

## MALACOLOGICAL EXCURSION TO VORARLBERG (AUSTRIA) IN THE COURSE OF THE AUSTRIAN BARCODE OF LIFE PROJECT

Michael Duda<sup>1</sup>, Elisabeth Haring<sup>2,3</sup>, Helmut Sattmann<sup>1</sup>, Oliver Macek<sup>1,3</sup>, Julia Schindelar<sup>2</sup>, Sara Schnedl<sup>1</sup>, Anita Eschner<sup>1</sup>, J. Georg Friebe<sup>4</sup> & Luise Kruckenhauser<sup>2</sup>

<sup>1</sup> 3rd Zoological Department, Museum of Natural History, Vienna, Austria

<sup>2</sup> Central Research Laboratories, Museum of Natural History, Vienna, Austria

<sup>3</sup> Department of Integrative Zoology, University of Vienna, Vienna, Austria

<sup>4</sup> inatura – Erlebnis Naturschau GmbH, Dornbirn, Austria

Correspondence: Michael Duda, [michael.duda@nhm-wien.ac.at](mailto:michael.duda@nhm-wien.ac.at)

### Abstract

In June 2016, an excursion to Vorarlberg, the westernmost Austrian federal country, took place. It was conducted by the Natural History Museum Vienna in the course of the ABOL pilot project mollusca. Aim of this excursion was to obtain fresh material of non-marine molluscs of this area, as most of the few material from Vorarlberg in the mollusc collection of the NHMW was not younger than 1974. Sampling took place in the following regions: Bregenzer Wald, Vorarlberger Rheintal, Walgau, Rätikon and Klostertal. Altogether, 69 species of Gastropoda were sampled or observed at 23 sites. Besides the first record of *Trochulus clandestinus*, which was already published in a previous paper, the first unambiguous record of *Trochulus striolatus sensu stricto* could be documented.

**Keywords:** Gastropoda, Vorarlberg, ABOL

### INTRODUCTION

From 11th to 15th June 2016, members of the Natural History Museum Vienna (NHMW) undertook a malacological excursion to Vorarlberg in the course of the ABOL pilot project Mollusca. The Austrian Barcode of Life (ABOL, <http://www.abol.ac.at/en/>) is an initiative that aims to generate and provide DNA barcodes of all species recorded from Austria. Vorarlberg, the westernmost federal country of Austria, is situated at the border between the Western and the Eastern Alps (Friebe 2007) with more biogeographic connections to Switzerland and south western Germany, than to the rest of Austria. During the last glacial maximum it was covered by an ice shield and post-glacial recolonisation by

organisms took place from south-western and north-western refuge areas (Van Husen & Reitner 2011, de Graaff et al. 2007). Concerning gastropods, this becomes apparent by e.g. the westerly distributed land snail *Trochulus villosus*, whose origin lies very likely in the French Jura and Central Switzerland (Depráz et al. 2008). In contrast, the eastern parts of the Austrian Alps were presumably re-colonized from refuges east and north-east of the formerly glaciated areas (e.g., *Orcula dolium*: see Harl et al. 2014a & b), from refuge areas within the Alps as proposed for plants by Schönschwetter et al. (2005) or land snails (e.g., *Cylindrus obtusus*: Kruckenhauser et al. 2017) or even from the northern Balkans (e.g., *Caucasotachea vindobonensis*: Kajtoch et al. 2017). Thus, the malacofauna of Vorarlberg differs

remarkably from the rest of Austria and is therefore of special interest for the ABOL project. Until now, there was only few material from Vorarlberg in the mollusc collection of the NHMW, most of it not younger than 1974. The main goal of this excursion was to obtain recent data and samples of terrestrial molluscs of Vorarlberg. Participants of this excursion were (in alphabetical order): Michael Duda, Elisabeth Haring, Oliver Macek, Luise Kruckenhauser, Helmut Sattmann, Sara Schnedl and Julia Schindelar.

## MATERIAL & METHODS

Collection areas were determined by studying the literature concerning the malacofauna of

Vorarlberg (Klemm 1974, Sperling 1972, Reischütz 1993) and surveying the material of the mollusc collection of the NHMW. The 12 selected collection areas belong to the following regions: Bregenzer Wald, Vorarlberger Rheintal, Walgau, Rätikon, and Klostertal. Within these 12 areas (Table1) snails were recorded and collected at 22 sampling sites (minimum distance within areas 200 m). Individuals were collected by hand catch and at some sampling sites in the Bürser Schlucht also by sieving of leaf litter. The sampling sites are listed in Table 1 including the coordinates they cover (exactness: 1 minute) and some brief description.

The specimens collected during this excursion are stored in the mollusc collection of the Museum of Natural History Vienna under the acquisition

**Table 1.** Sampling areas visited from Monday, 11.07.2016 to Friday, 15.07.2017. Number of sampling sites within each area are indicated.

	Area	Date	Coordinates, elevation	Description	No. sampling sites
1	Bregenzerwald, Bezau, Rimsbach	Monday, 11.07.2016	47°22'N 09°55'E 702 m asl	mixed forest in a small valley, creek with perennial herbs, forest edge	1
2	Bregenzerwald, Bezau, Greben	Monday, 11.07.2016	47°22'N 09°54'E 677 m asl	meadow with rocks on forest edge	1
3	Bregenzerwald, Bezau, Unterdorf	Monday, 11.07.2016	47°22'N 09°53'E 646 m asl	well on wayside	1
4	Vorarlberger Rheintal, Götzis, Örfaschlucht	Tuesday, 12.07.2016	47°19'N 09°39'E 493-640 m asl	river canyon with mixed forest, rocks and forest edges	3
5	Bregenzerwald, Schwarzenberg / Andelsbuch Bregenzer Ache	Tuesday, 12.07.2016	47°24'N 09°51'E 723 m asl	river canyon with mixed forest, high perennial herbs and rocks	1
6	Bregenzerwald, Mellau / Au, Kanisfluh	Tuesday, 12.07.2016	47°19'N 09°55'E 1520-1530 m asl	alpine meadows, rocks, forest edge	2
7	Walgau, Bludenz, Montikel	Wednesday, 13.07.2017	47°09'N 09°49'E 600-743 m asl	mixed forest with rocks and rock faces	4
8	Rätikon, Brand, Seetal - Böser Tritt	Thursday, 14.07.2016	47°03'N 09°45'E 1594 m asl	rocks (scree) with alpine meadows and single mountain pines	1
9	Rätikon, Bürs, Bürser Schlucht	Thursday, 14.07.2016	47°08'N 09°49'E 558-711 m asl	river canyon with mixed forest and rocks	4
10	Rätikon, Brand, Palüdhütte, Melkboden	Thursday, 14.07.2016	47°06'N 09°43'E 1695 m asl	alpine meadow with forest edge and rocks	1
11	Klostertal, Dalaas, Radonatobel	Friday, 15.07.2016	47°07'N 10°01'E- 47°08'N 10°01'E 962-1331 m asl	mixed forest with forest edge, subalpine meadow and creek	3
12	Klostertal, Stuben, Rauzmähder	Friday, 15.07.2016	47°08'N 10°10'E 1813 m asl	alpine meadow with rocks and boulders	1

numbers:

NHMW 109000/AL/00968 - NHMW 109000/AL/01024,  
 NHMW 109000/AL/01114 - NHMW 109000/AL/01123,  
 NHMW 109000/AL/01129,  
 NHMW 109000/AL/01265 - NHMW 109000/AL/01347,  
 NHMW 109000/AL/01412 - NHMW 109000/AL/01415,  
 NHMW 109000/AL/01521 - NHMW 109000/AL/01523.

## RESULTS & DISCUSSION

The recorded snails are summarized in table 2. Altogether, 69 species were sampled or observed at 23 sites. Sampled areas with a higher number of recorded species (see also table 2) were Bürser Schlucht (30), Montikel (23), Örfli Schlucht (21) and Rimsbach (18). In general, it can be stated that the higher number of species within these areas is not only a result of a higher number of sampling sites, but also results from the habitat diversity of rocks facing river canyons, which inhabit a many of different microclimates. The number of recorded species of Montikel and Bürser Schlucht also differs from already published records of these areas (Brandstetter & Stummer 1995, Falkner & Stummer 1996). Notable findings were those of *Trochulus clandestinus* (first record in Austria, see Duda et al. 2017) and *Trochulus striolatus* (first unambiguously documented record for Vorarlberg) as the occurrence of these taxa in Vorarlberg were not clear so far. Klemm (1974) mentioned the taxa *Trichia striolata subcarinata* (Clessin, 1874) and *Trichia striolata subtecta* (Clessin, 1874) to occur possibly in Vorarlberg. Reischütz (1993) mentioned *T. rufescens* (synonym of *T. striolatus*) with a question mark in his preliminary red data book concerning molluscs of Vorarlberg. He also mentioned *T. suberectus* sensu Forcart 1965, which he suspected to be more likely connected to the Swiss taxa (*T. caelatus*, *T. clandestinus* or *T. montanus*) than to *T. striolatus*. Our results reconfirm that both *T. striolatus* sensu stricto as well as a Western Alpine taxon currently named *T. clandestinus* occur in Vorarlberg. According to traditional nomenclature, which is used e.g. in the Austrian Red Lists (Reischütz & Reischütz 2007), the recorded

specimens of *T. striolatus* would be most likely assigned to the nominate subspecies *Trochulus striolatus striolatus*, as the next known populations in South Germany also belong to this taxon (Duda et al. 2014). Nevertheless, Procków et al. (2017) claim that *T. striolatus* should not be subdivided into subspecies, as there exist neither morphological nor genetic hints for a clear subdivision of populations. Concerning *T. clandestinus*, it has to be stated that there are no good traits to separate the three West Alpine taxa *T. caelatus*, *T. clandestinus* and *T. montanus* neither by genetics nor by morphology (Procków et al. 2014). Nevertheless, the findings of Duda et al. (2017) represent a new record for Austria, as the recorded snails definitely belong to a West-Alpine distributed species group, which was hitherto not detected in Austria. As long as the question about the correct name or separation within this taxon group is not resolved satisfactorily, we follow the approach of Falkner et al. (2017), who used the name *T. clandestinus* for those populations of this species group, which are widespread outside the Jura mountains. The question raised by Reischütz (1993), whether *T. suberectus* sensu Forcart 1965 could represent a synonym of *T. clandestinus* cannot be answered, as the drawings of Forcart 1965 do not show inner structures of genitalia, which would be necessary to reconfirm this assumption. Concerning the genus *Oxychilus* it is worth mentioning, that only two specimens in the sampled area Örfli Schlucht resembled by shell size and form *Oxychilus mortiletti*, but after penial dissection (Giusti & Manganelli 1997) and genetic barcoding (data not yet published) they were also assigned to *O. draparnaudi*. This reveals the need for a revision of other *O. mortiletti* findings in regions north of the Southern Alps.

**Table 2.** Taxa recorded in the 12 sampling areas. Numbers refer to area numbers in table 1. L = living snails; E = empty shells

	1	2	3	4	5	6	7	8	9	1	11	12
Taxon	Rimsbach	Greiben	Bezu Oberdorf	Örflachslucht	Bregenzer Ache	Kanisfluh	Montikel	Böser Tritt	Bürser Schlucht	Palüdhütte	Radonaböbel	Stuben
<i>Abida secale secale</i>	-	-	-	-	-	-	L	-	L	-	-	-
<i>Acicula lineata lineata</i>	-	-	-	-	-	-	-	-	E	-	-	-
<i>Acanthinula aculeata</i>	-	-	-	-	-	-	-	-	E	-	-	-
<i>Aegopinella nitens</i>	L	-	-	-	-	-	-	-	L	-	-	L
<i>Arianta arbustorum ssp.</i>	L	-	-	L	-	-	L	-	L	-	-	L
<i>Arion distinctus</i>	-	-	-	-	-	-	L	-	-	-	-	-
<i>Arion fuscus</i>	-	-	-	L	-	-	-	L	-	L	-	-
<i>Arion rufus</i>	-	-	-	-	-	L	-	-	-	-	-	-
<i>Arion silvaticus</i>	-	-	-	-	-	-	-	-	L	-	L	-
<i>Arion vulgaris</i>	L	-	-	-	-	-	-	-	-	-	-	-
<i>Balea biplicata ssp.</i>	-	-	L	-	-	L	-	-	-	-	-	-
<i>Bulgarica cana cana</i>	L	-	-	L	-	-	L	L	L	-	-	-
<i>Carychium minimum</i>	-	-	-	-	-	-	-	-	L	-	-	-
<i>Carychium tridentatum</i>	-	-	-	-	-	-	-	-	E	-	-	-
<i>Cepaea hortensis</i>	-	-	-	L	-	-	L	-	-	-	-	-
<i>Cepaea nemoralis</i>	L	-	-	-	-	-	-	-	-	-	-	-
<i>Cepaea nemoralis</i>	-	-	-	-	-	-	L	-	-	-	-	-
<i>Chondrina arcadia clienta</i>	-	-	-	-	-	-	L	-	-	-	-	-
<i>Chondrina avenacea</i>	-	-	-	-	-	-	L	-	-	-	-	-
<i>Chondrina burtscheri</i>	-	-	-	-	-	-	L	-	-	-	-	-
<i>Clausilia cruciata cruciata</i>	-	-	-	-	L	-	-	-	-	-	-	-
<i>Clausilia dubia ssp.</i>	-	-	-	-	-	-	L	-	-	-	-	-
<i>Clausilia rugosa parvula</i>	-	-	-	L	L	-	L	-	L	-	-	-
<i>Cochlicopa lubrica</i>	-	-	-	-	-	-	-	-	-	-	L	L
<i>Cochlodina laminata ssp.</i>	L	-	-	-	-	-	L	-	L	-	-	-
<i>Columella edentula</i>	-	-	-	-	-	-	-	-	E	-	-	-
<i>Deroceras laeve</i>	-	-	L	-	-	-	-	-	-	-	-	-
<i>Deroceras sp. juv.</i>	-	-	-	L	-	-	-	-	-	-	-	-
<i>Deroceras reticulatum</i>	-	-	L	-	-	-	-	-	-	-	-	-
<i>Discus rotundatus</i>	L	-	-	L	-	-	L	-	L	-	-	-
<i>Ena montana</i>	L	-	-	L	-	-	L	-	L	-	-	L
<i>Eucobresia nivalis</i>	-	-	-	-	-	-	-	-	-	L	-	-
<i>Euconulus fulvus</i>	-	-	-	-	-	-	L	-	L	-	-	-
<i>Euconulus praticola</i>	-	-	-	-	-	-	-	L	-	-	-	-
<i>Fruticicola fruticum</i>	L	-	-	L	-	-	-	-	-	-	-	-
<i>Galba truncatula</i>	-	-	L	-	-	-	-	-	-	-	L	-
<i>Helicigona lapicida</i>	-	-	-	L	L	-	-	-	-	-	-	-
<i>Helicodonta obvoluta</i>	-	-	-	L	-	-	L	-	L	-	-	-
<i>Helix pomatia</i>	L	-	-	-	-	-	-	-	-	-	-	-
<i>Isgonomostoma isognomostomos</i>	L	-	-	L	-	-	-	-	L	-	-	L
<i>Limax cinereoniger</i>	L	-	-	-	-	-	-	-	-	-	-	-
<i>Macrogastra attenuata lineolata</i>	L	-	-	L	L	-	L	-	-	-	-	-
<i>Macrogastra plicatula ssp.</i>	-	-	-	L	L	-	-	L	L	L	L	L
<i>Macrogastra ventricosa ssp.</i>	-	-	-	L	-	-	L	-	-	-	-	-
<i>Merdigera obscura</i>	-	-	-	-	-	-	L	-	-	-	-	-
<i>Monachoides incarnatus</i>	-	L	-	L	L	-	L	-	-	L	-	-
<i>Nesovitrea hammonis</i>	-	-	-	-	-	-	-	-	E	-	-	-
<i>Oxychilus alliarius</i>	-	-	-	-	-	-	L	-	-	-	-	-
<i>Oxychilus cellarius</i>	-	-	-	-	-	-	-	-	L	-	-	-
<i>Oxychilus draparnaudi/"mortiletti"</i>	-	-	-	L	-	-	-	-	L	-	-	-
<i>Oxychilus glaber glaber</i>	-	-	-	-	-	-	-	-	-	-	L	-
<i>Oxychilus sp. juv.</i>	-	-	-	-	-	L	-	L	-	-	-	-
<i>Perpolita petronella</i>	-	-	-	-	-	-	-	L	-	-	-	-
<i>Petasina edentula helvetica</i>	L	-	-	-	-	-	-	-	-	-	-	-
<i>Petasina unidentata ssp.</i>	-	-	-	-	-	-	L	L	L	L	L	L
<i>Platyla polita</i>	-	-	-	-	-	-	-	-	E	-	-	-
<i>Punctum pygmaeum</i>	-	-	-	-	-	-	-	-	L	-	-	-
<i>Pyramidula pusilla</i>	-	L	-	L	-	-	L	L	E	-	-	L

<i>Succinea putris</i>	L	-	-	-	-	-	-	-	-	-	-	-
<i>Trochulus clandestinus</i>	L	-	-	-	-	-	-	-	-	-	-	-
<i>Trochulus hispidus</i>	L	-	-	L	-	-	-	-	L	-	-	-
<i>Trochulus "sericeus"</i>	-	-	-	L	-	-	-	-	-	-	-	-
<i>Trochulus striolatus ssp.</i>	-	-	-	-	-	-	-	-	-	-	L	-
<i>Trochulus villosus</i>	L	-	-	L	-	-	-	-	-	-	-	-
<i>Truncatellina cylindrica</i>	-	-	-	-	-	-	-	-	E	-	-	-
<i>Truncatellina monodon</i>	-	-	-	-	-	-	-	L	-	-	-	-
<i>Vallonia enniensis</i>	-	-	-	-	-	-	-	-	E	-	-	-
<i>Vitrea subrimata</i>	-	-	-	-	-	-	-	-	E	-	L	-
<i>Vertigo alpestris</i>	-	-	-	-	-	-	-	-	L	-	-	-
<i>Vertigo pusilla</i>	-	-	-	-	-	-	-	-	L	-	-	-
No. species/living	18	2	4	21	5	3	23	8	20	5	8	8
No. species/empty shells	0	0	0	0	0	0	0	0	10	0	0	0
No. species/total	18	2	4	21	5	3	23	8	30	5	8	8

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