



CYPRUS QUARRIES ASSOCIATION
Essential Materials, for Sustainable Development

BIODIVERSITY ASSESSMENT IN CYPRUS AGGREGATES QUARRIES



University of Cyprus
Department of Biological
Sciences

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WHY BIODIVERSITY?

The effects of aggregates' quarries on the environment is of great concern to the general public but also to the community of aggregates' producers, given that we live in an era of global biodiversity loss. More and more data from the literature suggest that the effects of quarries on biodiversity is a complex issue, and the picture emerging shows that quarries play an important, often positive, role in shaping new biological communities at local scale. The situation in Cyprus remains largely unknown as no comparative evaluation of data from a large number of quarries, taking into account several biodiversity components, is available.

Hence, the Cyprus Quarries Association assigned to the Laboratory of Ecology and Biodiversity at the University of Cyprus the task to conduct a scientifically sound study on the status of biodiversity at aggregates' quarries of the island, aiming to an objective documentation of the current state. The study aimed also to offer advice towards optimization of management practices and restoration of sites where quarrying activities have been concluded.

QUARRIES AND METHODS

The study lasted from March 2024 to March 2025. Initially, the Research Group visited many aggregates' quarries across Cyprus and selected 10 of these as representative of the whole. These cover all quarry zones of the Republic of Cyprus and the whole range of habitats where quarries have been installed. In each quarry, two main sites for recording were selected, one inside restoration sites and one just outside the quarries' confines, in locations hosting habitats typical for the the surrounding area. In addition, recordings were performed at the temporal wetlands that are created inside quarries. At each site, habitat types and the species of plants, birds, reptiles, amphibians, three families of beetles, butterflies, and terrestrial isopods were recorded, as well as evidence for the presence of non-volant mammals. All recordings were repeated twice, once in spring and once in fall. The results were analyzed at both the local and the cross- quarry scales.

IAKOVOU BROS. (XYLOFAGOU)

PYRGA QUARRY (PYRGA)

MOSFILOTI QUARRY (MOSFILOTI)

ELMENI (AGIOS SOZOMENOS)

ELEFThERIOS PANAGI & SONS (SIA)

K. KYTHREOTIS & SON (PAREKKLISIA)

SKYRA VASAS (VASA)

FARMAKAS QUARRY(FARMAKAS)

EME (MITSERO)

GENNADIOS THEOLOGOU & SONS (ANDROLYKOU)



RESULTS

The presence of seven habitat types has been documented, three of which are of EU priority. In addition, the small wetlands formed inside quarries are expected to remain after the conclusion of the quarries' function at several sites, adding one more important habitat type.



The EU priority habitat type 5220* (Mediterranean arborescent shrubs with *Ziziphus lotus*) by the quarry at Mitsero.

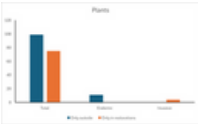
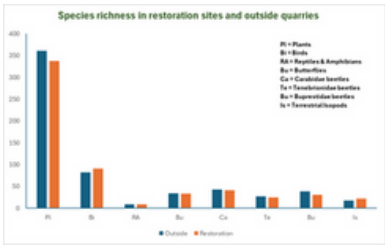
An important wetland habitat at the quarry of Agios Sozomenos. If it is maintained in the long run, it will make an important addition to the habitat types in quarries, hosting a rich biodiversity.



Mediterranean temporary ponds (3170*) at the quarry of Androlykou. Temporary ponds host a distinct flora and fauna that cannot be found in surrounding sites.



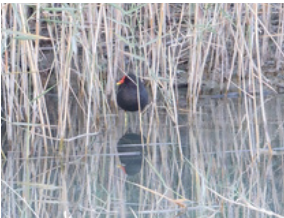
Species richness in restoration sites did not statistically differ from that in neighboring sites outside quarries. This is particularly significant when one takes into account the much smaller area of restoration sites and their recent development.



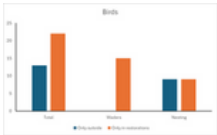
A small but noteworthy difference between external and restoration sites can be seen in the occurrence of more invasives and less endemics in the latter. The richness of species that occur in only one of the two site categories is somewhat higher in external sites, something to be expected due to the recent development of restorations.



The endemic species *Onobrychis venosa* at Agios Sozomenos.



The wader *Gallinula chloropus* at Xylotagou.



As far as birds that occur in one site category only are concerned, it is important to note that waders can be found only in restorations, where most of these species can be found also overall.

Seven out of eleven lizard species and two out of three amphibians of Cyprus can be found in the studied sites, without any differences between external and restoration sites. The presence of refugia (mainly stone piles and crevices in rocks) is the most important factor for reptiles, regardless of site type. The presence of amphibians, of course, depends on the occurrence of temporary or permanent freshwater habitats.



The endemic toad species *Bufotes cypriensis* at Andriolykou.



An important component of this study was the recording of invertebrate groups, which do not often receive much attention despite the fact that they make the largest, by far, part of total biodiversity! Invertebrates contribute significantly in the functioning of all ecosystems, so the enrichment of their communities should be a prime component of any attempt to restore natural habitats.



The beetle *Acmaeoderella gibbulosa* (family Buprestidae) at Farmakas.

Terrestrial isopods contribute in the decomposition of dead plant material and are sensitive to drought. Therefore, they make good indicators of soil quality, hence also of the potential to develop rich ecosystems. Among the 23 species found, 22 were recorded in restoration sites and 18 in external, but no statistically significant difference among site types was detected.



The terrestrial isopod species (Oniscidea) *Armadillidium marmoratum* at Andrioykou.

Ground beetles are also important indicators of ecosystems' state. Carabidae are usually richer in wetter areas with dense vegetation, while Tenebrionidae are richer in warmer and drier sites. It is interesting to note that the, richer in species, Carabidae did not differ between site types, while Tenebrionidae was the only group studied that is richer in external sites. It is important to study further the possibility that this is due to the development of habitats with denser plant cover and higher humidity in restorations compared to surrounding areas.



The endemic subspecies *Allancastris cerisyi cypria* at Pyrga.

All six endemic butterflies of Cyprus were recorded among the 35 out of 50 Cypriot species found overall. In this case too, no difference between site types was detected, either for the total species lists or for endemics. The richest sites were in restorations.



SUMMARY OF MOST IMPORTANT FINDINGS

Biodiversity at restoration and external sites is generally rich, with a large number of recorded species in view of their small surface area and/or the high levels of disturbance by quarrying activities.

Biodiversity in restoration sites does not show important differences from that in neighboring sites outside quarries.

The similarity in biotic community composition between restoration and external sites underlines the importance of maintaining surrounding habitats and neighboring sites at a good condition.



There is an apparent trend of higher richness of endemics outside quarries, and of more invasives and other anthropophilic species in restoration sites, which has to be taken into account in future restoration activities.



The presence of freshwater bodies and special habitats (e.g., cliffs) inside quarries is an important factor of biodiversity differentiation with several species occurring exclusively at such sites, and it is crucial to implement actions toward their maintenance after the conclusion of quarries' activity.

ATTENTION: All the above do not take into account particular species of interest that are not included in the groups studied, for which it is always necessary to make the appropriate planning after a focused scientific study.

The aggregates' quarries do not seem to affect the total biodiversity status of the groups studied.

On the contrary, they can lead to enrichment of biodiversity if the freshwater bodies and habitat heterogeneity they create can be maintained in the long run.



RECOMMENDATIONS FOR OPTIMIZING RESTORATIONS

- Long-termed maintenance of freshwater bodies and the hygrophilous vegetation along their banks, and impeding the sudden drying out of the temporal wetlands, especially during the reproductive period of waders.
- Maintenance of connecting corridors among restoration sites and with external surrounding areas.
- Planting of more than one native plants of each area and only where deemed necessary.
- Restriction of alien invasive species, more importantly regular removal of tree tobacco (*Nicotiana glauca*), acacias, and African boxthorn (*Lycium ferocissimum*).



RECOMMENDATIONS FOR OPTIMIZING RESTORATIONS



- Restriction, to the minimum possible level, of dust and light pollution.
- Enrichment of soil where needed, by removing infertile mud, inoculation with microorganisms, and planting of native low scrubs and herbaceous plants.
- Maintenance of micro-habitats (e.g., stone piles, logs, leaf-litter layer) that are important for the preservation of several species of ecological interest, especially reptiles, mammals, and invertebrates.
- Extension of the study to more sites at selected quarries and for a longer time period.
- Implementation of a long-termed biodiversity monitoring project in selected quarries.

Sustainable development for a
sustainable Cyprus





Research Group

Scientific Coordinator:
Sfenthourakis Spyros,
Professor of Ecology and Biodiversity

Makris Christodoulos,
Architect –Environmental Researcher

Papaonisiforou Giorgos,
Biologist, MSc Environmental Biology: Conservation
& Resource Management
Savvides Pantelis,
Dr Biodiversity and Ecology
Tolgyesi Zoltan,
Environmental Researcher

Photo credits:
Makris Christodoulos & Tolgyesi Zoltan

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