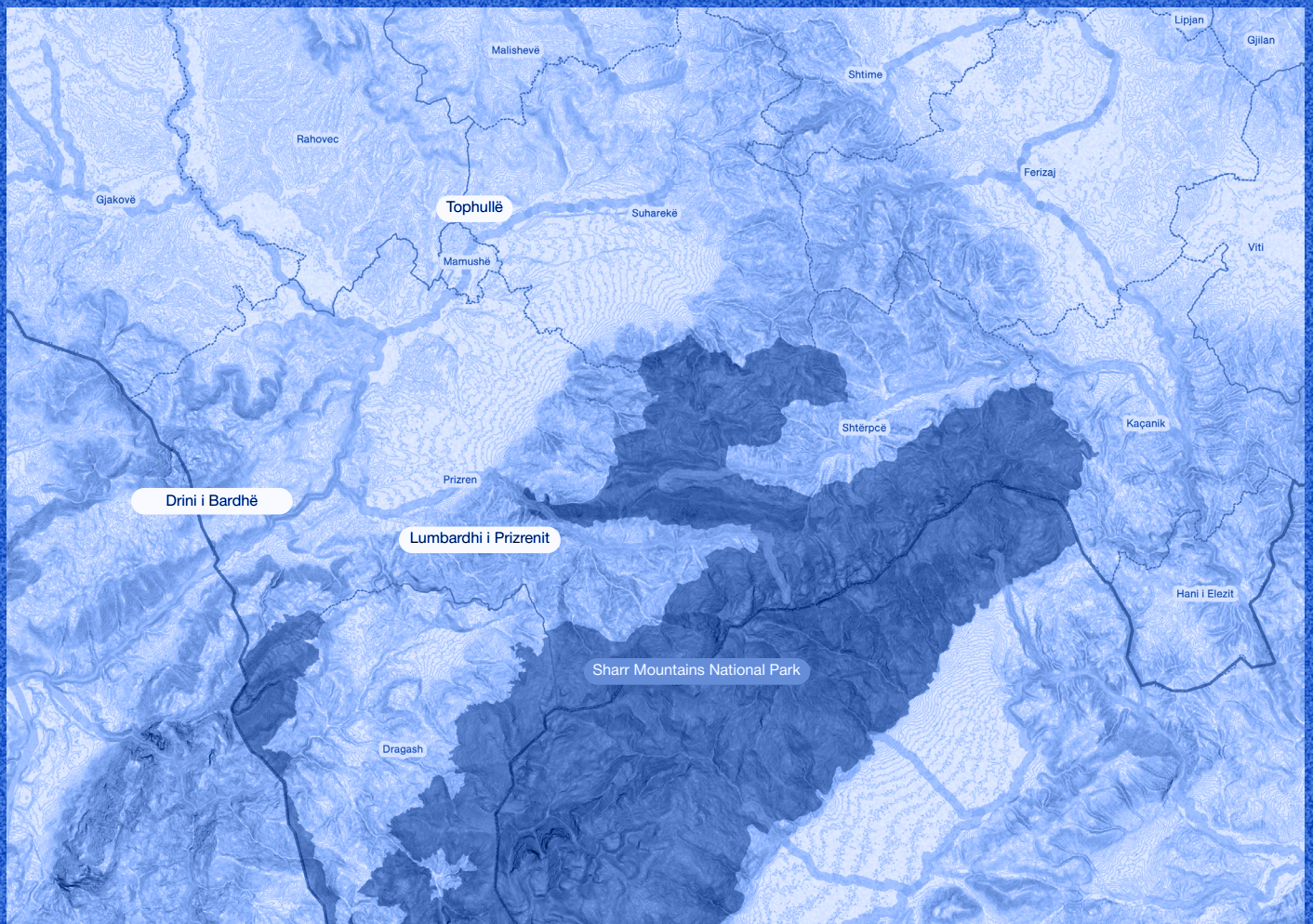
The documentation of new national records, such as *Limnephilus extricatus*, further emphasizes that Kosovo's freshwater biodiversity remains incompletely understood and that continued survey and monitoring efforts are essential. Ultimately, this study provides both a scientific foundation for conservation action and a call to protect and restore critical freshwater habitats—inside and outside formally designated protected areas.

OBJECTIVES OF FIELDWORK

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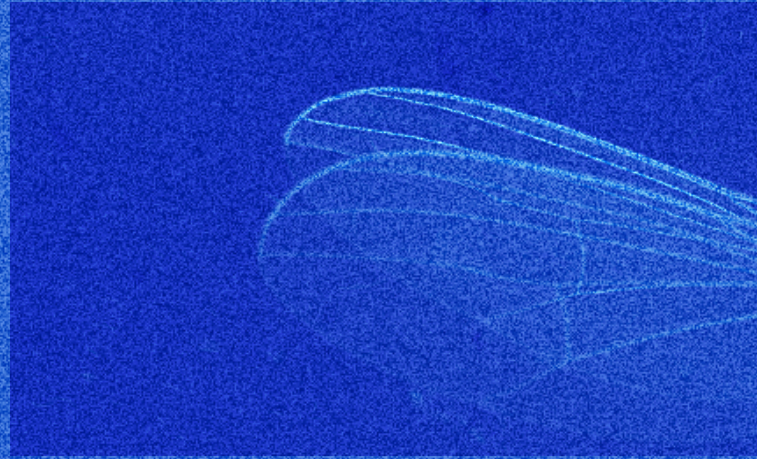
THE FIELDWORK BUILDS A SPATIALLY EXPLICIT BASELINE FOR KOSOVO'S FRESHWATER BIODIVERSITY BY COMBINING NEW, STANDARDIZED SURVEYS WITH HISTORICAL SOURCES ACROSS PRIORITY SITES IN PRIZREN, SUHAREKË, AND THE SHARR MOUNTAINS. IT CENTERS ON AQUATIC INSECTS (EPT TAXA) BECAUSE THEIR LIFE CYCLES BRIDGE WATER AND LAND, MAKING THEM SENSITIVE, EARLY-WARNING INDICATORS OF POLLUTION, HYDROLOGICAL CHANGE, TEMPERATURE SHIFTS, AND HABITAT FRAGMENTATION WHILE ALSO UNDERPINNING NUTRIENT CYCLING AND FOOD WEBS. BY RECORDING SPECIES IDENTITY, ABUNDANCE, AND HABITAT CONDITIONS, THE STUDY DETECTS SUBTLE SHIFTS IN COMMUNITY STRUCTURE BEFORE VISIBLE ECOSYSTEM DECLINE. CRITICALLY, IT COMPARES PROTECTED AND NON-PROTECTED AREAS TO TEST HOW WELL FORMAL PROTECTION WORKS, REVEAL ECOLOGICAL BLIND SPOTS, AND PINPOINT HIGH-RETURN RESTORATION OPPORTUNITIES. TOGETHER, THESE OBJECTIVES SUPPORT ADAPTIVE MANAGEMENT—PRIORITIZING RIPARIAN PROTECTION, CONNECTIVITY, AND TARGETED RESTORATION TO STRENGTHEN LONG-TERM ECOSYSTEM RESILIENCE.



Map of the study area, focusing on Sharri Mountains National Park and the surrounding landscape, including key river systems such as the Drini i Bardhë, Lumbardhi i Prizrenit, and Toplluha, in proximity to the settlements of Prizren and Suharekë.

METHODOLOGY

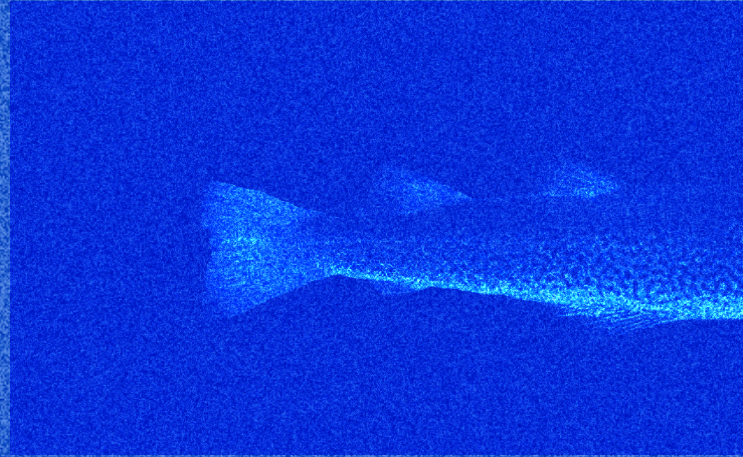
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THE APPROACH USED FOR COLLECTING AND ANALYZING DATA ON FRESHWATER BIODIVERSITY IN KOSOVO COMBINES NEW FIELD OBSERVATIONS WITH HISTORICAL DATA, FOCUSING ON THE RIVERS AND MOUNTAIN AREAS OF PRIZREN, SUHAREKA, AND THE SHARR MOUNTAINS. METHODS INCLUDE SAMPLING AQUATIC INSECTS (THE EPT GROUPS – EPHEMEROPTERA, PLECOPTERA, TRICHOPTERA) AS KEY INDICATORS OF ECOLOGICAL QUALITY, THE USE OF SPATIAL TECHNOLOGIES FOR MAPPING AND DOCUMENTATION, AND THE STANDARDIZATION OF PROCEDURES TO ENSURE COMPARABILITY AND RELIABILITY OF RESULTS.

SPECIES OF INTEREST AND THEIR IMPORTANCE

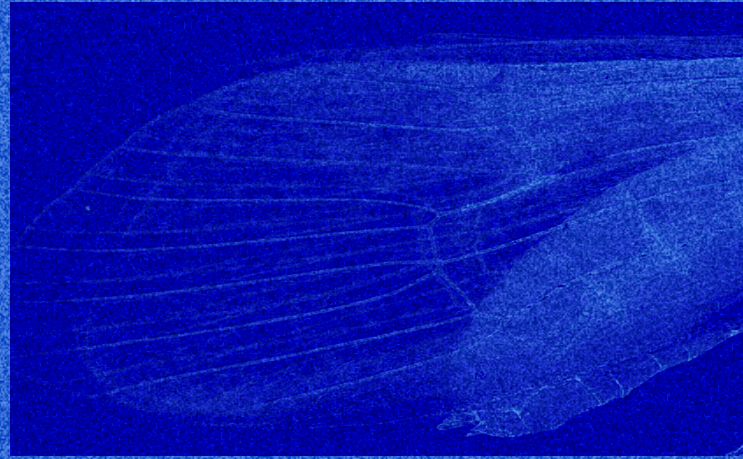
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THE SELECTION OF STUDY AREAS WAS MADE IN THREE REGIONS WITH DIFFERENT ECOLOGICAL CONDITIONS, ENABLING COMPARISONS BETWEEN PROTECTED AND NON-PROTECTED HABITATS, AS WELL AS BETWEEN FORESTED AND NON-FORESTED ZONES. THE METHODS USED INCLUDED STANDARDIZED TECHNIQUES FOR COLLECTING AQUATIC INSECTS, SUCH AS UV LIGHT TRAPS AND ENTOMOLOGICAL NETS, COMBINED WITH LARVAL AND MACROINVERTEBRATE SAMPLING USING A D-NET. SAMPLES WERE IDENTIFIED AT THE TAXONOMIC LEVEL USING REGIONAL KEYS AND SCIENTIFIC LITERATURE, WHILE THE DATA WERE CROSS-CHECKED WITH EXISTING DATABASES FOR VERIFICATION. THE FOCUS WAS ON INDICATOR TAXA SENSITIVE TO POLLUTION AND CLIMATE CHANGE (EPT), ALLOWING THE ASSESSMENT OF ECOLOGICAL STATUS AND THE ESTABLISHMENT OF BASELINES FOR LONG-TERM MONITORING AND FRESHWATER HABITAT CONSERVATION.

STUDY IN PROTECTED AND NON-PROTECTED AREA

6



THE STUDY WAS CARRIED OUT IN BOTH PROTECTED AND NON-PROTECTED AREAS TO ASSESS BIODIVERSITY CONDITIONS UNDER DIFFERENT ECOLOGICAL PRESSURES AND LAND-USE REGIMES. PROTECTED AREAS, SUCH AS THE SHARR MOUNTAINS, REVEALED SHRINKING HABITATS FOR SPECIALIZED AQUATIC INSECTS DUE TO CLIMATE CHANGE, WITH SOME SPECIES BEGINNING TO SHIFT THEIR RANGES. THESE AREAS PROVIDE VALUABLE MODELS FOR RESTORATION STRATEGIES, AS THEY STILL MAINTAIN SUITABLE CONDITIONS FOR SENSITIVE TAXA. IN CONTRAST, NON-PROTECTED AREAS OFFERED INSIGHTS INTO ECOLOGICAL TRANSITIONS AND RESTORATION POTENTIAL, HIGHLIGHTING OPPORTUNITIES TO CREATE CONNECTIVITY AND NEW REFUGES FOR VULNERABLE SPECIES UNDER CLIMATE STRESS.

CHALLENGES AND GAPS

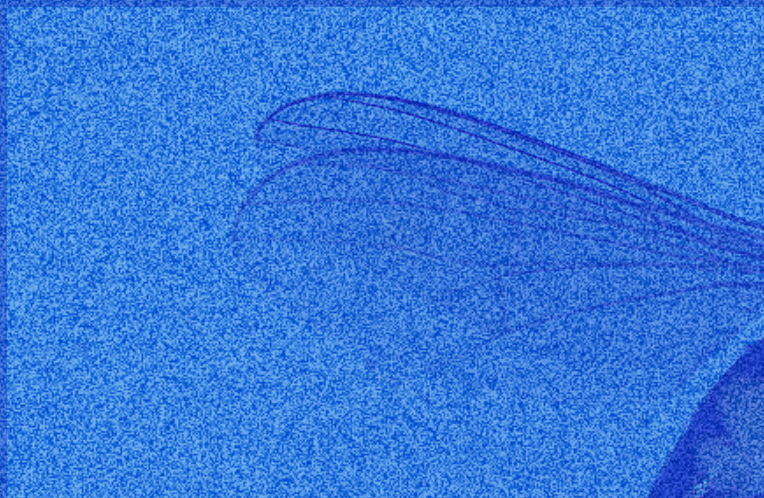
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THE MAIN CHALLENGES AND GAPS IN STUDYING AQUATIC INSECTS IN KOSOVO STEM FROM THE LACK OF BASELINE DATA AND CONTINUOUS MONITORING, SEASONAL DIFFICULTIES IN SAMPLING, SHORTAGE OF TRAINED SPECIALISTS, AND ABSENCE OF DETAILED SPATIAL BIODIVERSITY INFORMATION. AQUATIC INSECTS REMAIN ONE OF THE LEAST STUDIED GROUPS IN THE REGION, WITH EXISTING RECORDS FRAGMENTED AND GEOGRAPHICALLY LIMITED, HINDERING NATIONAL BIODIVERSITY ASSESSMENTS AND CONSERVATION POLICIES. THIS STUDY ADDRESSES THESE SHORTCOMINGS BY GENERATING NEW, SPATIALLY DISTRIBUTED DATA, PROVIDING A FOUNDATION FOR REGIONAL COMPARISONS, TREND ANALYSIS, AND THE DEVELOPMENT OF FUTURE CONSERVATION AND RESTORATION STRATEGIES.

SURVEY AND LABORATORY FINDINGS

8



THE RESULTS OF THE STUDY SHOW THAT AQUATIC INSECTS (PARTICULARLY EPT GROUPS) SERVE AS CLEAR INDICATORS OF THE ECOLOGICAL STATUS OF FRESHWATER HABITATS IN KOSOVO, REVEALING CONTRASTS BETWEEN PROTECTED AND NON-PROTECTED AREAS AS WELL AS BETWEEN FORESTED AND NON-FORESTED HABITATS. SENSITIVE SPECIES WERE MOSTLY RECORDED IN WELL-PRESERVED SITES, WHILE DEGRADED AREAS EXHIBITED FRAGMENTED COMMUNITIES AND LOWER DIVERSITY. THESE FINDINGS CONFIRM THE ROLE OF AQUATIC INSECTS AS BIOINDICATORS AND HIGHLIGHT THE NEED FOR LONG-TERM MONITORING AND RESTORATION MEASURES TO STRENGTHEN ECOSYSTEM RESILIENCE UNDER CLIMATIC AND ANTHROPOGENIC PRESSURES.

CONCLUSIONS

9



THIS FIELDWORK REPRESENTS ONE OF THE FIRST SYSTEMATIC EFFORTS TO DOCUMENT AQUATIC INSECT BIODIVERSITY IN KOSOVO ACROSS BOTH PROTECTED AND NON-PROTECTED FRESHWATER ZONES. THE STUDY HAS GENERATED A PRELIMINARY SPECIES LIST, WITH PARTICULAR ATTENTION TO ECOLOGICALLY SENSITIVE TAXA, AND HAS BEGUN MAPPING THEIR SPATIAL DISTRIBUTION. EARLY FINDINGS SUGGEST A CLEAR DIFFERENCE IN BOTH DIVERSITY AND ABUNDANCE BETWEEN THE SHARR MOUNTAINS PROTECTED SITE AND THE NON-PROTECTED ZONE NEAR PRIZREN, REINFORCING THE ECOLOGICAL VALUE OF HABITAT PROTECTION AND THE POTENTIAL FOR TARGETED RESTORATION

About EC

EC Ma Ndryshe is a community-based organization, established in 2006, committed to sustainable development through an inclusive approach.

EC's activism envisions a Kosovo where democratic governance is participatory, transparent, and accountable, ensuring that institutions, communities, and stakeholders work together towards sustainable development.

This vision promotes inclusive decision-making, stronger policies, and greater public participation, ensuring that sustainability is an integral part of governance at both local and national levels.

Through better institutional coordination, evidence-based policymaking, and citizen engagement, EC's work aims to bridge the gap between communities and institutions, ensuring that good governance leads to tangible and lasting change.

Vision statement

"Empowering a resilient and inclusive Kosovo, where communities actively shape sustainable, digitalized, and conscientious institutions."

Mission statement

"EC Ma Ndryshe supports democratic governance and sustainable development in Kosovo by fostering sustainable socioeconomic, cultural, and green growth through digital education, environmental stewardship, community mobilization, advocacy for participatory public decision-making, and the cultivation of strategic partnerships."

