

Final Project Report

1. Contestant profile

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| ▪ Contestant name: | VILVENS Claude |
| ▪ Contestant occupation: | Professional - lecturer |
| ▪ University / Organisation | Haute Ecole Province de Liège & Société Belge de Malacologie |
| ▪ E-mail: | |
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| ▪ Number of people in your team: | 12 |

2. Project overview

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| Title: | Land and freshwater snails: a too poorly known fauna of the quarries |
| Contest: | Quarry Life Award |
| Quarry name: | Loën (Belgium) |
| Prize category: (select all appropriate) | <input checked="" type="checkbox"/> Education and Raising Awareness <input checked="" type="checkbox"/> Habitat and Species Research <input checked="" type="checkbox"/> Biodiversity Management <input type="checkbox"/> Student Project <input type="checkbox"/> Beyond Quarry Borders |

Land and freshwater snails: a too poorly known fauna of the quarries

A malacofauna survey of the Loën quarry : a snails and slugs sanctuary ?



Abstract

A study of the land and freshwater molluscs (malacofauna) in the HeidelbergCement quarry of Loën (Belgium) has been realized from April to August 2016 by a team of members of Natagora Low Meuse Valley (in French, Natagora Basse Meuse = N.B.M.) and of the Belgian Malacological Society (in French, Société Belge de Malacologie = S.B.M.).

This study, based on 7 exploring days, covers 32 stations located in the quarry, corresponding to 7 kinds of biotopes. The result is that the presence of a 38 molluscs species has been established, with more precisely 28 land snails, 9 slugs and 1 freshwater gastropod. Only 1 freshwater species has been observed because of the difficulty of exploring the ponds and lake banks and the impossibility to use the services of a team of experimented divers.

Because these poorly known animals are indeed indicators of environmental health, these results show clearly the biodiversity importance of a closed and protected area such this quarry of Loën. It is the proof that reasoned and responsible industrial exploitation is compatible with biodiversity protection.

It implies also that education of the general public is needed to preserve the biodiversity of this malacological sanctuary. Various means are considered, as explanatory shields and more especially understandable books about Loën quarry, Belgium and neighbouring countries.

Additional information is available on the Quarry Life Award web site

<http://www.quarrylifeaward.be/projects/benelux/land-and-freshwater-snails-too-poorly-known-fauna-quarries>.

1. A short preliminary presentation of the project

1.1 What ?

The global aim of this project was to build a large survey at the Loën quarry looking for land molluscs (snails and slugs) and freshwater molluscs. So, to be short, we have carry out a large survey of Loën quarry "**malacofauna**". This latter term means "fauna coming under the malacology", the **malacology** being the scientific study of the molluscs.

1.2 Why ?

Molluscs are a probably one of the lesser known of the animals groups. They **contribute however highly to the biodiversity**: there are about 130.000 marine, land freshwater species in the world. Belgium welcomes more than 80 land gastropods species bearing a shell (commonly known as "snails"), about 30 land gastropods without shell (the "slugs"), as well as at least 50 freshwater gastropods and about 30 freshwater bivalves living in ponds and rivers. These poorly known animals live in **various biotopes**: forests, wetlands, cliffs, rocks, screes, fields, dry landscape. The freshwater snails live in flowing as well as in standing waters. Only a **few scholars study** these molluscs (their scientific branch is called "malacology") and recent data are not very common.

Recent research however has shown that these creatures could serve as **indicators of environmental health**. Today, our region's nature and biodiversity face difficult times due to anthropic pressure resulting from overexploitation of available space. Human activity has created new environments, such as industrial wastelands, slagheaps, and quarries. Paradoxically, for many species, these new habitats created by man

represent more than simply refuge zones, but equally substitutional habitats even better suited to these species than their natural habitat is (especially if their original habitats have disappeared). This phenomenon is well known in birds, amphibians, and insects, but is still badly documented in molluscs. Limestone quarries, in particular, would appear promising to these animals, due to the non-acidic nature of the soil as well as the diversity of biotopes and microhabitats created. Furthermore, with the exception of the ground's direct exploitation, the impact of human activities is unusually absent (little to no pesticides, pollution, etc., being neither in an urbanized nor in an over-cultivated setting).

The **Loën quarry** is certainly of a **high interest** for the molluscs study for many reasons. First, it is located near several very interesting calcareous natural areas such as the Montagne St Pierre, Thier de Caster and Oost-Maarland (of which we survey their malacofauna); such a location is extremely important in understanding the evolution of mollusc communities and the expansion of certain species. Moreover, it presents a **rich diversity of biotopes and habitats**, ranging from extremely dry stations with very little vegetation to wet meadows and woods with ponds and streams. And lastly, as stated earlier, it is a site **very little impacted by human activity** other than the actual quarry exploitation.

That's because we felt it of very high interest to identify, photograph on the field, list and establish distribution maps of these interesting species in the Loën quarry because one can find there various biotopes sites, sites that are closed and so protected. All this information should lead to accurate surveys and precise mapping of the high biodiversity islands located in this quarry, confirming that some parts of this site function as "malaco-sanctuaries" and are therefore very important to preserve as a natural treasure.

1.3 Who ?

The project has been carry out by a core team of five persons (fig. 1), members of Natagora Low Meuse Valley (in French, Natagora Basse Meuse = N.B.M.) and of the Belgian Malacological Society (in French, Société Belge de Malacologie = S.B.M.). On the field, every prospecting walk was made with a variable number of volunteers and members, usually about 10-12.

The work is leaded by *Claude Vilvens*, college teacher and malacologist, president of the Belgian Malacological Society, scientific collaborator of the Muséum national d'Histoire naturelle of Paris, vice-president of Natagora Low Meuse Valley and long-term organizer of the S.B.M and N.B.M. samplings on the field.

Acting as co-leader, *Johann Delcourt* is a biologist and a malacologist, PhD of the Liège University, specialist of the environmental studies and ethologist and an effective member of the S.B.M. and Natagora.

The three other main actors of the team are *Claudine Jordan*, president of the N.B.M. and responsible of all the logistic facets of the project; *Etienne Meuleman*, malacologist, vice-president of the Belgian Malacological Society and responsible, among other things, of our bibliographic resources; *Myriam Peruzzi*, another member of the N.B.M., very effective field "snail-prospector" and literature teacher keeper of our documents formatting.



Figure 1 : The Core Team in the Loën quarry
(J.Delcourt, C.Jordan, E.Meuleman, M.Peruzzi, C.Vilvens)



Figure 2 : *Helix pomatia* (Roman Snail)
on boulders of Loën quarry

2. The molluscs world - snails and slugs

2.1 Molluscs and malacology

The word "molluscs" is derived from the Latin word : "mollusca" = "soft body". The science handling the animals is called "malacology", word derived from the Ancien Greek word "malakos", meaning "soft". So, it will be clearly issue of "soft animals". But still? To fully understand the scope and results of this project, it seems to us that a basic knowledge of these animals would be welcome (and even needed).

2.2 Main features and systematics

Molluscs are soft body invertebrates with or without a shell, characterised by three anatomical parts: a head or cephalic mass, a foot, and a visceral mass, possibly inside a shell (fig. 2).

The Molluscs phylum contains about **130 000 species**! It includes 8 classes, some of them being only marine, the most important regarding the number of living species being Gastropods, Bivalves and Cephalopods. Only two classes, but by far the most populated, are within the scope of this project: **Gastropods** and **Bivalvia**.

2.3 Gastropods : identify species of land snails and slugs

Gastropods are molluscs with a single part shell (snails) or without shell (slugs), with a twisted body resulting from the adjustment to the coiled shell (that has disappeared within the evolution history for the slugs). Their size can reach from 1 mm to 50 cm. To identify **landsnails**, a field malacologist uses first **the shell features** (an accurate terminology does exist - fig. 3). Also useful is the colour of the body, that can indicate the family of the snail one have in hand. Concerning **slugs**, the identification is not easy with a minimal experience, differences between some species being slight, with a high individual variability ratio. To take up such a challenge, these features must be considered (fig. 3): location of breathing pore (the pneumostome), the proportion between the mantle to the whole body, presence or not of a crest on the tail, colour (spots, bands) of the body (including around the pneumostome), of the bottom of the foot (the sole), but sometimes also of the mucus!

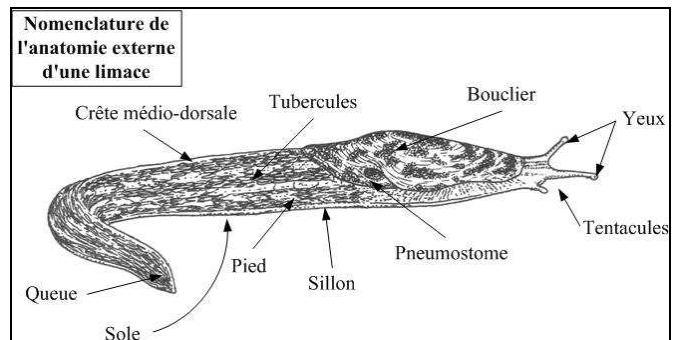
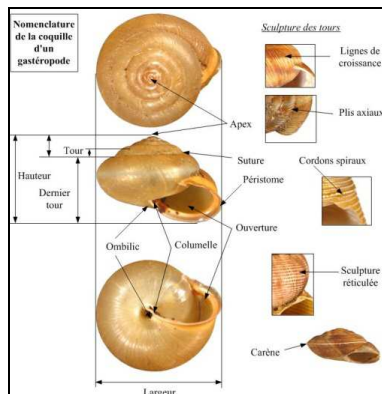


Figure 3: General morphological characteristics noted to identify species in landsnails (left) and slugs (right).

2.4 Freshwater molluscs: identify freshwater snails and mussels

The freshwater molluscs live in flowing as well as in standing waters. The **freshwater gastropods** are identified using the same features as the one used for land gastropods. Regarding the **bivalves**, the malacologists use shell features (again, an accurate terminology does exist) mainly based on shape and teeth of the hinge and shape of the anterior and posterior parts of the valves. We do not comment more about bivalves because almost none were observed.

3. Methodology of the study of the malacofauna in the quarry

3.1 Preliminary list of operational biotopes

First exploring and various information of the Loën quarry reveal that there are here **various biotopes**:

- sunny crests and slopes (SCS);
- shrubs and shaded boulders below cliffs (SSB);
- dry grasslands or meadows (DGM);

- wet woodlands (WW);
- dry woodlands (DW);
- ponds, lake and temporary pools (PL);
- of course, industrial estate (IE).

According to this analysis, we have planned the study of the area to access each kind of biotope that will be carried out by the observers.

3.2 Planning and stations

This means defining possible stations to explore and planning the way to reach them. Finally, **32 stations** have been explored (fig. 4, tab.1), corresponding to various biotopes, for a height from 52 to 121 m (fig. 5).

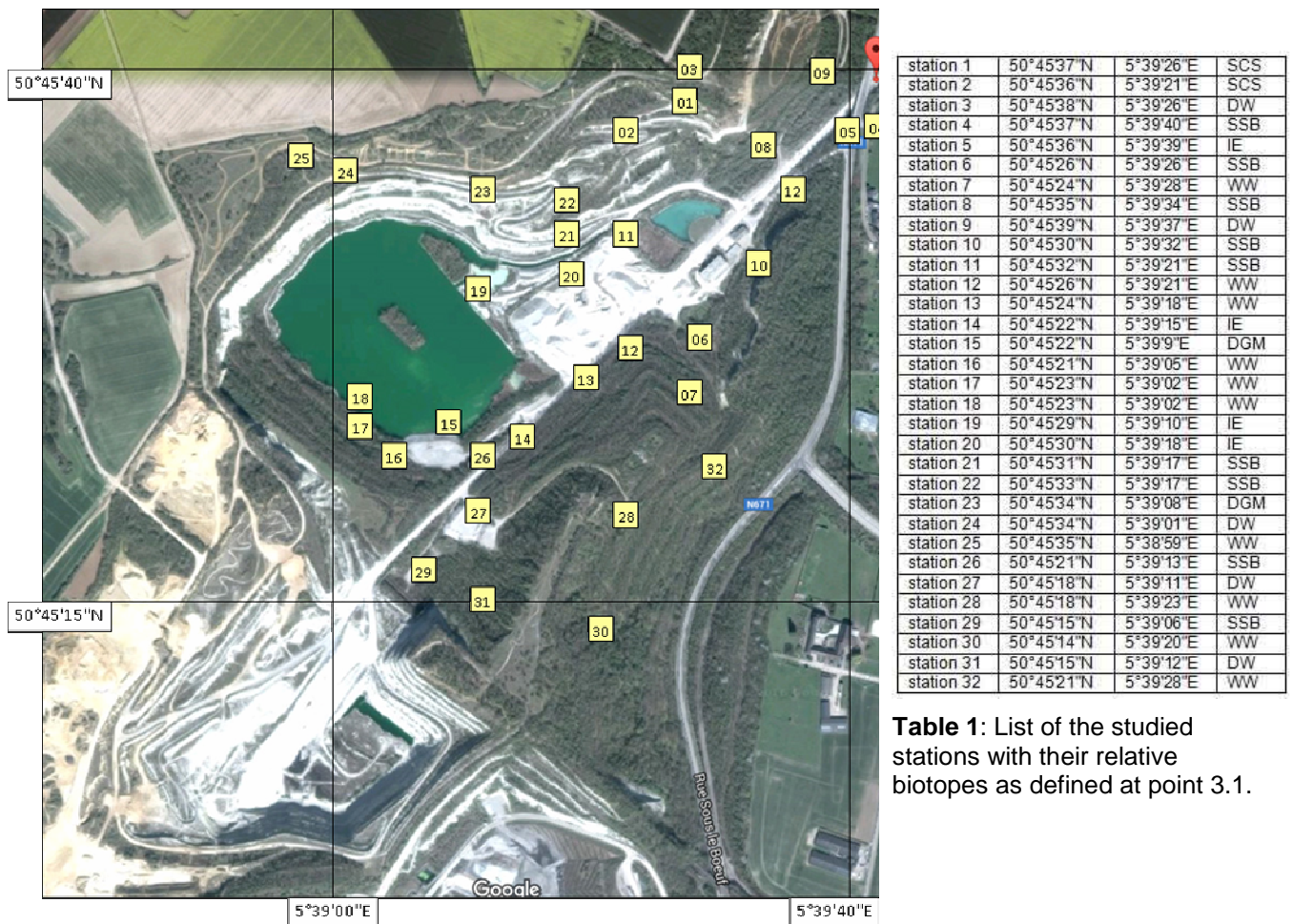


Table 1: List of the studied stations with their relative biotopes as defined at point 3.1.

Figure 4: Map with stations location (background from Google Map).

These 32 stations were studied during 7 explorations, following this timing: 15/4/2016: stations 1,2,3; 30/4/2016: stations 4,5,6,7; 14/5/2016: stations 8,9,10,11; 29/5/2016: stations 12,13,14,15,16,17,18,19,20; 13/7/2016: stations 21,22,23,24,25; 6/8/2016: stations 26,27,28,29; 20/8/2016: stations 30,31,32



Figure 5: Some landscapes views in the Loën quarry

A. Station 29. B. stn 11. C. stn 31. D. stn 21. E. Entrance of the CBR Loën quarry. F. stn 23 with perspective to stn 16-17-18. G. stn 28. H. stn 11. I. stn 22 with perspective to stn 1 & 2.

Typically, we plan a study of about half an hour to **one hour per station**. Some stations were explored in the springtime, other in the summertime These dates are interesting to know because one find usually more **juvenile** and **subadult** samples during the first months after the wintertime than in the later summer months.

3.3 Way to explore each land and/or freshwater station

The methodology used by the malacologists in a snail exploration may be summarized as follow. At each station:

- 1) geographic coordinates (field GPS), height, type of soil and plants, characterization of the different biotopes sites (most often a single one), weather and temperature;
- 2) exploring plants, trees, soils, rocks, litters OR ponds and streams with aquatic plants, emerged stones, banks;
- 3) preliminary identification of observed species (using scientific systematics), photograph living animals on the field, picking empty shells, codification (living/dead, adult/subadult/juvenile, ...) (fig. 6);
- 4) collecting litter OR mud especially important for small (even minute) land/freshwater species.
- 5) at home (fig. 6), one can fix the final identifications of collected shells, using known studies and photographs, comparison with existing data, sieving litter/mud collection.

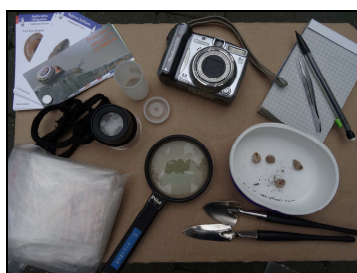
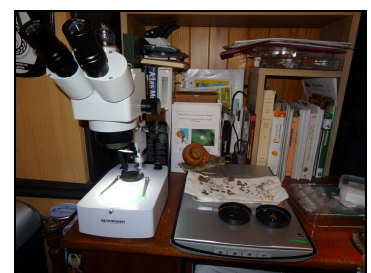


Figure 6:
Panel examples of materials used for this study



3.4 Data and photographs management

An accurate attention is needed to manage all these data:

- * clearly, management of the data, photographs and shells (using an information database).
- * also, summary of the systematics study and possible observed correlation between species and soils/waters/biotopes, leading to possible statistical exploitation (e.g. Multiple Correspondence Analysis - MCA).

4. The results

4.1 The observed species

We observed **38 molluscs species in the quarry of Loën**. These observed species are listed here under (yellow background means "slug" and blue one means "freshwater"). We only mention the scientific names and the corresponding French and English vernacular names (see annexes 1 and 2 for a more accurate systematics

with names of the author(s) of the species and additional German and Dutch vernacular names - we have clearly no place enough here for these details).

| Scientific name | English vernacular name | Nom vernaculaire français | Stations where observed |
|--|---------------------------|---------------------------|---|
| <i>Aegopinella nitidula</i> | Smooth Glass Snail | Grande luisantine | 5,9,10,17,30,32 |
| <i>Aegopinella pura</i> | Clear Glass snail | Petite luisantine | 25 |
| <i>Arion ater</i> | Large Black slug | Arion noir | 9,10,12,17,22,27 |
| <i>Arion hortensis</i> | Garden Arion | Limace des jardins | 8,17,28 |
| <i>Arion rufus</i> | Marge Red Slug, | Arion rouge | 5,9,22,25,26,31,32 |
| <i>Arion silvaticus</i> | Forest Arion | Arion des bois | 12,13 |
| <i>Arion vulgaris</i> | Vulgar slug, Spanish slug | Loche méridionale | 4,5,6,7,10,11,12,13,15,17,18,20,21,22,26,27,28,30,31,32 |
| <i>Boettgerilla pallens</i> | Worm Slug | Limace vermiforme | 9,10 |
| <i>Carychium tridentatum</i> | Herald Snail | Auriculette commune | 30 |
| <i>Cepaea hortensis</i> | White-lipped Grove Snail | Escargot des jardins | 4,5,6,7,9,10,11,12,18,26,28,30,31,32 |
| <i>Cepaea nemoralis</i> | Brown-lipped Snail | Escargot des haies | 1,5,24,25 |
| <i>Cernuella neglecta</i> | Neglected Dune snail | Hélice négligée | 1,2,5,8,9,10,12,15,18,21,22,23,24,26,27,29,31,32 |
| <i>Clausilia bidentata</i> | Door Snail | Clausilie noirâtre | 6,7,10,17,18,22,25,26,27,28,30,31 |
| <i>Clausilia parvula</i> | Door Snail | Clausilie naine | 1,2,5,8,9,10,11,17,21,22,23,25,27,31 |
| <i>Cochlicopa lubrica</i> | Slippery Teardrop Snail | Bulime brillant | 9,10,24,32 |
| <i>Cochlicopa lubricella</i> | Least Slippery Snail | Petite brillante | 9 |
| <i>Cochlodina laminata</i> | Plaited Door Snail | Clausilie lisse | 4,5,9,10,11,30,32 |
| <i>Deroceras invadens</i> | Longneck Field Slug | Loche maltaise | 10,12,13,30 |
| <i>Deroceras reticulatum</i> | Netted Slug | Limace réticulée | 9,10,12,13,30,32 |
| <i>Discus rotundatus</i> | Garden Disk Snail | Hélice bouton | 4,5,9,10,17,21,22,23,24,25,26,28,29,30 |
| <i>Eucobresia diaphana</i> | Ear-shaped glass snail | Vitrine transparente | 1,30 |
| <i>Helicella itala</i> | Heath Snail | Hélice des bruyères | 2,5,8,9,10,21,22,24,27,28,29,32 |
| <i>Helix pomatia</i> | Roman Snail | Escargot de Bourgogne | 1,6,8,10,17,20,22,24,25,26,27,28,29,30,31 |
| <i>Limax maximus</i> | Tiger Slug | Limace tigrée | 1,25 |
| <i>Macrogastra attenuata lineolata</i> | Lined Door Snail | Clausilie linéolée | 17 |
| <i>Macrogastra rolpheii</i> | Rolph's Door Snail | Clausilie de Rolph | 1,17,25,32 |
| <i>Merdigera obscura</i> | Lesser Bulin | Bulime obscur | 2,10,22,25,28,31 |
| <i>Monacha cartusiana</i> | Cartusian Snail | Hélice chartreuse | 9,10,23,25,27,29 |
| <i>Monachoides incarnatus</i> | Incarnate Snail | Moine des bois | 7,8,9,28,29,30,32 |
| <i>Oxychilus cellarius</i> | Cellar Glass Snail | Zonite des caves | 10,22,24,30 |
| <i>Oxychilus draparnaudi</i> | Draparnaud's Snail | Grande Zonite | 2,5,8,10,22,26,28,32 |
| <i>Oxyloma elegans</i> | Pfeiffer's Amber Snail | Ambrette élégante | 5 |
| <i>Pomatias elegans</i> | Round-mounted Snail | Cyclostome géant | 5 |
| <i>Potamopyrgus antipodarum</i> | Jenkin's Spire Snail | Hydrobie des Antipodes | 3,17 |
| <i>Pupilla muscorum</i> | Moss Chrysalis Snail | Maillot des mousses | 2,23,24 |
| <i>Trochulus hispidus</i> | Hairy Hygromia | Hélice veloutée | 1,2,5,9,10,17,25,28,30 |
| <i>Vallonia costata</i> | Ribbed Snail | Vallonie à côtes | 25 |
| <i>Vitrea crystallina</i> | Crystal Snail | Zonite cristallin | 32 |

Of course, such a list needs illustrations to visualise what kind of animals we are talking about. The 4 following plates (figs. 7-10) are provided for this purpose (much more explanations are also available on the web site <http://www.quarrylifeaward.be/projects/benelux/land-and-freshwater-snails-too-poorly-known-fauna-quarries>).



Figure 7: Some shelled gastropods found in the Loën quarry

A. *Helicella itala*. B-D. *Cepaea hortensis*. E *Monacha cartusiana*. F. *Clausilia bidentata*. G. *Oxyloma elegans*. H. *Oxychilus draparnaudi*. I. *Clausilia parvula*. J. *Carychium tridentatum*. K. *Merdigera obscura*. L *Cochlicopa lubrica*. M. *Helix pomatia*. N. *Aegopinella pura*. O. *Oxychilus cellarius*. P. *Aegopinella nitidula*. Q. *Cernuella neglecta*. R. *Discus rotundatus*. S. *Pomatias elegans*. T *Macrogaster lineolata*. U. *Macrogaster rolpheii*. V. *Trochulus hispidus*. W. *Eucobresia diaphana*. X. *Cochlodina laminata*. Y. *Pupilla muscorum*.

4.2 Juveniles and spawns

Also important to notice: we observed many juvenile and subadult specimens, for snails as well as slugs. The same observation is right regarding clutches. This means clearly that **the quarry is considered by the molluscs as a quiet and sheltered area**, suitable for feeding, growing and **breeding**.

4.3 Freshwater species

We failed until now to find freshwater molluscs in the waters of the lake and pond, neither gastropods nor bivalves :-(! We have to say that these waters seem very inhospitable, without plants and with many floating chalk-like particles in them.

The only freshwater snail we have found is *Potamopyrgus antipodarum* (the Jenkin's Spire Shell), neither in the pond nor in the lake, but in temporary pools appeared after raining. Moreover, it is impossible to prospect the lake far from the banks, because the bottom sinks quickly and steeply.

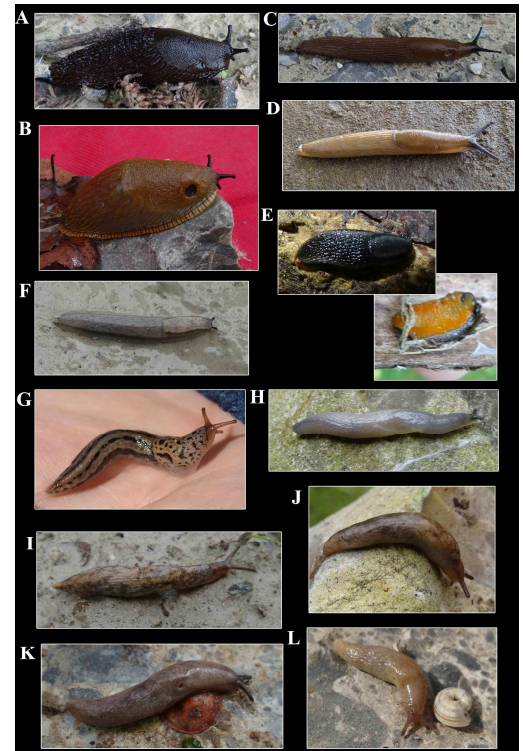


Figure 8: Some slugs found in the Loën quarry

A. *Arion ater*. B *Arion rufus*. C-D. *Arion vulgaris*. E. *Arion hortensis* and its yellowish sole. F. *Arion silvaticus*. G. *Limax maximus*. H. *Boetgerilla pallens*. I-J. *Deroceras reticulatum*. K-L. *Deroceras invadens*.

Clearly we needed help from a team of divers. In fact, such a contacted team could agree to explore the bottom of the main lake of the quarry. But the chief engineer of the quarry deny them any access to the lake, arguing that a firemen report establish that there was no visibility near the bottom. Although the divers told us that there was trained to dive in such trouble water, we had to give up. A fisherman also reported us the presence of "freshwater mussels" (*Anodonta* species), but it was clearly impossible to verify this assertion.



Figure 9: Shells of some gastropods found in the Loën quarry

A. *Helix pomatia* 39.5 x 36 mm. B. *Helicella itala* 8.3 x 14.5 mm. C. *Cernuella neglecta* 9.3 x 14.5 mm. D. *Monacha cartusiana* 8.4 x 13.2 mm. E. *Oxyloma elegans* 15.3 x 8.1 mm. F. *Aegopinella nitidula* 4.6 x 8.1 mm. G. *Aegopinella pura* 1.4 x 3.5 mm. H. *Oxychilus cellarius* 4.5 x 9.0 mm. I. *Oxychilus draparnaudi* 6.5 x 13.3 mm. J. *Pomatias elegans* 14.6 x 10.3 mm and juvenile 8.2 x 6.8 mm. K. *Clausilia rugosa parvula* 7.8 x 2.3 mm. L. *Clausilia bidentata* 11.0 x 2.3 mm. M. *Macrogastra rolphii* 12.7 x 3.3 mm. N. *Macrogastra attenuata lineolata* 14.2 x 3.7 mm. O. *Cochlodina laminata* 16.5 x 14.5 mm. P. *Merdigera obscura* 9.0 x 3.9 mm. Q. *Cochlicopa lubrica* 6.1 x 2.3 mm. R. *Pupilla muscorum* 3.5 x 2.1 mm. S. *Monachoides incarnatus* 9.8 x 14.5 mm. T. *Trochulus hispidus* 4.0 x 6.5 mm. U. *Discus rotundatus* 2.8 x 5.5 mm. V. *Cepaea hortensis* f. 12345 13.8 x 18.1 mm. W. *Cepaea hortensis* 00000 14.2 x 19.3 mm. X. *Vitrea crystallina* 1.1 x 3.2 mm. Y. *Carychium tridentatum* 2.1 x 0.8 mm. Z. *Vallonia costata* 1.0 x 2.3 mm.

4.4 Preliminary analysis of the results for land molluscs

The observed land species richness is very high for Western Europe habitats, **making Loën a very interesting sanctuary for malacofauna.**

The statistical analysis of cumulative curve shows that the species richness of Loën quarry is statistically estimated to 40 species, indicating that only 2 species should be discovered yet. This result underlines that our effort of prospection was very good because we have statistically observed 95% of the malacofauna.

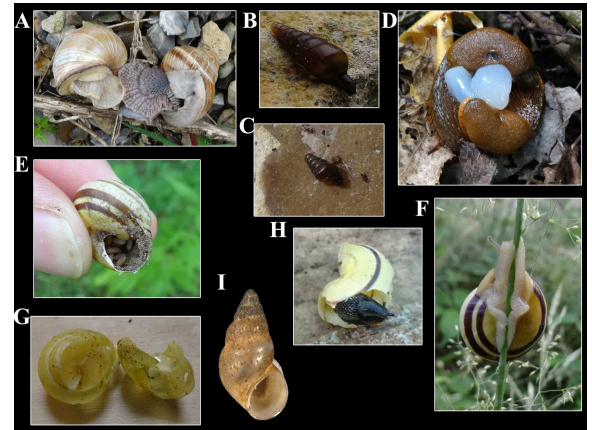


Figure 10: Miscellaneous

A. *Helix pomatia* ready to mate (20). B. *Cochlodina laminata* subadult. C. *C. laminata* juvenile. D. *Arion vulgaris* mating with spawn. E. Ants eggs inside a *Cepaea* shell. F. *Cepaea hortensis* with its foot around a plant stem. G. *Cepaea* shells probably broken by a thrush. H. *Arion hortensis* sheltering in a broken *Cepaea* shell. I. The only freshwater snail we have found : *Potamopyrgus antipodarum* (Gray, 1843).

Some species are more frequently observed (fig.12). The ubiquitous invasive species *Arion vulgaris* is not a surprise (62% of stations). *Cepaea hortensis* and *Discus rotundatus* are also two species largely spread in our region. *Helix pomatia*, *Clausilia rugosa parvula*, *Helicella itala* and *Cernuella neglecta* are species generally not very frequent even very rare for the last one. These species associated to limestone habitats are very widespread and frequent in the Loën quarry. The case of *Cernuella neglecta*, a rare species in our country, is largely observed in the quarry. At the opposite, **some species were very rarely observed**, sometimes only one times. This is true for species very difficult to observe because they live inside the soil (*Boettgerilla pallens*) or because they are very tiny (ex: *Vallonia*, *Carychium*, *Pupilla*). The case of *Macrogastra attenuata* is very interesting because this is a rare species in our country known just in some forest located in tributaries of the Meuse and in Montagne-St-Pierre. Localised in the station 17 in an isolated wood in the middle of the quarry, *M. attenuata lineolata* is perhaps a relictual population before exploitation.

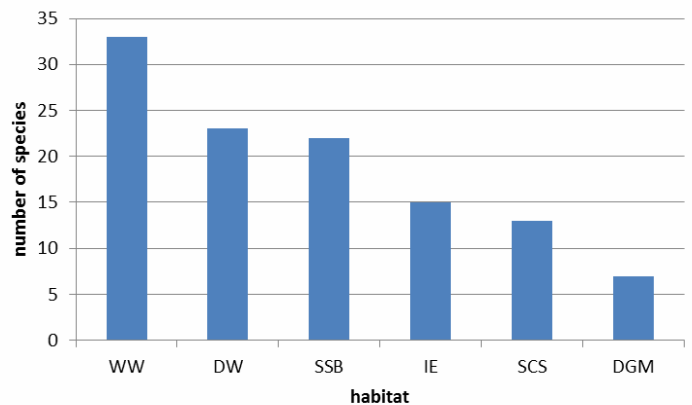
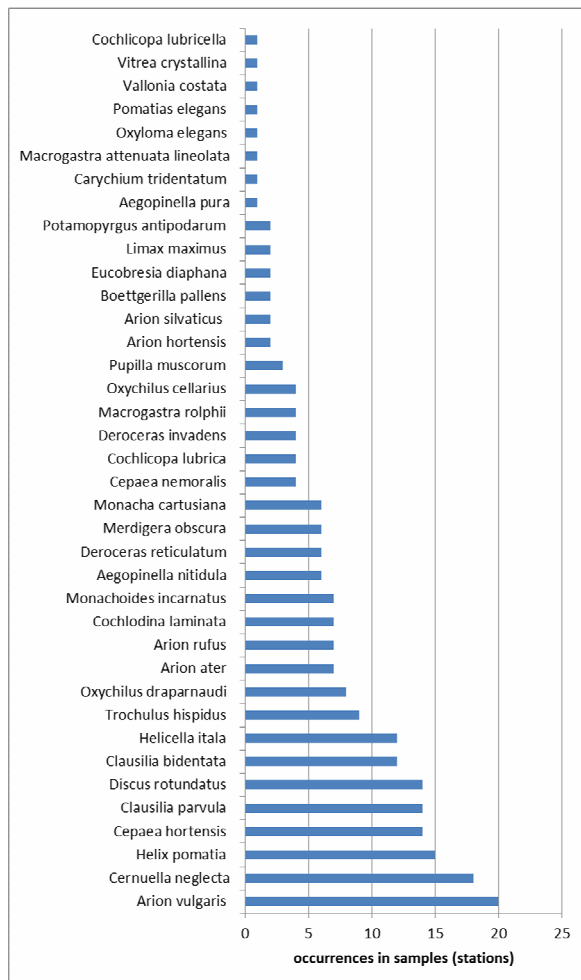


Figure 11: Species richness of the various biotopes

Studying the richness for the different categories of habitats (fig. 11), one can see that **more the habitat is rich in trees and more this habitat is humid, and more species can be observed**. With 33 species, wet woodlands welcome the most of species. However, some species of close habitats are sometimes observed out of their classical habitat like *Cernuella neglecta* or *Helicella itala* sometimes detected in woods in lower part of open areas. Sunny crest and slopes, and dry grasslands and meadows are the most poor. However, poor in species does not mean not interesting for the malacofauna. Some species live typical in these dry and sunny areas as *Cernuella neglecta*, *Helicella itala*, *Monacha cantiana*. *Pupilla muscorum* were observed **only in dry habitats**.

Figure 12 (left): Occurrences of each species per station

5. The final goal : educating the general public to malacology and biodiversity

Both associations taking part in this project would like to spread malacology, and more generally biodiversity protection questions, into the general public. Some different ways to achieve this goal are here considered.

5.1 Meetings and guided tours to discover malacofauna

One of the best ways to interest people to molluscs is to show this poorly known animals living in their biotopes. But to be successful, it is very important to find them during the walk. So, this approach must be performed in a rather small area having a rich malacofauna: the Loën quarry fit this requirement very well. It should be very interesting to propose from times to times such walks, demonstrating the high malacofauna interest of the site and, more generally, the good industrial practices that used here, leading to a high biodiversity level.

5.2 The main thing : books and booklets about snails and slugs for general public

Here come the main hopes for our project (fig. 13). In the same context, a booklet or a cheap **book about the malacofauna of the quarry of Loën** would certainly highly appreciated by the regional visitors and naturalists.

On another hand, the Belgian Malacological Society has already published booklets about the land and freshwater malacofauna of Belgium (5 booklets) and about common European land snails (4 booklets, the fifth one is in progress for next year). The first of them are already 7 years old and intended for malaco-beginners. So, we would like to update information (for instance, species coming from the South and new in Belgium, systematics changes, new ethological notes, ...) and propose to all the readers a true beautiful book about snails. Two tracks could be follow :

- ♦ a single **book about land and freshwater molluscs in Belgium** (with possibility to note new occurrences - maybe a kind of "snails network");
- ♦ another **book about the very European common land snails** one can meet when travelling in Europe for holidays (coming from everywhere) - let's call it "The common holidays snails" (or something like this).

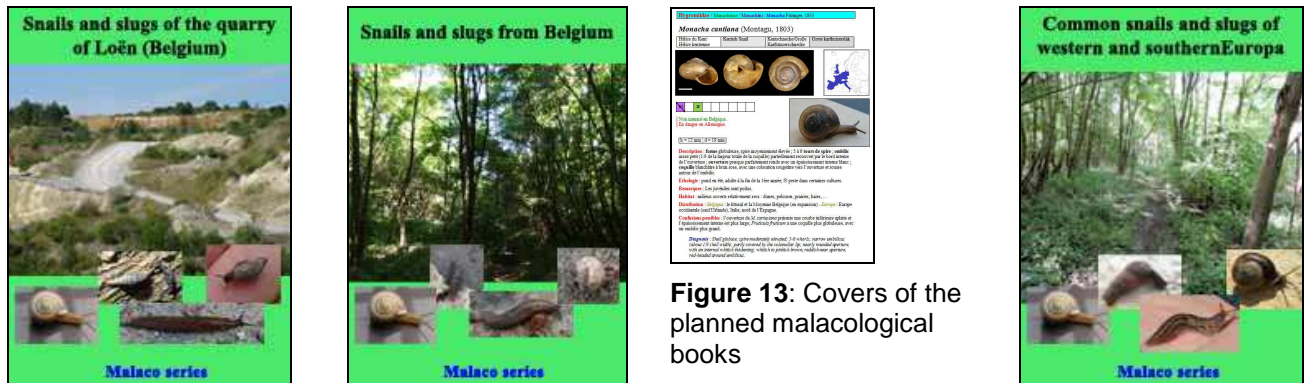


Figure 13: Covers of the planned malacological books

Regarding these books projects, we have contacted some Belgian and French editors, and even a specialized German one: when they answered (not all did it), they warned us they **such a books project could cost a few thousands euros**, that is clearly too much for our associations.

5.3 Adding malacofauna signs to the educational trail

There is already in the quarry of Loën a didactic path reserved for the general public. We would like to develop it by **adding new signs**, indicating by this way that **this structure is dynamic**. For this time, we would plan to make 2 or 3 additional signs explaining the main features about snails and slugs in the Loën quarry. They could look like this: So, the concluding message will be **"Welcome in a malaco-sanctuary"** ☺

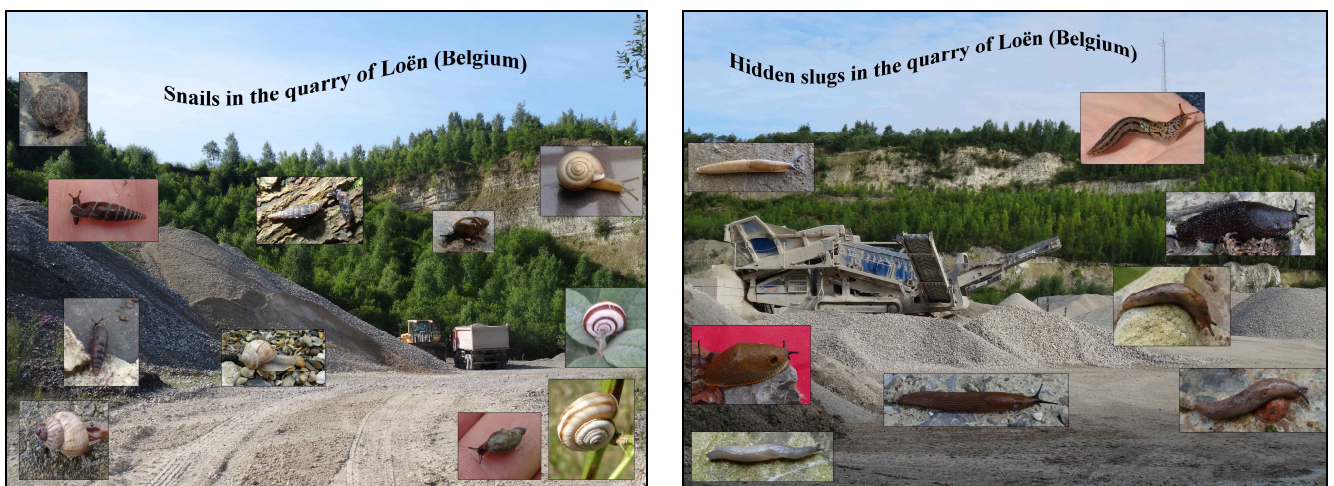


Figure 14: Two examples of signs to put in the quarry to make the general public discovers snails and slugs

| | |
|---|---|
| <p>Project tags (select all appropriate):</p> <p>This will be use to classify your project in the project archive (that is also available online)</p> | |
| <p>Project focus:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Biodiversity management <input type="checkbox"/> Cooperation programmes <input checked="" type="checkbox"/> Education and Raising awareness <input checked="" type="checkbox"/> Endangered and protected species <input checked="" type="checkbox"/> Invasive species <input type="checkbox"/> Landscape management - rehabilitation <input type="checkbox"/> Rehabilitation <input checked="" type="checkbox"/> Scientific research <input type="checkbox"/> Soil management <input type="checkbox"/> Urban ecology <input type="checkbox"/> Water management <p>Flora:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Conifers and cycads <input type="checkbox"/> Ferns <input type="checkbox"/> Flowering plants <input type="checkbox"/> Fungi <input checked="" type="checkbox"/> Mosses and liverworts <p>Fauna:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Amphibians <input type="checkbox"/> Birds <input type="checkbox"/> Dragonflies & Butterflies <input type="checkbox"/> Fish <input type="checkbox"/> Mammals <input type="checkbox"/> Reptiles <input type="checkbox"/> Spiders <input type="checkbox"/> Other insects <input checked="" type="checkbox"/> Other species | <p>Habitat:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Cave <input checked="" type="checkbox"/> Cliffs <input checked="" type="checkbox"/> Fields - crops/culture <input checked="" type="checkbox"/> Forest <input checked="" type="checkbox"/> Grassland <input checked="" type="checkbox"/> Human settlement <input checked="" type="checkbox"/> Open areas of rocky grounds <input type="checkbox"/> Recreational areas <input checked="" type="checkbox"/> Screes <input checked="" type="checkbox"/> Shrubs & groves <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Wander biotopes <input checked="" type="checkbox"/> Water bodies (flowing, standing) <input checked="" type="checkbox"/> Wetland <p>Stakeholders:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Authorities <input checked="" type="checkbox"/> Local community <input type="checkbox"/> NGOs <input type="checkbox"/> Schools <input type="checkbox"/> Universities |

Annexes

Annex 1: Full systematics of the observed species

Phylum Mollusca Cuvier, 1795
 Class Gastropoda Cuvier, 1795
 Subclass Orthogastropoda Ponder & Lindberg, 1995
 Superorder Caenogastropoda Cox, 1960
 Order Neotaenioglossa Haller, 1892
 Superfamily Littorinoidea Children, 1834
 Family Pomatiidae Newton, 1891
 Sous-Family Pomatiinae Newton, 1891
 Genus Pomatias S. Studer, 1789
 Pomatias elegans (O.F. Müller, 1774)
 Superorder Heterobranchia J.E. Gray, 1840
 Order Ectobranchia P. Fischer, 1884
 Suborder Acteophila Dall, 1885
 Superfamily Ellobioidea L. Pfeiffer, 1854 (1822)
 Family Carychiidae Jeffreys, 1830
 Genus Carychium Müller, 1773
 Subgenus Saraphia Risso, 1826
 Carychium (S.) tridentatum (Risso, 1826)
 Suborder Stylommatophora A. Schmidt, 1855
 Superfamily Succineoidea H. Beck, 1837
 Family Succineidae H. Beck, 1837
 Subfamily Succineinae H. Beck, 1837
 Genus Oxylooma Westerlund, 1885
 Subgenus Oxylooma Westerlund, 1885
 Oxylooma (O.) elegans (Risso, 1826)
 Superfamily Cochlicopoidea Pilsbry, 1900 (1879)
 Family Cochlicopidae Pilsbry, 1900 (1879)
 Genus Cochlicopa A. Férussac, 1821
 Cochlicopa lubrica (O.F. Müller, 1774)
 Cochlicopa lubricella (Rossmässler, 1834)
 Super-Family Pupilloidea Turton, 1831
 Family Valloniidae Morse, 1864
 Subfamily Valloniinae Morse, 1864
 Genus Vallonia Risso, 1826
 Vallonia costata (O.F. Müller, 1774)
 Family Pupillidae Turton, 1831
 Genus Pupilla Fleming, 1828
 Subgenus Pupilla Fleming, 1828
 Pupilla (P.) muscorum (Linnaeus, 1758)
 Super-Family Enoidea B.B. Woodward, 1903 (1880)
 Family Enidae B.B. Woodward, 1903 (1880)
 Subfamily Eninae B.B. Woodward, 1903 (1880)
 Tribe Multidentulini Schileyko, 1978
 Genus Merdigera Held, 1838
 Merdigera obscura (O.F. Müller, 1774)
 Super-Family Clausilioidea J.E. Gray, 1855
 Family Clausiliidae J.E. Gray, 1855
 Subfamily Aloiinae A.J. Wagner, 1913
 Tribe Cochlodini Lindholm, 1925 (1923)
 Genus Cochlodina A. Férussac, 1821
 Subgenus Cochlodina A. Férussac, 1821
 Cochlodina (C.) laminata (Montagu, 1803)

- Subfamily Clausiliinae J.E. Gray, 1855
 - Tribe Clausiliini J.E. Gray, 1855
 - Genus Macrogastra W. Hartmann, 1841
 - Subgenus Pseudovestia H. Nordsieck, 1977
 - Macrogastra (P.) rolphii** (Turton, 1826)
 - Subgenus Pyrostoma Vest, 1867
 - Macrogastra (P.) attenuata lineolata** (Held, 1836)
 - Genus Clausilia Draparnaud, 1805
 - Subgenus Clausilia Draparnaud, 1805
 - Clausilia (C.) rugosa parvula** (A. Férussac, 1807)
 - Clausilia (C.) bidentata** (Ström, 1765)
- Super-Family Punctoidea Morse, 1864
 - Family Patulidae Tryon, 1866
 - Genus Discus Fitzinger, 1833
 - Subgenus Gonyodiscus Fitzinger, 1833
 - Discus (G.) rotundatus** (O.F. Müller, 1774)
 - Super-Family Gastrodontoidea Tryon, 1866
 - Family Pristilomatidae T. Cockerell, 1891
 - Genus Vitrea Fitzinger, 1833
 - Vitrea crystallina** (O.F. Müller, 1774)
 - Family Oxychilidae P. Hesse, 1927 (1879)
 - Subfamily Oxychilinae P. Hesse, 1927 (1879)
 - Genus Oxychilus Fitzinger, 1833
 - Subgenus Oxychilus Fitzinger, 1833
 - Oxychilus (Ox.) cellarius** (O.F. Müller, 1774)
 - Oxychilus (Ox.) draparnaudi** (H. Beck, 1837)
 - Subfamily Godwiniinae C.M. Cooke, 1921
 - Genus Aegopinella Lindholm, 1927
 - Aegopinella pura** (Alder, 1830)
 - Aegopinella nitidula** (Draparnaud, 1805)
 - Super-Family Limacoidea Lamarck, 1801
 - Family Limacidae Lamarck, 1801
 - Subfamily Limacinae Lamarck, 1801
 - Genus Limax Linnaeus, 1758
 - Limax maximus** Linnaeus, 1758
 - Family Agriolimacidae H. Wagner, 1935
 - Subfamily Agriolimacinae H. Wagner, 1935
 - Genus Deroceras Rafinesque, 1820
 - Subgenus Deroceras Rafinesque, 1820
 - Deroceras (D.) invadens** Reise, Hutchinson, Schunack & Schlitt, 2011
 - Deroceras (D.) reticulatum** (O.F. Müller, 1774)
 - Family Boettgeriidae Van Goethem, 1972
 - Genus Boettgerilla Simroth, 1910
 - Boettgerilla pallens** Simroth, 1912
 - Family Vitrinidae Fitzinger, 1833
 - Subfamily Vitrininae Fitzinger, 1833
 - Genus Eucobresia H.B. Baker, 1929
 - Eucobresia diaphana** (Draparnaud, 1805)
 - Super-Family Helicoidea Rafinesque, 1815
 - Family Arionidae J.E. Gray, 1840
 - Subfamily Arioninae J.E. Gray, 1840
 - Genus Arion A. Férussac, 1819
 - Subgenus Arion A. Férussac, 1819
 - Arion (A.) rufus** (Linnaeus, 1758)
 - Arion (A.) ater** (Linnaeus, 1758)
 - Arion (A.) lusitanicus** J. Mabille, 1868

- Subgenus Carinarion P. Hesse, 1926
 - Arion (C.) silvaticus*** Lohmander, 1937
- Subgenus Kobeltia Seibert, 1873
 - Arion (K.) hortensis*** A. Férussac, 1819
- Family Hygromiidae Tryon, 1866
 - Subfamily Monachinae Wenz, 1930 (1904)
 - Tribe Monachini Wenz, 1930 (1904)
 - Genus Monacha Fitzinger 1833
 - Subgenus Monacha Fitzinger 1833
 - Monacha (M.) cartusiana*** (O.F. Müller, 1774)
 - Subfamily Hygromiinae Tryon, 1866
 - Tribe Trichiini Ložek, 1956
 - Genus Trochulus Chemnitz, 1786
 - Subgenus Trochulus Hartmann, 1840
 - Trochulus (T.) hispidus*** (Linnaeus, 1758)
 - Tribe Helicellini IHERING, 1909
 - Genus Helicella A. Férussac, 1821
 - Helicella itala*** (Linnaeus, 1758)
 - Tribe Hygromiini Tryon, 1866
 - Genus Cernuella Schlüter, 1838
 - Subgenus Xerocincta Monterosato, 1892
 - Cernuella (X.) neglecta*** (Draparnaud, 1805)
 - Tribe Leptaxini C. Boettger, 1909
 - Genus Monachoides Gude & B.B. Woodward, 1921
 - Monachoides incarnatus*** (O.F. Müller, 1774)
- Family Helicidae Rafinesque, 1815
 - Subfamily Helicinae Rafinesque, 1815
 - Tribe Helicini Rafinesque, 1815
 - Genus Cepaea Held, 1838
 - Subgenus Cepaea Held, 1838
 - Cepaea (C.) nemoralis*** (Linnaeus, 1758)
 - Cepaea (C.) hortensis*** (O.F. Müller, 1774)
 - Genus Helix Linnaeus, 1758
 - Subgenus Helix Linnaeus, 1758
 - Helix (H.) pomatia*** Linnaeus, 1758

Annex 2: Vernacular names of the snails and slugs observed in the quarry of Loën

The scientific name is of course the only right way to consider a species in an official paper. But in front of the general public, this is not the same: most people don't like the Latin names, finding them too difficult and clearly tedious. So, a good strategy is to use the vernacular names of snails and slugs (in the adequate language!), as do the botanists for the flowers or the entomologists for the insects. You can find here the list of these vernacular names for French, English, German and Dutch.

| Scientific name | Nom vernaculaire français | English vernacular name | Deutsch Mundart | Nederlandse landstaal naam |
|---|--|--|--------------------------------|--|
| <i>Aegopinella nitidula</i> (Draparnaud, 1805) | Grande luisantine | Smooth Glass Snail | Rötliche Glanzschnecke | Bruine blinkslak |
| <i>Aegopinella pura</i> (Alder, 1830) | Petite luisantine | Clear Glass snail | Kleine Glanzschnecke | Kleine blinkslak |
| <i>Arion ater</i> (Linnaeus, 1768) | Arion noir, Grande limace noire | Large Black slug | Große Schwarze Wegschnecke | Duistere wegslak |
| <i>Arion hortensis</i> A. Férussac, 1819 | Limace des jardins, Limace horticole | Garden Arion, Small striped Slug | Echte Garten-Wegschnecke | Zwarte wegsлаг |
| <i>Arion rufus</i> (Linnaeus, 1758) | Arion rouge, Grande limace rouge | Marge Red Slug, Chocolate Arion | Große Rote Wegschnecke | Rode wegsлаг |
| <i>Arion silvaticus</i> Lohmander, 1937 | Arion des bois | Forest Arion, Silver False-keeled Slug | Wald-Wegschnecke | Bos-wegsлаг |
| <i>Arion vulgaris</i> Moquin-Tandon 1855 | Loche méridionale | Vulgar slug, Spanish slug | Spanische Wegschnecke | Spaanse wegsлаг |
| <i>Boettgerilla pallens</i> Simroth, 1912 | Limace vermiforme | Worm Slug | Wurmnacktschnecke | Grijze wormnaaktslag |
| <i>Carychium tridentatum</i> (Risso, 1826) | Auriculette commune | Herald Snail | Schlanke Zwerghornschnecke | Slanke dwergsлаг |
| <i>Cepaea hortensis</i> (O.F. Müller, 1774) | Hélice jardinière, Escargot à bord blanc | White-lipped Grove Snail | Weißmündige Bänderschnecke | Witgerande tuinslag |
| <i>Cepaea nemoralis</i> (Linnaeus, 1758) | Escargot des haies, Escargot à lèvre brune | Brown-lipped Banded Snail | Schwarz-mündige Bänderschnecke | Zwartgerande tuinslag, Gewone tuinslag |
| <i>Cernuella neglecta</i> (Draparnaud, 1805) | Hélice négligée | Neglected Dune snail | Rotmündige Heideschnecke | Afgevlakte duinslag |
| <i>Clausilia bidentata</i> (Ström, 1765) | Clausilie noirâtre | Door Snail | Kleine Glanzschnecke | Vale clausilia |
| <i>Clausilia parvula</i> (Férussac, 1807) | Clausilie naine | Door Snail | Kleine Schließmundschnecke | Kleine clausilia |
| <i>Cochlicopa lubrica</i> (O.F. Müller, 1774) | Bulime brillant | Slippery Teardrop Snail | Gemeine Achatschnecke | Glanzende agaathoren |
| <i>Cochlicopa lubricella</i> (Rossmässler, 1834) | Petite brillante | Least Slippery Snail | Kleine Achatschnecke | Slanke agaathoren |
| <i>Cochlodina laminata</i> (Montagu, 1803) | Clausilie lisse | Plaited Door Snail | Glatte Schließmundschnecke | Gladde clausilia |
| <i>Deroceras invadens</i> Reise, Hutchinson, Schunack & Schlitt, 2011 | Loche maltaise | Longneck Field Slug, Tramp Slug | Mittelmeer-Ackerschnecke | Zwervende akkerslag |

| | | | | |
|--|--|----------------------------------|--------------------------------------|-------------------------------------|
| <i>Deroceras reticulatum</i> (O.F. Müller, 1774) | Limace réticulée | Netted Slug | Genetzte Ackerschnecke | Gevlekte akkerslak |
| <i>Discus rotundatus</i> (O.F. Müller, 1774) | Hélice bouton | Garden Disk Snail, Rounded Snail | Gefleckte Schüssel-schnecke | Boerenknoopje |
| <i>Eucobresia diaphana</i> (Draparnaud, 1805) | Vitrine transparent, Vitrine diaphane | Ear-shaped glass snail | Ohrförmige Glasschnecke | Oorvormige glasslak |
| <i>Helicella itala</i> (Linnaeus, 1758) | Hélice des bruyères, Hélice ruban | Heath Snail | Gemeine Heideschnecke | Heideslak |
| <i>Helix pomatia</i> (Linnaeus, 1758) | Escargot des vignes, Escargot de Bourgogne | Roman Snail | Weinberg-schnecke | Wijngaardslak, Gewone wijngaardslak |
| <i>Limax maximus</i> Linnaeus, 1758 | Limace cendrée, Limace Léopard | Tiger Slug, Spotted leopard Slug | Tigerschnegel | Tijgerslak |
| <i>Macrogaster attenuata lineolata</i> (Held, 186) | Clausilie linéolée | Lined Door Snail | Mittlere Schließmund-schnecke | Geribde clausilia |
| <i>Macrogaster rolpheii</i> (Turton, 1826) | Clausilie de Rolph | Rolph's Door Snail | Spindelförmige Schließmund-schnecke | Gekielde clausilia |
| <i>Merdigera obscura</i> (O.F. Müller, 1774) | Bulime obsur | Lesser Bulin | Kleine Turmschnecke | Donkere torenslak |
| <i>Monacha cartusiana</i> (O.F. Müller, 1774) | Hélice chartreuse | Cartusian Snail | Kartäuser-schnecke | Klein kartuizerslake |
| <i>Monachoides incarnatus</i> (Müller, 1774) | Moine des bois | Incarnate Snail | Rötliche Laubschnecke | Bos-loofslak |
| <i>Oxychilus cellarius</i> (O.F. Müller, 1774) | Zonite des caves, Hélice des celliers | Cellar Glass Snail | Keller-Glanzschnecke | Kelder-glansslak |
| <i>Oxychilus draparnaudi</i> (H. Beck, 1837) | Grande Zonite, Zonite des Draparnaud | Draparnaud's Snail | Große Glanzschnecke | Grote glansslak |
| <i>Oxyloma elegans</i> (Risso, 1826) | Ambrette élégante | Pfeiffer's Amber Snail | Schlanke Bernstein-schnecke | Slanke barnsteenslak |
| <i>Pomatias elegans</i> (O.F. Müller, 1774) | Cyclostome géant | Round-mounted Snail | Schöne Landdeckel-schnecke | Geruite rondmondhoren |
| <i>Potamopyrgus antipodarum</i> (J.E. Gray, 1843) | Hydrobie des Antipodes | Jenkin's Spire Snail | Neuseeländische Zwergdeckel-schnecke | Jenkin's waterhorentje |
| <i>Pupilla muscorum</i> (Linnaeus, 1758) | Maillot des mousses, Maillot mousseron | Moss Chrysalis Snail | Moos-Puppenschnecke | Mostonnetje |
| <i>Trochulus hispidus</i> £(Linnaeus, 1758) | Hélice veloutée, Hélice hispide | Hairy Snail, Hairy Hygromia | Gemeine Haarschnecke | Haarslak |
| <i>Vallonia costata</i> (O.F. Müller, 1774) | Vallonie à côtes | Ribbed Snail | Gerippte Grasschnecke | Jachtorenslakken |
| <i>Vitrea crystallina</i> (Müller, 1774) | Zonite cristallin | Crystal Snail | Gemeine Kristallschnecke | Grote Kristalslak |