First record of a population of *Hygromia limbata* (Draparnaud, 1805) in the Benelux (Gastropoda: Hygromiidae)

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Key words: first record, Belgium, stone yard, invasive species, malacofauna.

A population of the Hedge snail *Hygromia limbata* was found in eastern Belgium (Lontzen) in March 2023. Live individuals of various age classes, along with numerous empty shells, were found in a residential area including two yards of a building materials shop. With other recent new sightings in the northern portion of its range, this find expands the distribution range of the species northwards. It also increases the list of terrestrial gastropod species of southern European origin settling in the Benelux.

INTRODUCTION

The genus *Hygromia* (Hygromiidae) is represented by four extant species. Two of them, *H. odeca* (Bourguignat, 1882) and *H. tassyi* (Bourguignat, 1884), are confined to the Pyrenees (Locard, 1882; Prieto & Puente, 1992; Welter-Schultes, 2012; MolluscaBase, 2024). Up to the mid-20th century, *Hygromia cinctella* (Draparnaud, 1801) was restricted to southeastern France, Italy and the eastern Adriatic Coast (Comfort, 1950). By 1950, its presence was noticed in Switzerland, Czechoslovakia, Hungary, and the UK, and by 1978 in Austria (Comfort, 1950; Fischer, 2010). Belgium was reached in 1994 (Van den Neucker & Scheers, 1994), the Netherlands and Germany in 1995 (Neckheim, 1996; Neiber & Haack, 2019), and Luxembourg in 2021 (https://www.inaturalist.org/observations/80749968). The populations in the Benelux are widespread nowadays (Delcourt & Vilvens, 2017; Gmelig Meyling et al., 2023; pers. obs.). New countries or regions are regularly being colonised across Europe and even worldwide, like the USA in 2004 (Michalak & Price, 2010) and New Zealand in 2015 (Salvador et al., 2022).

Hygromia limbata (Draparnaud, 1805) has not experienced such a spread as its counterpart. Its range is limited to northern Spain and western France and an introduced population present in southern England since 1917 (Kerney, 1999; Welter-Schultes, 2012). In the Benelux region, an empty shell had been discovered in Rixensart (Walloon Brabant, Belgium) in 2018 (Delcourt & Vilvens, 2019). Despite searches we conducted at the same locality in Rixensart (on 6.xii.2018, 9.v.2019 and 8.xii.2021), no live individuals or additional shells were found.

On 19.iii.2023 we located a population in Lontzen (50.7004 °N, 5.9773 °E) (Liège province, Belgium). At least thirteen live and active individuals, both adult and juvenile, and tens of shells were found around a block of houses including the yard of a building materials shop (Fig. 1). Most specimens were found in the ground vegetation, mainly ivy, *Hedera helix*, located at the edge of a garden in a strip of grass, and in another strip of grass between the fence surrounding the yard and the ditch running alongside the roadway. Other specimens were found beneath a cedar (*Thuya* sp.) hedge and within a concrete planter wall. The sightings spread over 200 m along the main roadway (N3) and over 100 m in the perpendicular street (Rosenstraße/rue des Roses). On 10.ii.2024, juvenile individuals were still observed in the area.

SYSTEMATICS

Class Gastropoda Cuvier, 1795
Superfamily Helicoidea Rafinesque, 1815
Family Hygromiidae Tryon, 1866
Genus *Hygromia* Risso, 1826
Subgenus *Riedelia* Schileyko, 1972

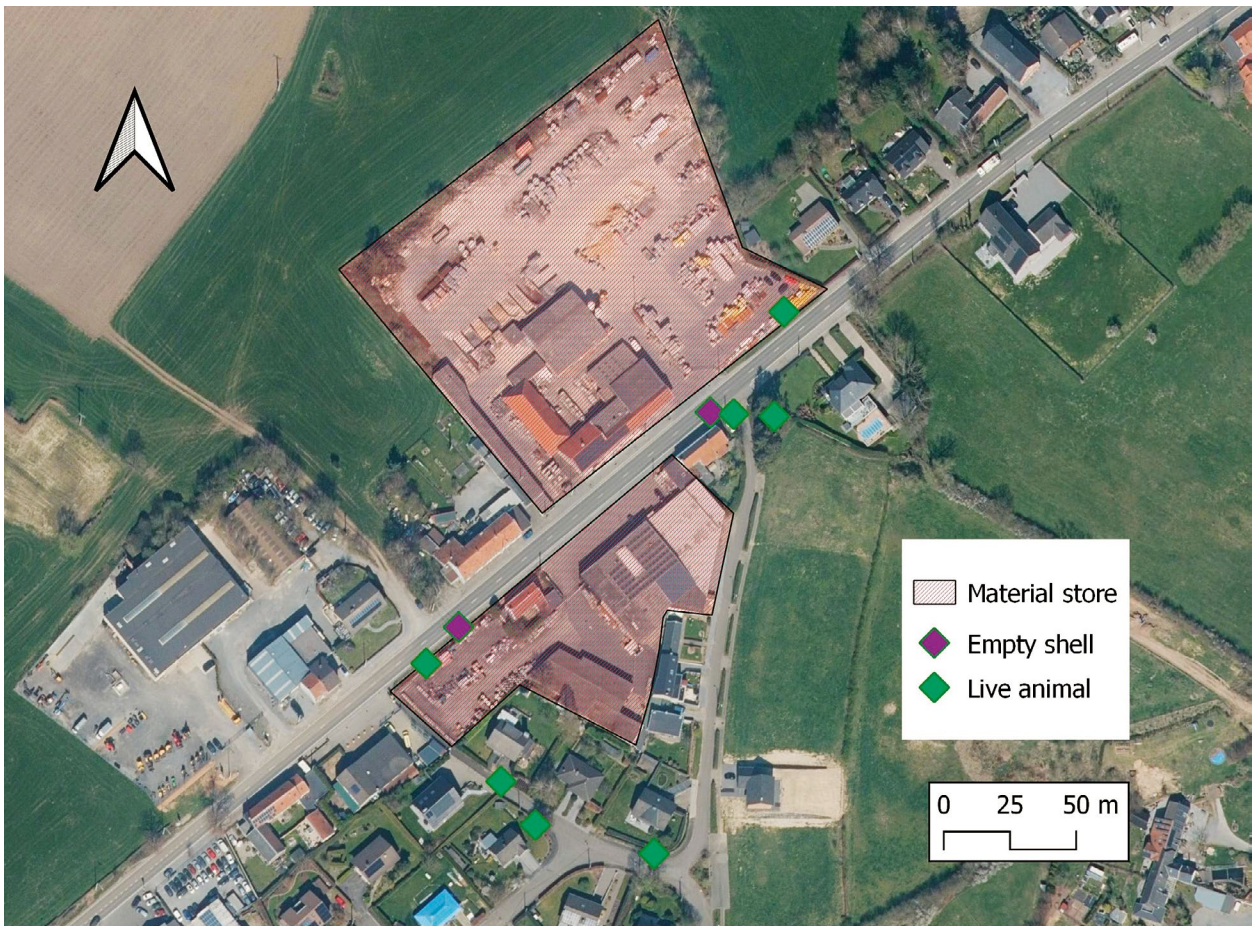

Fig. 1. Distribution of individuals of *Hygromia limbata* found in Lontzen, Belgium (March 2023).

***Hygromia* (*Riedelia*) *limbata* (Draparnaud, 1805)**
Figs 2-4

Shape of the shell (Figs 2-3). — The shell is globular or subkeeled, translucent, striated, with shallow suture, 5-6 whorls. The initial whorls are keeled. The last whorl slightly descends near the aperture, often exhibiting a white edge at the periphery. The aperture features a white lip inside, with a reflected margin. The umbilicus is very narrow to narrow (less than 1/10 of the shell width), and partly covered by the reflected columellar margin. The shell shares similarities with that of *Monachoides incarnatus* (O.F. Müller, 1774), but it lacks the reticular microsculpture (Kerney et al., 1999: 284; Welter-Schultes, 2012: 544).

The adult shells collected in Lontzen measure 9-10 mm in height and 11-14 mm in width. Published values include 9-11 and 11-16 mm (Schileyko, 2006: 1958), 9-11 and 12-17 mm (Kerney et al., 1999) and 8-14 and 12-17 mm (Welter-Schultes, 2012).

Colour. — The colour is similar to that of *H. cinctella*; the colour and opacity of the shell are variable. The colour range extends from lightcoloured animals with conspicuous spots visible through the light horn-coloured shell with a rust line running above the periphery (Fig. 2) to nearly black animal within a dark brown shell (Delcourt & Vilvens, 2019: fig 3). In all morphs, a white (or sometimes dark) line usually runs around the keel of the shell (Kerney et al., 1999; Welter-Schultes, 2012).

Genitalia (Fig. 4). — Within the genus *Hygromia,* the genitalia facilitate a clear identification of the subgenus. The subgenus *H.* (*Hygromia*) includes *H. cinctella*, and the subgenus *H.* (*Riedelia*) includes *H. limbata*, *H. tassyi* and *H. odeca* (MolluscaBase, 2024). The genitalia of the individual depicted in Fig. 2 were examined (Fig. 4). The long and slender penis, the very long epiphallus, the very long bursa copulatrix with a relatively short duct indicate the subgenus *Riedelia*. Two dart sacs arise from the vagina; the external one is typically slender and smaller than the internal one (Giusti & Manganelli, 1987; Prieto & Puente, 1992; Schileyko, 2006).

Distribution (Fig. 5). — During the Marine Isotope Stage 11 (403 ± 73 kyr, longest and warmest Interglacial period of the last 500 kyr), *Hygromia limbata* was present in the Somme Valley (Limondin-Lozouet & Antoine, 2006). In

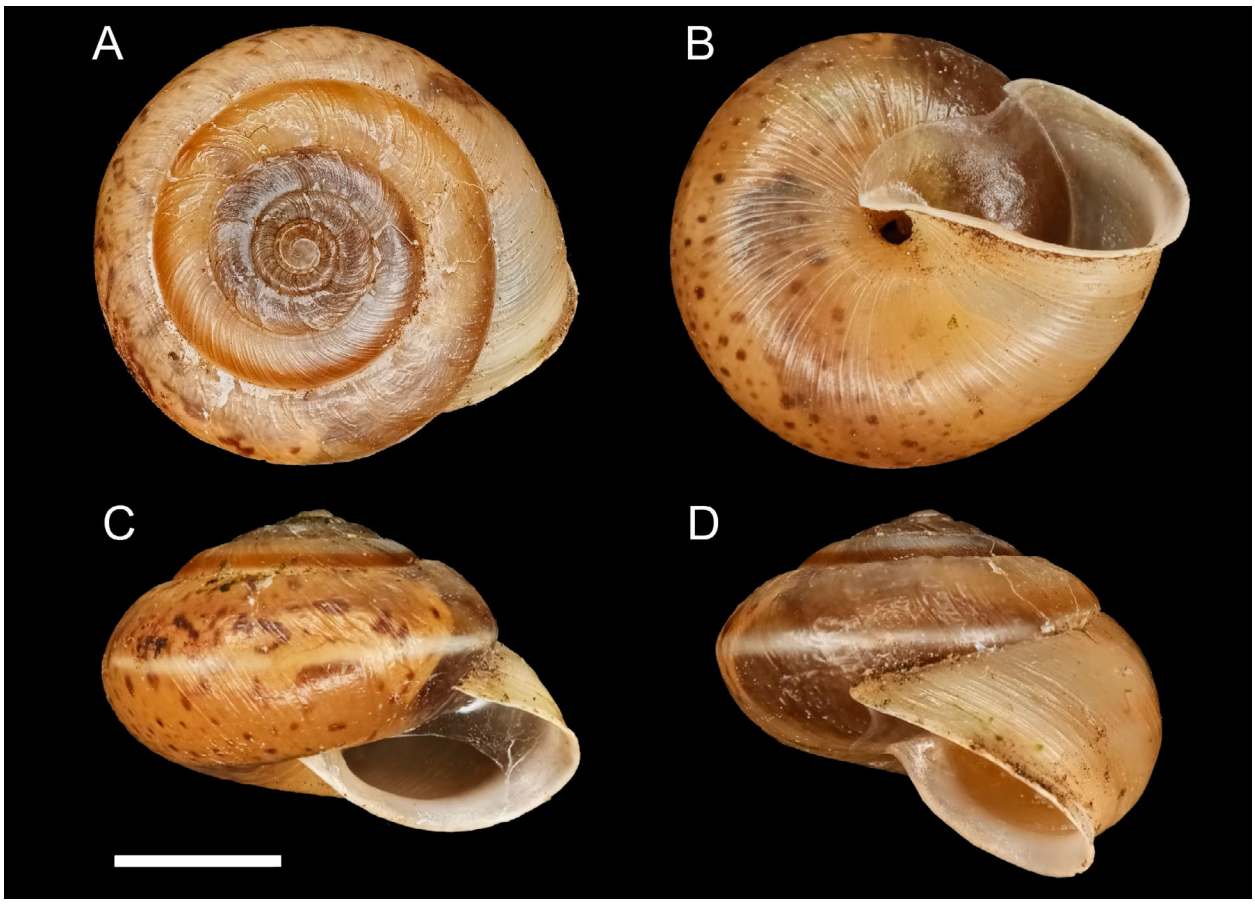

Fig. 2. Apical (A), basal (B) apertural (C), and lateral (D) views of an adult live specimen of *Hygromia limbata* collected in Lontzen (19. iii.2023). Scale bar: 5 mm.

the Holocene period (6.5 kyr ago), the species is mentioned from Normandy (Limondin-Lozouet & Preece, 2004).

The earliest historical mentions of *H. limbata* come from two localities in southwestern France ("Agénois et Sorézois") (Draparnaud, 1805) situated in the Atlantic biogeographic region. In fact, this species is recognised as a typical Atlantic species (Delcourt & Vilvens, 2019), with its current distribution ranging from northeastern Spain to western France (Fig. 5). Well-established introduced populations are also found in England (Prieto & Puente, 1992; Kerney, 1999; Welter-Schultes, 2012; Audibert & Bertrand, 2015).

Fig. 3. Live specimen of *Hygromia limbata* from Lontzen (19. iii.2023).

To plot the distribution (Fig. 5), we considered data available on GBIF (16 February 2024). Records outside of the range provided by Welter-Schultes (2012) were checked. Sightings documented with pictures were rejected in any case of doubt. Undocumented mentions were omitted if they were not considered certain or probable by their providers (Inventaire National du Patrimoine Naturel, 2017, 2021, 2022, 2023; Bristol Regional Environmental Records Centre, 2023; Conchological Society of Great Britain & Ireland, 2023; Leicestershire and Rutland Environmental Records Centre, 2021; South East Wales Biodiversity Records Centre, 2023; MNHN & Chagnoux, 2024). Please note that coordinate uncertainty may extend up to 80 km.

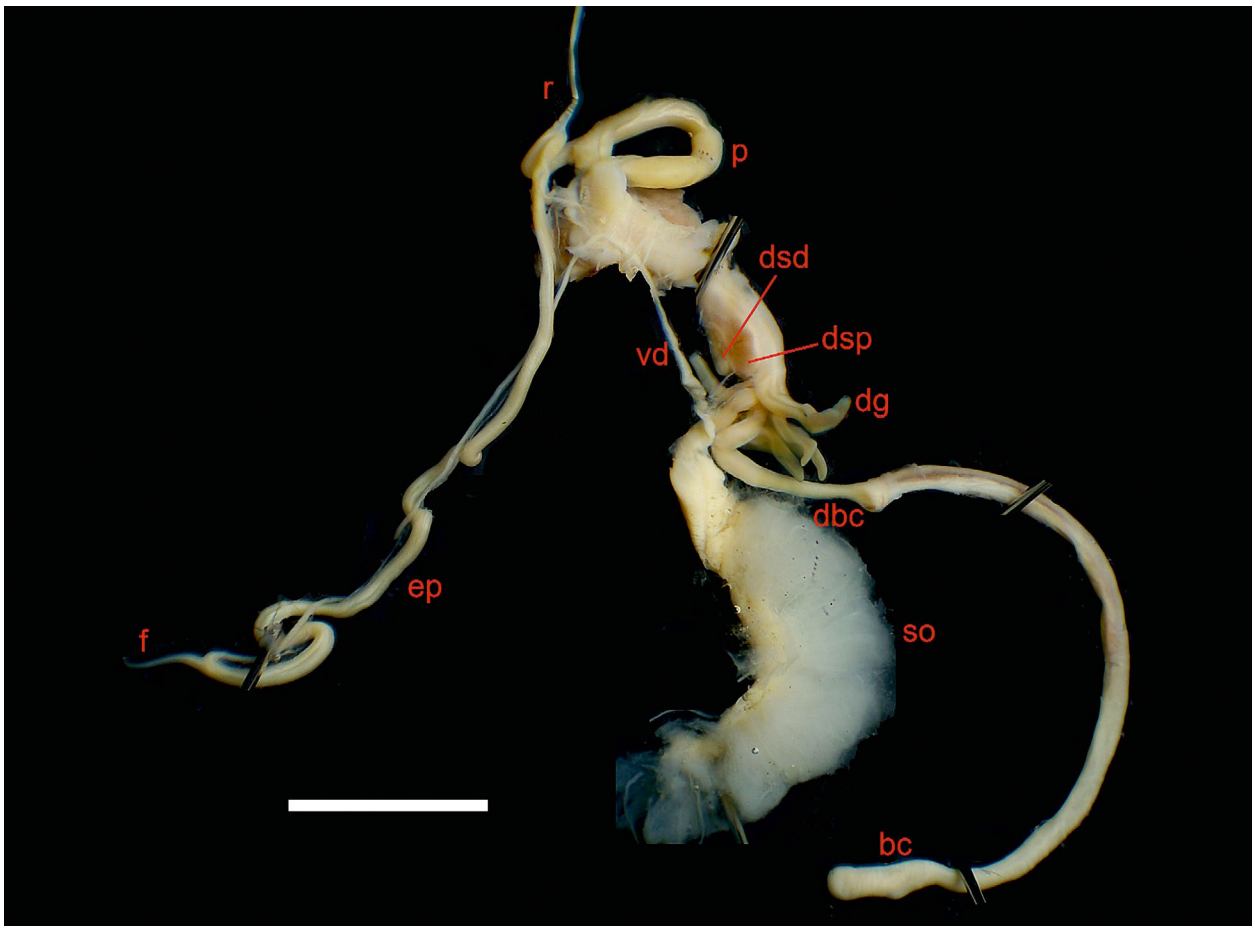

Fig. 4. Genitalia of the individual of *Hygromia limbata* depicted in Fig. 2. Organs have been displaced to show the key criteria. bc: bursa copulatrix; dbc: duct to bursa copulatrix; dg: digitiform glands; dsd: distal dart sac; dsp: proximal dart sac; ep: epiphallus; f: flagellum; p: penis; r: penial retractor; so: spermoviduct; vd: vas deferens. Scale bar: 5mm.

DISCUSSION

In Lontzen, the persistence of live individuals of *H. limbata* of different age classes found after two consecutive winters and their presence throughout an entire neighbourhood strongly suggest the establishment of a population, likely initiated several years ago. The habitat in Lontzen perfectly fits the description made by Kerney (1999) for English populations: "moist, grassy places, among herbage and ground litter on sheltered roadside banks, in overgrown ditches, old stone quarries and gardens." The evergreen plants (ivy, cedar) may have provided the snails with a relatively stable microclimate required by an oceanic species (Whitehead, 2008).

The localization of the population in Lontzen strongly suggests a human-assisted introduction. Different pathways are possible. The population could have been introduced with building material, as suggested by the presence of animals at the edge of the stone yards (on both sides of the road). The stone trade can be an important vector of translocation of land snails (Fischer & Reischütz, 2010; Michalak & Price, 2010) as highlighted by the recent find of seven species new to Belgium in stone yards (Bronne & Delcourt, 2024; Bronne et al., 2024). Interestingly, the wholesale yard where Bronne & Delcourt (2024) found six of the species new to Belgium supplies the building material reseller in Lontzen. The arrival of the closely related species *H. cinctella* in the Czech Republic is also supposed to have occurred via building material (Říhová & Juřičková, 2011).

Alternatively, the first specimens of *H. limbata* could have arrived in Lontzen attached to vehicle(s). This pathway has been suspected several times for *H. cinctella*, which is frequently found in car parks (Chatfield, 2009; Wimbleton, 2009; pers. obs.). The presence of *H. cinctella* on a car has also been witnessed by Gural-Sverlova & Andrik (2023) and by the first author. On 26.xi.2022 a live animal was found crawling on his car, parked in front of his garden. *Hygromia cinctella* had previously never been observed in or near this garden. The car had been used to visit sites with plenty of *H. cinctella* ten days before. The place of the first mention of *H. limbata* in Belgium, an auto repair shop, also sug-

gests a possible journey on a car (Delcourt & Vilvens, 2019). Finally, specimens of *H. limbata* in Lontzen could also have been imported with plants. Plant trade is a pathway known for numerous land snail species (Cowie & Robinson, 2003; Bergey et al., 2013; pers. obs.), including *H. cinctella* (Dedov et al., 2015).

Several land gastropod species originating from southern Europe arrived in and often became established in the Benelux in the last 30 years, including *Milax nigricans* (Philippi, 1836), *Hygromia cinctella* (Draparnaud, 1801), *Xerotricha apicina* (Lamarck, 1822), *Ferussacia folliculum* (Schröter, 1784), *Eobania vermiculata* (O. F. Müller, 1774), *Drusia valenciennii* (P. B. Webb & Van Beneden, 1836), *Morlina glabra* (Rossmässler, 1835), *Oestophora barbula* (Rossmässler, 1838), *Charpentieri itala* (G. von Martens, 1824), *Chilostoma cingulatum* (S. Studer, 1820) and *Xerotricha conspurcata* (Draparnaud, 1801) (i.e. Soes & De Winter, 2005; Mienis, 2006; Van den Neucker & Scheers, 2014; Soes, 2014; Sablon et al., 2017; Ronsmans & Van den Neucker, 2017; Keulen et al., 2018; Inden et al., 2020; Bronne & Delcourt, 2022; Gmelig Meyling et al., 2023; Bronne & Delcourt, 2024; Bronne et al., 2024). The arrival of *Hygromia*

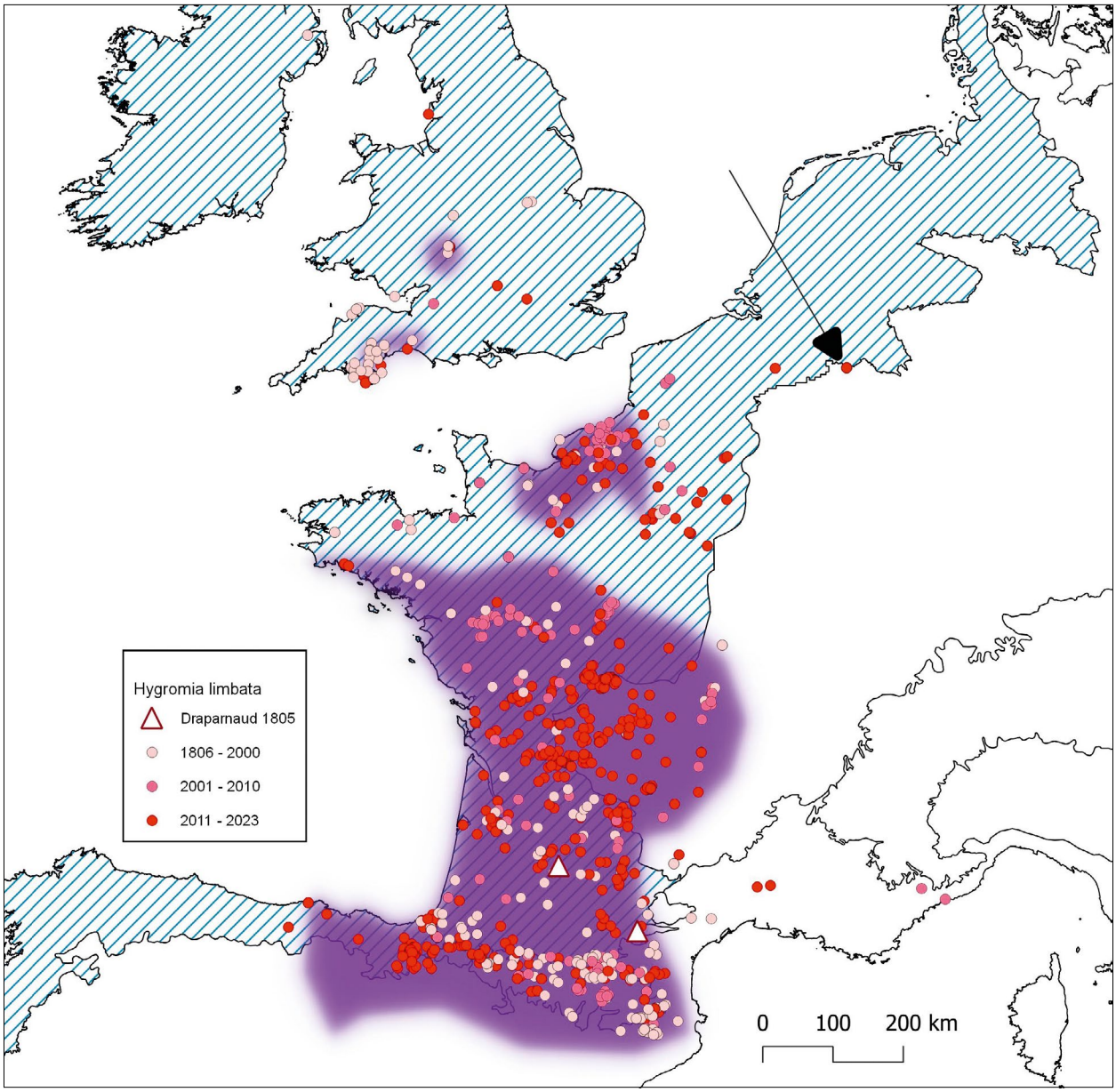

Fig. 5. Map of Western Europe, showing the limits of the biogeographic regions and the range of *Hygromia limbata*. The hatched area corresponds to the Atlantic biogeographic region. White triangles: locations mentioned by the descriptor of the species. Dots: reports of *H. limbata* (source: GBIF 16 February 2024, corrected, see text; Delcourt & Vilvens, 2019; our data). Violet area: range of *H. limbata* following Welter-Schultes (2012: 544). The arrow points to Lontzen.

limbata adds one species more to the list.

The mentions of *H. limbata* from 2008 onwards in northern France outside the range given by Welter-Schultes (2012) and the recent records in Belgium could indicate a northwards extension (Fig. 5). It is noticeable that all those northern reports fall within the Atlantic Biogeographic region. The comparison of the maps published by Kerney (1976, 1999) suggests that the species expanded its range in the UK in the last quarter of the 20th century. Data plotted in Fig. 5 even suggest that this extension may have continued in recent years. By contrast, the southern edge of the range, according to the Spanish data in Fig. 5, still roughly matches the distribution area published by Prieto & Puente (1992) and redrawn by Welter-Schultes (2012). Nevertheless, in southern France, a recent eastward extension seems also possible since the two easternmost points are from 2010.

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