THE SNAIL *MORLINA GLABRA* (GASTROPODA: OXYCHILIDAE), ALTHOUGH PREVIOUSLY UNREPORTED, IS WIDESPREAD THROUGHOUT BELGIUM AND AT LEAST PRESENT IN THE NETHERLANDS AND LUXEMBOURG

Louis Bronne[1] & Johann Delcourt[2,3]

[1]Natagora (NPO), Traverse des Muses 1, 5000 Namur, Belgium
[2]University of Liège, Department of Biology, Ecology and Evolution, Service of Behavioural Biology, Institut de Zoologie (I1), Quai Van Beneden 22, B-4020 Liège, Belgium
[3]University of Liège, High Fens Scientific Station (SSHF), rue de Botrange 137, B-4950 Robertville, Belgium

Abstract *The present paper reports the presence of living populations of* Morlina glabra *(Rössmässler, 1835) in the Benelux and gives a first glance at the extent of the range in the three countries. This species, originating mainly from southern European mountains, has been present since at least 2014 in Belgium and 2018 in the Netherlands but was previously misidentified, mainly by confusion with* Oxychilus navarricus helveticus*. It was presumably introduced accidentally by man and seems to have largely spread on its own in both artificial and natural habitats. We recommend a rapid assessment of the environmental risks of this non-native species with a high invasive potential.*

Key words Oxychilus glaber*, first record, non-native species,* Oxychilus navarricus helveticus*, citizen science, distribution*

Introduction

The main range of *Morlina glabra* (Rössmässler, 1835), formerly and still often known as *Oxychilus glaber* (Rössmässler, 1835), spreads from the Meseta Central (Spain) to the Peloponnese (Greece), running through the Eastern Pyrenees, the south of France, the Alps (France, Switzerland, Austria, northern Italy, Slovenia), the Carpathians (Austria, Czech Republic, Slovakia, Hungary, south of Poland, Romania, part of Ukraine, north of Croatia) and the Balkans (Bulgaria, Macedonia, Albania and Greece). The western coast of Galicia, the north of Portugal and the south of Italia (Sicily and Calabria) are also included within its distribution range, along with some disjunctive populations in southern Germany and on the Baltic Island of Gotland (Sweden) (Neiber, 2017).

In recent decades, new isolated occurrences have been found in six French departments (Vienne, Ille-et-Villaine, Bas-Rhin, Essonne, Seine-et-Marne and Aisne) (Gargominy, 2018), as well as in Nordrhein-Westfalen, Germany (Walther *et al.*, 2021). Although *M. glabra* was known in Belgium (Cucherat, pers. comm.), no publication had reported it yet in the Benelux. Amateur malacologists in Belgium and the Netherlands have then largely confused it with other Oxychilinae, in particular *Oxychilus navarricus helveticus* (Blum, 1881), the rarest of the four *Oxychilus* taxa known in those countries.

Contact author : louis.bronne@natagora.be

Material & methods

In a first step, shells and live individuals found by the authors were compared with the external description of all known species in the subfamily Oxychilinae to determine the potential alternative identifications (MolluscaBase, 2021; Welter-Schultes, 2012; Bourguignat, 1867; Brandt, 1958; de Winter, 1989; Falkner, 2008; Gittenberger, 2008; Gredler, 1885; Hesse, 1914; Kobelt, 1882; Lindholm, 1914; Martins, 1989; Martins, 2017; Martins & Ripken, 1991; Martins *et al.*, 2012; Neubert, 1998; Pallary, 1939; Riedel, 1962; Riedel, 1964; Riedel, 1966; Riedel, 1989; Riedel, 1995; Riedel, 1997; Walther & Neiber, 2018).

The pictures documenting the records of *O. n. helveticus*, *O. alliarius* (Miller, 1822) and undetermined *Oxychilus* on the respectively Belgian and Dutch citizen science portals Observations.be/Waarneming.be (Natagora *et al.*, 2021) and Waarneming.nl (Stichting Observation International & local partners, 2021) were checked in March 2021. All documented records of *Oxychilus* species in Belgium, the Netherlands

and Luxembourg on iNaturalist.org (iNaturalist, 2021) were checked on April 5th 2021. Some observers were keen to add useful pictures where needed. Field searches were conducted in March and April 2021 in the province of Hainaut (Belgium) and in the city of Luxembourg to confirm records, which were still lacking evidence. A targeted search was also conducted on April 5th 2021 in the very south of the Netherlands.

The photographed empty shells belong to the collection of the first author.

Results

At least 67 records of sightings – 65 in Belgium and 2 in the Netherlands – documented with pictures matching the external characteristics of *M. glabra* were found on the citizen science portals. The confusion with *O. n. helveticus* reached a high percentage (61%) as 57 of the 93 documented records of *O. n. helveticus* present on March 1st 2021 concerned in fact *M. glabra* (55/85 on Observations.be; 2/8 on Waarneming.nl). The first record in Belgium, from 2014, concerns empty shells and live animals. The 2021 searches in Luxembourg and in the Netherlands led to finding the first live individuals for both countries, and in large numbers. The 74 records are detailed in Table 1 and plotted on Fig. 1.

We summarize here the external key criteria, including comparison with *O. n. helveticus*, which is conchologically the closest species in North-West Europe (Fig. 2, Fig. 3). Shells of *O. n. helveticus* and *M. glabra* share an almost globular outline, and both are quite shiny, although this characteristic is more obvious in *M. glabra*. There is an overlap in their full-grown diameter and count of whorls: respectively 7–10(13) mm and 4.5–6 whorls for *O. n. helveticus*, and 12–15(18)mm and 5–5.5 whorls for *M. glabra* (Welter-Schultes, 2012). Nevertheless, shells of *O. n. helveticus* show a more yellowish tinge, a weaker suture, a rather smooth surface and a wider and conical umbilicus (1/8–1/7 of the diameter in adult shells). The whole body is generally paler than is the case with *M. glabra*. Shells of *M. glabra* are generally proportionally larger and more translucent; they show a typical uniform reddish-brown tinge, especially marked on live individuals, and have a marked suture and more marked growth lines, especially near the suture. Diameters at different whorl counts are: 5–6mm at 3 whorls, 8–8.5mm at 4 whorls, 13–14mm at 5 whorls (Welter-Schultes, 2012). The tiny, deep, and almost cylindrical umbilicus (about 1/12 of diameter) is the main diagnostic feature of *M. glabra* (Welter-Schultes, 2012; Riedel, 1969; Pintér, 1975). This combination of criteria could nevertheless also match *M. urbanskii*, which has a smaller and proportionally higher shell than *M. glabra* (Welter-Schultes, 2012; Riedel, 1963; Riedel & Maassen, 1993). In both *Morlina* species, the external colour of the soft body is dark slate blue with lighter flanks. However in *M. glabra*, the sole shows a sharp contrast between the whitish central stripe and the slate blue edges, whereas in *M. urbanskii*, the central stripe is barely paler than the edges (Riedel, 1969; Kerney & Cameron, 1979), as is the case for *O. n. helveticus* (Welter-Schultes, 2012; Adam, 1947; Giusti & Manganelli, 2002). Moreover, the distribution area of *M. urbanskii* is localized in Bulgaria and Turkey (Welter-Schultes, 2012). The main internal criterion is the presence, in the genus *Morlina* only, of a strong and diagnostic fold inside the distal part of the penis, ending up in an ear-shaped lobe and affecting the external shape of the penis (Riedel, 1963; Riedel, 1969; Altonaga, 1998; Walther *et al.*, 2021; Giusti & Manganelli, 2002)

Morlina glabra is reported to live in leaf litter of deciduous and coniferous forests, under stones and old logs (Welter-Schultes, 2012; Neiber, 2017), and on limestone scree slopes and rocks (Strätz, 2007). *Morlina glabra* is also frequently found in caves (Neiber, 2017). In the Benelux, individuals have been found in wall gaps or under stones and logs, mainly in deciduous tree forests and in rocky environments. Although most records come from disturbed areas, *M. glabra* is also present in natural sites of great biological interest (pers. obs.). When present, *M. glabra* generally seems to be, by far, the most numerous gastropod species. For instance, on a rainy day, mass emergences can be observed, with several tens or even hundreds of individuals in a few square metres (record 204710424, Fig. 2d).

Discussion

The confusion between *M. glabra* and *O. n. helveticus* is not new. Several authors of the 19th Century reported specimens found in the south-west of Wallonia (Belgium) as "*Zonites glaber* Stud". Adam (1947) checked the corresponding

Table 1 Photographic records of *Morlina glabra* corresponding to sightings made between April 2014 and April 2021 in the Benelux. The details and pictures of each record can be accessed by appending the id to the URL https://observation.org/observation/

First date	Place	Observer	Ids
2014/04/20	Esneux (BE) 50°30' N 5°33' E	Johann Delcourt	83585831
2015/05/23	Andenne (BE) 50°29' N 5°5' E	Johann Delcourt	102642383
2016/12/24	Esneux (BE) 50°32' N 5°33' E	Kurt Boux	133079394
2017/07/21	Esneux (BE) 50°32' N 5°34' E	Kurt Boux, Eric Wille	141888181, 173053780
2017/09/03	Amay (BE) 50°33' N 5°20' E	Ward Vercruysse, Louis Bronne	143975574, 188147825
2017/10/29	Liège (BE) 50°39' N 5°35' E	Louis Bronne	145463153, 156599345, 183244267
2017/11/01	Liège (BE) 50°37' N 5°35' E	Louis Bronne	145549398
2017/11/03	Trois-Ponts (BE) 50°22' N 5°52' E	Louis Bronne	145611955, 147571917
2017/11/19	Liège (BE) 50°39' N 5°36' E	Louis Bronne	145985139, 147006163, 208483801
2018/01/26	Liège (BE) 50°36' N 5°36' E	Louis Bronne	147970465
2018/02/03	Herstal (BE) 50°39' N 5°36' E	Louis Bronne	148187480
2018/03/14	Visé (BE) 50°46' N 5°41' E	Louis Bronne	149521466
2018/04/17	Namur (BE) 50°28' N 4°51' E	Louis Bronne	154800918
2018/05/18	Chaudfontaine (BE) 50°36' N 5°38' E	Louis Bronne	156791349
2018/07/21	Itteren (NL) 50°54' N 5°41' E	Arie Twigt	199930577
2018/10/10	Herstal (BE) 50°39' N 5°37' E	Louis Bronne	163381556
2018/11/21	Stavelot (BE) 50°23' N 5°52' E	Louis Bronne	164767415
2019/03/06	Aywaille (BE) 50°28' N 5°40' E	Pierre Bonmariage	168660955
2019/04/13	Liège (BE) 50°38' N 5°36' E	Louis Bronne	170103638
2019/05/03	Liège (BE) 50°36' N 5°36' E	Louis Bronne	171561154
2019/06/15	Esneux (BE) 50°31' N 5°34' E	Gabriel Casalanguida	174524694, 174520455
2019/12/12	Comblain-au-Pont (BE) 50°28' N 5°34' E	Kurt Boux	183105979
2020/02/04	Profondeville (BE) 50°22' N 4°52' E	Yolan Bosteels	185130577
2020/04/03	Namur (BE) 50°29' N 4°57' E	Xavier Vandevyvre, Thibaut Mariage	187728599, 206780029
2020/04/30	Gembloux (BE) 50°34' N 4°41' E	Quentin Goffette	190096861
2020/05/26	Olne (BE) 50°34' N 5°42' E	Louis Bronne	192465324
2020/07/20	Profondeville (BE) 50°23' N 4°52' E	Tello Neckheim	196751946
2020/07/21	Châtelet (BE) 50°23' N 4°31' E	Johann Delcourt	197220054
2020/07/24	Visé (BE) 50°43' N 5°41' E	Tello Neckheim	198960475
2020/08/22	Maastricht (NL) 50°53' N 5°42' E	Jan Koert	200636032
2020/10/16	Oupeye (BE) 50°41' N 5°38' E	Louis Bronne	201756268
2020/10/20	Chaumont-Gistoux (BE) 50°42' N 4°39' E	B. & A. Schretter	201982335, 202140011, 202150896, 202407523, 202449524, 202763094, 202770249, 203048443, 203220691, 203195320, 203365192, 204369410, 207324388
2020/10/20	Visé (BE) 50°41' N 5°40' E	Louis Bronne	202013597
2020/11/08	Villers-la-Ville (BE) 50°34' N 4°31' E	Françoise Lust	202953412
2020/11/14	Verviers (BE) 50°34' N 5°50' E	Louis Bronne	203237388
2020/11/27	Sprimont (BE) 50°32' N 5°37' E	Louis Bronne	203718686
2020/12/20	Verviers (BE) 50°35' N 5°50' E	Louis Bronne	204556033
2020/12/22	Verviers (BE) 50°34' N 5°49' E	Johann Delcourt	204710424
2020/12/26	Huy (BE) 50°30' N 5°11' E	Thibaut Mariage	204737212
2021/01/22	Ferrières (BE) 50°23' N 5°32' E	Louis Bronne	206276960, 206276973
2021/01/29	Pepinster (BE) 50°34' N 5°47' E	Louis Bronne	206560463

Table 1 (*Continued*)

First date	Place	Observer	Ids
2021/01/29	Pepinster (BE) 50°34' N 5°49' E	Louis Bronne	206560448, 206560464
2021/02/03	Saint-Nicolas (BE) 50°37' N 5°32' E	Louis Bronne	206757112
2021/02/16	Sprimont (BE) 50°30' N 5°38' E	Louis Bronne	207423183
2021/02/24	Yvoir (BE) 50°19' N 4°52' E	Fabian Deck	207821637
2021/03/13	Montigny-le-Tilleul (BE) 50°22' N 4°21' E	Johann Delcourt	208680930
2021/03/14	Fontaine-l'Évêque (BE) 50°22' N 4°20' E	Johann Delcourt	208685842
2021/03/17	Denderleeuw (BE) 50°52' N 4°3' E	Pierre Mannaert	208827896
2021/03/30	Tamines (BE) 50°26' N 4°37' E	Eliott Leclercq	209903034
2021/04/05	Maastricht (NL) 50°48' N 5°41' E	Johann Delcourt	210165064
2021/04/25	Luxembourg (LU) 49°36' N 6°7' E	Johann Delcourt	211887768

Figure 1 Red dots indicate photographic records of *Morlina glabra* corresponding to sightings made between April 2014 and April 2021 in the Benelux (see text and Table 1) and closest sightings in France (Cucherat, 2020) and Germany (Walther *et al.*, 2021).

Figure 2 (a–d) Live specimens of *Morlina glabra*: (a) Top view (record 204556033: Verviers, Belgium, December 20th 2020); (b) Apertural view, and (c) Bottom view, showing the tiny umbilicus and the sharp contrast between the whitish central stripe of the sole and the slate blue edges (record 208483801: Liège, Belgium, March 8th 2021). (d) A part of a mass emergence on a rainy day (record 204710424: Verviers, Belgium, December 22th 2020). (e–g) Live specimen of *Oxychilus navarricus helveticus* (Tinlot, Belgium, May 9th 2021): (e) Top view; (f) Apertural view; (g) Bottom view, showing the nearly unicoloured sole. Scales are in mm.

collections of shells (coll. Colbeau, Nyst and Van den Broeck) and explicitly wrote that he found no shell of *O. glaber* (Studer) (=*Morlina glabra*). Neither is *M. glabra* present in the checklists of the non-marine molluscs of Belgium published in 1960 and 1988 (Adam, 1960; Van Goethem, 1988), nor in the recent informal list of terrestrial gastropods of the Netherlands, Belgium and Luxembourg (Anonymous, 2018). It therefore seems highly probable that *M. glabra* is a recent newcomer in the three countries, presumably resulting from an accidental human introduction.

Figure 3 Empty shell of *Morlina glabra* found in Verviers, Belgium, January 29th 2021, and of *Oxychilus navarricus helveticus* found in Trois-Ponts, Belgium, November 11th 2017. Scale is in mm.

Similarly, Walther *et al.* (2021) established that the arrival in Hönnetal (Germany) took place after 2005, because such a large and locally numerous species would unlikely have been overlooked in the thorough searches conducted in 2002 and 2005. The spreading of *M. glabra* along the major valleys of Belgium (e.g. Meuse, Vesdre, Ourthe, Sambre) (Fig. 1) could nevertheless be due to later naturally occurring dispersion. Although *M. glabra* seems mainly associated with rocks and dead wood, individuals have also been found in or on alluvial soils (pers. obs.; records 199930577 and 200636032; Walther *et al.*, 2021).

The present work illustrates what Farah (2014) calls the Achilles' heel of citizen science, and of Observations.be in particular, namely the question of credibility of its data. But at the same time, it shows the possible use of properly documented records. Further targeted searches, especially along the Meuse in the Netherlands and in disturbed areas, would certainly extend the presented distribution area (Fig. 1). Meanwhile the recent records of *O. n. helveticus* without details, specimens of photographs should be viewed with great caution. Confusion has certainly taken place in some publications (e.g. Bronne & Van den Neucker, 2020). *M. glabra* is categorized as of Least Concern at global level (Neiber, 2017) but its conservation status varies depending on the country. For instance, it is categorized as Endangered in Germany, but with some new introduced populations (Walther *et al.*, 2021); as Near Threatened in Switzerland (Rüetschi *et al.*, 2012); and as of Least Concern in Austria (Reischütz & Reischütz, 2007), although it was previously categorized as Endangered (Frank & Reischütz, 1994). In the Carpathian Mountains, it is considered to be one of the most frequent species (Irikov & Mollov, 2006). In Wallonia (South Belgium), this species is experiencing a large expansion. The causes of this success remain unknown. Newly discovered in the Benelux, this alien species could already be considered as invasive. Its environmental risks should be quickly assessed (D'hondt *et al.*, 2014) in order to prevent potential damage in relatively pristine forests or rocky environments. The diet consists of parts of plants – live or dead – but also of juvenile snails (Welter-Schultes, 2012); *M. glabra* could then have a potential negative impact on the local malacofauna. There is also a high probability that this species will largely spread in Western Europe in the near future.

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