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A malacofaunistic study of the Wellbach pond, Taunus Nature Park, Hesse

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Abstract: As part of a two-week school internship during 30.6. – 14.7.2021, an ecological and faunistic study was undertaken to assess the malacofauna of a small pond within the Taunus Nature Park in the central upland range of the Taunus in the German federal state of Hesse. The Wellbach pond is easily accessible, and the project could be conceived and completed within two weeks. Different microhabitats were investigated for molluscs. In total, 17 gastropod species belonging to ten families were recorded and imaged. Four freshwater species and 13 terrestrial snails were found. This investigation constitutes the first published record concerning the malacofauna of Wellbach pond.

Keywords: freshwater snails, Gastropoda, Hesse, land snails, Nature Park Taunus

Zusammenfassung: Im Rahmen eines zweiwöchigen Schulpraktikums vom 30.6. bis 14.7.2021 wurde eine ökologische und faunistische Untersuchung zur Bewertung der Malakofauna eines kleinen Teiches im Naturpark Taunus im Mittelgebirge des Taunus im deutschen Bundesland Hessen durchgeführt. Der Weiher des Wellbachs ist sehr gut zugänglich und das Projekt konnte innerhalb von zwei Wochen konzipiert und abgeschlossen werden. Es wurden verschiedene Mikrohabitate nach Mollusken untersucht. Insgesamt wurden 17 Schneckenarten aus zehn Familien erfasst und fotografiert. Vier Süßwasserarten und 13 Landschnecken wurden gefunden. Diese Untersuchung stellt die erste Veröffentlichung über die Malakofauna des Wellbach-Weiher dar.

Introduction

As a part of a two-week school internship, a faunistic study was conducted to assess the malacofauna of the Wellbach pond (“Wellbach-Weiher”) located in the Taunus Nature Park between the eastern Taunus towns of Kelkheim-Eppenhain and Eppstein (50.15573°N 8.39521°E).

The Wellbach pond (Figs. 1-2) is a murky, slow moving to stagnant water body abutted by a hiking path on one side and surrounded by mixed deciduous forest comprised mostly of maple (*Acer*), oak (*Quercus*), beech (*Fagus*), and birch (*Betula*). The surface of the pond is ca. 350 m². Respective of our faunistic study, it can be divided into four general ecological sections: the small front recreational “beach” side lacking vegetation, the moderately vegetated right side, the “wild” undisturbed forested backside containing the most microhabitats and harboring the most terrestrial snails of our study and the reed mannagrass (*Glyceria maxima*) vegetated left side, where the two barely flowing feeder streams enter the Wellbach. During our study, the pond was frequently visited by kindergarten groups, hikers, and dog owners. Traces of wildlife were recognized at the left and back sides of the pond. Geologically, the local sediment is comprised of greenschist, sericite gneiss, keratophyr and quartzite gravel (STERRMANN 2015).

In this report, we present a list of slugs, freshwater snails, and land snails. Discussion of finds provides insights on the malacofauna of the Wellbach pond.

Material and Methods

The investigation began with the determination of microhabitat zones (separated ecological areas). Four microhabitat zones were designated, imaged, and searched for molluscs during different weather conditions for a total of seven hours. The microhabitats included leaf litter, sediment, sites on trees, under exfoliating decaying bark, blades of mannagrass, underneath fallen tree trunks and branches as well as organic debris in the water and the water itself for free swimming snails.



Fig. 1: Different perspectives of the Wellbach pond, Eppstein, Main-Taunus Kreis, Hesse, Germany. **A.** Front view of pond (from hiking trail) showing margins containing the sampled microhabitats. **B.** Margin of front part of pond showing high erosion and recreation use. **C.** Back side of pond showing reed mannagrass and view across to A–B. **D.** Wellbach stream feeding into Wellbach pond showing Taunus gravel substrate (**E.**).

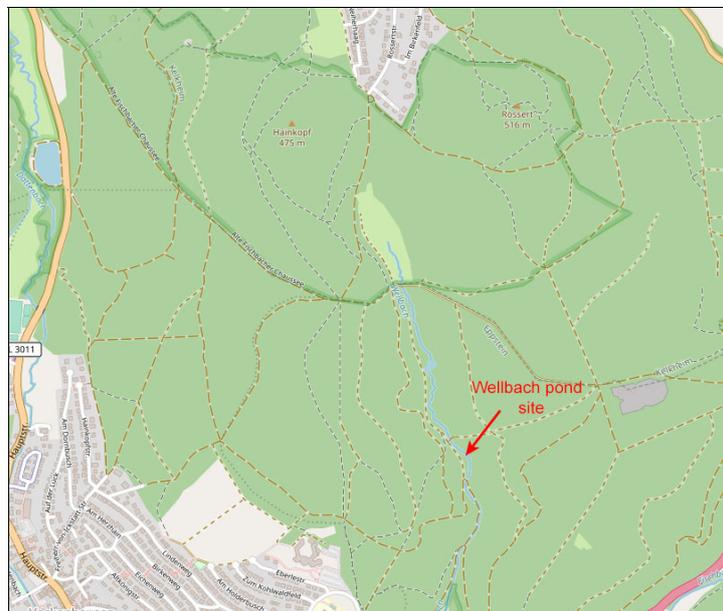


Fig. 2: Wellbach pond (“Weiher des Wellbach”) in the Hofheim Forest of Taunus Nature Park, Eppstein south of Eppenhain. Red arrow indicates the pond (Map source: OpenStreetMap, license: <https://opendatacommons.org/licenses/dbcl/1-0>).

Individuals were collected by handpicking. Geographic coordinates were determined with a GPS device. Samples were imaged alive in situ (Fig. 3) and empty shells sorted. Empty shells were inspected for signs of predation or habitation by other organisms such as smaller snails, leeches (Hirudinea: Haemopidae), nematodes, and arthropods. Binoculars were used to detect animals in the water at the

back part of the pond. Specimens of slugs were mostly collected in a terrarium and brought to the laboratory for additional imaging and identification. Slugs were placed on a glass butter dish for imaging their foot. Species were determined based on shell characters and/or outer appearance of soft part anatomy (i. e., Agriolimacidae, Arionidae, Discidae, Gastrodontidae, Helicidae, Hygromiidae, Limacidae, Lymnaeidae, Oxychilidae, and Planorbidae). WELTER-SCHULTES (2012) and WIESE & RICHLING (2007) were consulted for identification, MolluscaBase eds. (2021) for systematics and nomenclatural aspects.

In addition to our own investigation, we obtained water quality data collected in June 2017 by a 9th grade school chemistry class from the Freiherr-vom-Stein-Schule (Eppstein) as well as consulted DMG member, HASKO NESEMANN, about his broader, three-year ecological survey of the Wellbach flora and fauna.

During these two weeks of assessment, the ambient temperatures ranged from 12.5-20 °C, which were atypical and relatively cool for July in central Germany.



Fig. 3: Author, NOEMI PARLOV, imaging freshwater snails.

Results

Our search recovered very few mollusc species. Only 17 different species of live snails were found, including seven species of slugs, four species of freshwater snails and six species of terrestrial snails (Tab. 1).

Tab. 1: Recorded species of land and freshwater snails and their microhabitat types found at the Wellbach pond July 1–14, 2021. 1 = Moist leaf litter; 2 = In water; 3 = On tree; 4 = Under exfoliating bark or decaying wood; 5 = On vegetation or mushroom; 6 = Inside empty *P. corneus* shell.

Species and Microhabitat	1	2	3	4	5	6
<i>Ampullaceana balthica</i> (LINNAEUS 1758)		x				
<i>Arion circumscriptus</i> G. JOHNSTON 1828	x			x		
<i>Arion intermedius</i> NORMAND 1852				x		
<i>Arion rufus</i> (LINNAEUS 1758)	x					
<i>Cepaea hortensis</i> (MÜLLER 1774)					x	
<i>Deroceras</i> cf. <i>agreste</i> (LINNAEUS 1758)				x		
<i>Deroceras</i> cf. <i>reticulatum</i> (O. F. MÜLLER 1774)	x					
<i>Discus rotundatus</i> (O. F. MÜLLER 1774)						x
<i>Galba truncatula</i> (O. F. MÜLLER 1774)					x	
<i>Helix pomatia</i> LINNAEUS 1758	x					
<i>Lehmannia marginata</i> (O. F. MÜLLER 1774)			x			
<i>Limax cinereoniger</i> WOLF 1803				x	x	
<i>Lymnaea stagnalis</i> (LINNAEUS 1758)		x				
<i>Monachoides incarnatus</i> (O. F. MÜLLER 1774)	x					
<i>Oxychilus cellarius</i> (O. F. MÜLLER 1774)	x					
<i>Planorbarius corneus</i> (LINNAEUS 1758)		x				
<i>Zonitoides nitidus</i> (O. F. MÜLLER 1774)				x		

The Freiherr-vom-Stein school project (June 27, 2017) informed that the mean water temperature was 12.15 °C with the saturation of dissolved oxygen as low as 66 %. The pH-level of the Wellbach pond measured 6.35 at the time. Although we did not undertake water quality tests, these measurements are

in sync with the known spectrum of the ecologically flexible freshwater snail species (STRESEMANN 1992) we found during our study, including *Ampullaceana balthica*, *Planorbarius corneus*, *Lymnaea stagnalis* and *Galba truncatula*.

The different sides of the pond presented different habitats and different species diversity. Human disturbance was very noticeable at the front of the pond via lack of ground vegetation and apparent soil erosion due to human activity. No terrestrial mollusks were found there. The freshwater snails, *Ampullaceana balthica*, *Planorbarius corneus* and *Lymnaea stagnalis* were found crawling about close to the water's edge and on submerged tree branches at the front, the right side and at the back of the pond.



Fig. 4: Land snails encountered at the Wellbach pond, July 2021. **A.** *Oxychilus cellarius* (Oxychilidae), back of pond, leaf litter. **B.** *Arion rufus* complex (Arionidae), left side of pond, leaf litter. **C.** *Lehmannia marginata* (Limacidae), back of pond, on birch tree.



Fig. 5: Black and grey color morphs of *Limax cinereoniger* (Limacidae). **A.** Black adult with large tubercles and whitish keel. **B.** Sole of A with black lateral zones and white delimited central zone. **C.** Grey form of *Limax cinereoniger* feeding on *Amanita rubescens*. **D.** Sole of C with grey lateral zones and cream-colored central zone.

The left side was overgrown with mannagrass and heavily frequented by forest animals. Only one slug, *Arion rufus*, was encountered in this section. The least disturbed part of the pond was the back, right side containing most of the identified microhabitats in this study (i. e., leaf litter, sediment, on trees, in the water, under exfoliating bark of rotting hardwood logs in advance stages of decay, blades of reed mannagrass and underneath fallen tree trunks and branches). None of the terrestrial snail species were found in any great numbers ($n < 5$) (Fig. 4). Black and grey color morphs of *Limax cinereoniger* showed the characteristic, partite sole in which the middle zone is white and the sides either black or grey respective of the snail's color. (Fig. 5).

Signs of predation were observed on half of the empty *P. corneus* shells found at the back section of the pond. These shells were chomped from the perimeter of the shell up to, but not including the first two apical whorls (Fig. 6). On the other hand, no empty shells of *L. stagnalis* or *A. balthica* were found and no damage was observed on the shells of living individuals of these two species. We remark that *P. corneus* was the most abundant freshwater snail throughout the pond, followed by much fewer *A. balthica* (front and back of pond) and only less than ca. ten adult *L. stagnalis* were encountered (front and back of pond). Three empty shells of *P. corneus* showed bore holes with concave borders around them. Two juvenile individuals of both *L. stagnalis* (on leaf litter in the water) and *G. truncatula* (on reed mannagrass blades) were found at the back left side of the Wellbach.

Discussion

Site specific land snail richness and shell abundance has long been associated with diverse geological and ecological factors (DOURSON 2010). H. NESEMANN mentioned he found *Pisidium casertanum* ssp. *ovatum* (sensu JAECKEL 1962 and ZEISSLER 1971) [*Euglesia casertana* (POLI 1791)] and shell fragments of *Anodonta anatina* (LINNAEUS 1758) in the Wellbach pond in a previous study. We did not encounter living animals nor any shells or shell fragments of these species in our current study. Since the pond's depth and expanse have varied considerably during these past years of local drought conditions (A. JOCHUM pers. observ.), it is possible that these former instances were found in areas we could not access in our current study and that they may still inhabit the Wellbach pond. Alternatively, their current absence may also be due to the extreme drought conditions spanning several seasons. These two species have been listed in the Red List (JUNGBLUTH 1996) as "highly endangered" and as "declining species" respectively in Hessen.

Though a standard aquarium chemistry set was used (S. FRICK pers. comm. July 2021), the water quality data with a chemical index factor of 85 and a grade level 1 showed that the Wellbach pond was largely uncontaminated ("sehr geringe Belastung") at the time. We found that the pond was generally teeming with life above and below its surface and can confirm that although we did not measure the water quality, no signs of pollution were visually detected nor were numbers of empty shells lying on its banks, suggesting potential mortality beyond eventual rodent or snake predation on *P. corneus* (only at the back of the pond).

Though it is a highly variable parameter, the recorded saturation of dissolved oxygen (66 %) in June 2017 underscored the presence of the three ecologically flexible and low O₂ tolerant freshwater snail species, *A. balthica*, *P. corneus* and *L. stagnalis*.

Using binoculars, we observed what could be muskrats (*Ondatra zibethicus*) or nutria (*Myocastor coypus*) swimming at the back of the pond (July 10, 2021). A clearer identification of these aquatic rodents, however, was not possible. Larger and smaller holes indicative of snake or rodent habitation were present above the margins of the banks at the back part of the pond where the remains of *P. corneus* shells were found. One consideration is that European Grass snakes (*Natrix natrix natrix*) are known to exist in the wider vicinity of the Wellbach pond (A. JOCHUM pers. observ. July 2021) and have been recorded to occasionally feed specifically upon *P. corneus* in a pond in Tübingen, Germany (CONSUL & al. 2009). Alternatively, the aquatic rodents probably also feed on *P. corneus* and are likely predator candidates for the damaged *P. corneus* shells found at the back of the pond. According to HASKO NESEMANN, no crayfish species are known in the area. Small holes on the surface of three empty *P. corneus* shells (Fig. 6) may be attributed to potential calcium mining activity by arthropods entering the shell from the exterior. This penetration could well be post mortal.

This study provides literature data on the freshwater molluscs of Wellbach pond, which have up to now, been lacking. Considering the bigger ecological picture of the malacofauna of the Wellbach pond and its two feeder streams, our findings generally confirm the paucity of malacofauna reported from earlier investigations by HASKO NESEMANN (pers. comm. July 2021) while providing a current assessment for future studies in Hesse.



Fig. 6: Empty shells, bored shells and broken shells of *Planorbarius corneus* (Planorbidae). Second row of shells with boreholes. Lower three rows show evidence of predation.

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