

# LECTOTYPE DESIGNATION WITH TYPE LOCALITY RESTRICTION FOR *HELIX ABLUDENS*, LOCARD 1888, WITH NOTES ON THE TAXONOMY OF *TROCHULUS STRIOLATUS* (C. PFEIFFER, 1828) (GASTROPODA: HYGROMIIDAE)

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*Abstract* Trochulus is a genus of European land snail with a complex and disputed taxonomy and an intricate evolutionary history. Many species and subspecies were described only on the basis of shell morphology, which is highly variable, such that the shell morphology of many species and subordinate taxa appear to overlap that of others. In resolving the phylogeny and nomenclature of the genus, it is crucial to study type material, which is often not available. Examination of Locard's material from the Muséum national d'Histoire naturelle (MNHN) in Paris (France) led to the discovery of two specimens of *Helix abludens*, Locard 1888. This material is considered to belong to the original lot used by Locard to define his species, which was regarded as *Trochulus striolatus* subsp. *abludens* but recently discarded. In order to definitively clarify its identity and to stabilise the name, the best-preserved specimen is selected and designated herein as a lectotype. It is fully described and illustrated. The other specimen from the same lot becomes a paralectotype. This designation allows the restriction of the type locality to Boulogne-sur-Mer in the department Pas-de-Calais in France.

*Key words* Europe, nomenclature, *Trochulus striolatus*, type material, Paris

## INTRODUCTION

The systematics and taxonomy of land snails in the genus *Trochulus* Chemnitz, 1786 (Stylommatophora: Hygromiidae) have been a source of confusion and debate for more than a century (Falkner, 1982). Many species and subordinate taxa were described on the basis of shell morphology alone, and at a time when extreme splitting was commonplace (Dance, 1970). Conventional geographical constraints on designating subspecies were not developed (O'Brien & Mayr, 1991). The great variety of shell forms resulted in varying numbers of recognised species and subspecies allocated to one, two, three or six genera (Kerney *et al.*, 1983; Nordsieck, 1993; Procków, 2009; Bank, 2011; Neiber *et al.*, 2017). Within *Trochulus sensu stricto*, later works revealed a high degree of phenotypic plasticity in shell form (summaries in Procków *et al.*, 2017a, 2018). Coupled with molecular taxonomy, this has further compromised the status of subspecies (Kruckenhauser *et al.*, 2014) and the application of taxonomic conventions in any nomenclatural revision. Many original descriptions are

inadequate and lack figures; the type specimens of most taxa are not extant (Procków, 2009). The availability of names and the nature of the specimens referred to are thus obscured, which additionally causes difficulties in their reliable assignment.

During studies devoted to taxonomy of *Trochulus*, material borrowed from the Muséum national d'Histoire naturelle Paris, France (MNHN) included two shells labelled '*H. abludens*, Boulogne'. They come from Locard's collection of Invertébrés Marins et Malacologie. It is therefore possible to determine what is meant by *Helix abludens* Locard, 1888, treated as *T. striolatus abludens* in Falkner *et al.* (2001, 2002). Although the original description is quite detailed it lacks a figure and has been followed by contradictory later characterisations. Thus, while reintroducing the name *abludens* as a subspecies of *T. striolatus*, Falkner *et al.* (2002) used diagnostic features such as: larger shell, more depressed spire and wider umbilicus. This disagrees with Ellis's (1969) description based on smaller shell with often higher spire. Furthermore, both these descriptions are discordant with the original designation by Locard (1888), i.e. medium sized,

conical-subglobose shell, high spire and quite large umbilicus [“Coquille de taille moyenne, d’un galbe général conique-subglobuleux, ..., Spire haute, ..., Ombilic assez grand”]. No type material has been found for this nominal taxon.

Given the unstable state of *Trochulus* systematics and nomenclature, the name is potentially available. Thus, we present here both a detailed description of Locard’s specimens and designate a lectotype and type locality for *H. abludens* Locard, 1888. As the taxon is generally subsumed under *Trochulus striolatus* (C. Pfeiffer, 1828), a brief overview of its taxonomy is provided.

#### ON THE TAXONOMY OF *TROCHULUS STRIOLATUS* (C. PFEIFFER, 1828)

*T. striolatus*, like the type species of the genus, *T. hispidus* (Linnaeus, 1758), was originally placed in the genus *Helix* Linnaeus, 1758. Both species were later classified in the genus *Trichia* Hartmann, 1840 (Kerney *et al.*, 1983), but the ruling by ICZN, Opinion 2079 (BZN 61 (3) Sep 2004) resulted in replacing *Trichia*, which turned out to be a junior homonym of *Trichia* de Haan, 1839 (Crustacea: Brachyura), with *Trochulus* Chemnitz, 1786.

*T. striolatus*, like *T. hispidus*, shows much local variation in the size and shape of the shell (Naggs, 1985; Pročków, 2009; Pročków *et al.*, 2014), which led to the recognition of several separate species or subspecies (Locard, 1894; Ehrmann, 1933). Five subspecies were recognised in molluscan checklists (Falkner *et al.*, 2001; Bank & Neubert, 2017): (1) the nominal subspecies *striolatus* – a large flat form found in Germany, Switzerland, as well as eastern and south-eastern England (Ellis, 1926/1969; Falkner *et al.*, 2002), (2) *danubialis* (Clessin, 1874) – conical shell with a low spire and a very narrow umbilicus found along the Danube River, (3) *abludens* (Locard, 1888) – a medium-sized form, often with a higher spire, seemingly restricted to parts of the British Isles, France and Belgium (Ellis, 1926/1969; Moorkens & Speight, 2001; Falkner *et al.*, 2002; Cucherat & Demuyneck, 2006), (4) *juvavensis* (Geyer, 1914) – a remarkably small form known from Höllengebirge in Austria, and (5) *austriacus* (Mahler, 1952) – a form of varying shell sizes but with a higher spire and narrower umbilicus from mount Schlenken in Austria.

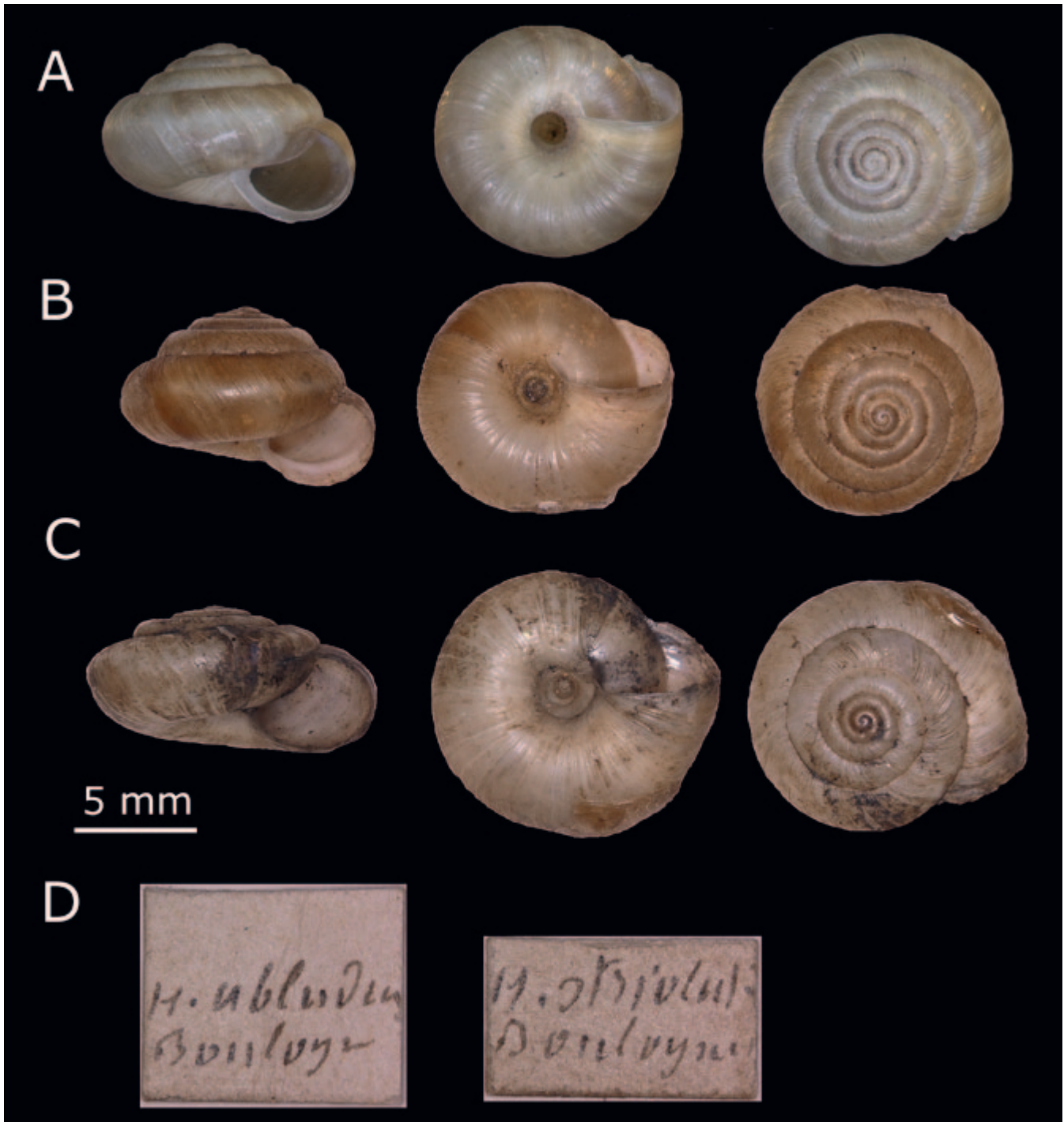
Even at an early stage, however, there were difficulties in allocating specimens among

these nominal taxa (Forcart, 1965; Naggs, 1985; Welter-Schultes, 2012). Shells were figured in original publications for only two taxa, namely *striolatus* and *danubialis*, making determination more difficult. High intrapopulation variation in shell morphology further complicates matters (Pročków *et al.*, 2017a). Recent studies confirm that there is insufficient evidence to support this infraspecific nomenclature; shell size and shape show great phenotypic plasticity in response to environmental variables (Pročków *et al.*, 2017a). Molecular data demonstrate that *T. striolatus* is a monophyletic clade, but the nominal subspecies are not clearly demarcated (Kruckenhauser *et al.*, 2014; Pročków *et al.*, 2014, 2017b, 2021).

#### THE STATUS OF *HELIX ABLUDENS* LOCARD, 1888

Despite the apparent lack of support for proposed subspecies within *T. striolatus*, the possibility that Locard’s name might be used if further work revealed distinctive clades within that species makes it beneficial to have a point of reference for the name. Locard (1888) had the initial problem of unpicking the confusion associated with the name *Helix altenana*, including: *Helix altenana* Gärtner, 1813, *Helix altenana* Kickx, 1830 and *Helix altenana* Klees, 1882. In fact, there was the only one name available, i.e. *Helix altenana* Gärtner, 1813 because two other ‘names’ were subsequent uses of *Helix altenana* Gärtner, 1813 (= currently *Euomphalia strigella* (Draparnaud, 1801)) (Kickx, 1830; Locard, 1882) and misidentifications without separate availability (ICZN 1999, Article 49). Thus, established *Helix abludens* Locard, 1888 was not a new replacement name, but an entirely new name (otherwise it would have adopted the name-bearing type of the replaced name).

In the original publication, Locard (1888) gave the description of habitat and distribution as follows: “HABITAT.— Peu commun; paraît vivre dans les mêmes milieux que l’*Hélix rufescens*. Nous l’avons observé: en Angleterre, dans l’île Jersey et aux environs de Dublin. En France, nous l’avons reconnu aux environs de Boulogne-sur-Mer, dans le Pas-de-Calais” [translation: HABITAT.— Not very common; appears to live in the same environments as *Helix rufescens*. We have seen it: in England, on Jersey Island and around Dublin. In France, we recognised it around Boulogne-sur-Mer, in Pas-de-Calais].



**Figure 1** Lectotype (A) and paralectotype (B) of *H. abludens* Locard, 1888. *H. striolatus* from Boulogne, Locard's collection (C). Handwriting samples from the Locard's labels are also provided (D).

They are located in three different countries: Great Britain, Ireland and France. Later the taxon was further recorded in Ireland and France (Nord and Pas-de-Calais departments), but without precise localities (Moorkens & Speight, 2001; Falkner *et al.*, 2002; Cucherat & Demuyneck, 2006). It is worth noting that *Helix rufescens* is a synonym of

*T. striolatus*. It is possible that “mêmes milieux” [the same environments] implies syntopic occurrence. Later records, and indeed Locard's own observations (see below) do not indicate a clear geographical separation from *T. striolatus*, and the varying criteria for identification referred to above add to the confusion. We therefore present

**Table 1** Shell measurements (in mm) of lectotype and paralectotype of *Helix abludens* Locard, 1888 and six specimens of Locard's collection of *T. striolatus* (C. Pfeiffer, 1828) from Boulogne-sur-Mer housed in MNHN, Paris. Total range of shell measurements of *Trochulus striolatus*\* according to Pročków et al. (2017a).

Features	<i>Helix abludens</i>		<i>Trochulus striolatus</i>				<i>Trochulus striolatus</i> * n=1251			
	lectotype	paralectotype	mean	sd	min	max	mean	sd	min	max
W – shell width	10.7	10.2	11.79	0.45	11.5	12.7	11.49	1.11	8.1	14.7
H – shell height	7.6	7.1	6.73	0.57	6.0	7.6	6.73	0.74	4.7	8.7
bwH – body whorl height	5.8	5.6	5.58	0.39	5.1	6.2	5.71	0.59	3.6	7.7
h – aperture height	4.0	3.8	4.21	0.24	4.0	4.7	4.20	0.51	2.7	6.0
w – aperture width	5.1	4.7	5.97	0.51	5.3	6.9	5.88	0.67	3.8	7.8
D – shell diameter	10.6	10.2	11.67	0.50	11.3	12.7	11.37	1.08	8.0	14.6
U – umbilicus diameter	2.0	1.8	2.00	0.26	1.6	2.4	1.87	0.37	0.9	3.5
whl – whorl number	6.1	6.2	5.8	0.19	5.5	6.0	5.69	0.25	5.0	6.5
H/W – shell height/width ratio	0.71	0.69	0.57	0.04	0.51	0.62	0.59	0.04	0.5	0.7
U/D – umbilicus relative diameter	0.19	0.18	0.17	0.02	0.14	0.21	0.16	0.03	0.1	0.3
bwH/H – relative height of body whorl	0.76	0.79	0.83	0.02	0.81	0.86	0.85	0.04	0.6	0.9
h/w – aperture height/width ratio	0.79	0.81	0.71	0.03	0.68	0.76	0.72	0.05	0.6	1.0

a full description and figure for the taxon, and designate a lectotype, using material obtained by the original author.

#### A LECTOTYPE FOR *HELIX ABLUDENS* LOCARD, 1888, WITH A REDESCRIPTION OF THE TAXON

##### Material

We examined two shells labelled '*H. abludens*, Boulogne' from Locard's collection (assigned G. p. 243), in the Invertébrés Marins et Malacologie collection in the Muséum national d'Histoire naturelle Paris, France. Additionally, in the same collection (G. p. 243) we found four lots of 1–2 shells (altogether 6 specimens); two of them labelled '*H. rufescens*, Boulogne-sur-Mer', one labelled '*Helix striolata*, Boulogne-sur-Mer' and one labelled '*H. striolata*, Boulogne'. Although, the specimens come from the same location, they cannot be regarded as original material for *Helix abludens* because of their assignment by Locard to other taxa (Fig. 1). The measurements show that these shells are generally larger and flatter with fewer whorls than the two *H. abludens* specimens (Table 1), whose dimensions are in accordance with those given by Locard (1888), i.e. shell height (H) 7–7.5mm, shell width (W) 10–11mm,

6 whorls. In more general terms, however, their shell morphology lies close to the *T. striolatus* mean for all characters (Table 1).

We have no reason to believe that the two shells labelled as *H. abludens* are not the original material used by Locard when describing the species. We therefore consider the whole material (two shells) to be syntypes. Only one specimen is in good condition, the second one is broken at the periphery. Thus, we choose and designate the best-preserved specimen as a lectotype (Fig. 1A, H=7.6mm, W=10.7mm) following the provisions of the International Code of Zoological Nomenclature (ICZN 1999, Article 74). The other specimen from the same lot becomes a paralectotype (Fig. 1B, 7.1mm, W=10.2mm; ICZN 1999, Article 74.1.3).

##### Type locality

Distribution of the species was originally described as Jersey, England, environs of Dublin (Ireland) and Boulogne-sur-Mer (dép. Pas-de-Calais, France). The only known type specimens that are the lectotype and paralectotype, designated herein, come from 'Boulogne'. Therefore, following the ICZN Article 76.2 (1999) we restrict the type locality of *H. abludens* to

Boulogne-sur-Mer in the department Pas-de-Calais, France.

#### *Type specimens*

Lectotype (Ref. no. coll. Locard G. p. 243, MNHN; Fig. 1A) and one paralectotype (Ref. no. coll. Locard G. p. 243, MNHN; Fig. 1B) are housed in Muséum national d'Histoire naturelle Paris, France. Their shell measurements are shown in Table 1.

#### *Lectotype description*

Shell conical-subglobular, subopaque, with darker and lighter irregular longitudinal bands that have no limited edges. Shell surface with irregular, slightly flexuous growth lines. Spire high and conical. Whorls 6.1, grow slowly and regularly, becoming barely more rapid in the last whorl, which is rounded. A narrow, paler band visible on the last whorl. Suture rather deep. Umbilicus large, visible to the top of the shell. Aperture slightly oblique, almost exactly rounded with whitish callus inside, visible throughout the periphery. Aperture margin thin and straight.

#### *Distribution*

Because of contradictory diagnostic features used in some studies (Ellis, 1969; Falkner *et al.*, 2002), previous identifications of this taxon are uncertain. Nominally, it occurs in the north-west of Europe including Ireland and northern France (Ellis, 1969; Moorkens & Speight, 2001; Falkner *et al.*, 2002; Cucherat & Demuyneck, 2006), but without precise locations.

### CONCLUSION

The designation of a lectotype for *Helix abludens* allowed us primarily to restrict and characterise the morphology of this taxon. A detailed quantitative characterisation of *T. striolatus* and its subspecies was done by Proćków *et al.* (2017a), and it is clear that *H. abludens* falls within this group. The morphological categorisation of type species is generally relevant as it is regarded necessary to select the key taxa to be employed for phylogenetic/molecular reconstructions at low taxonomic levels. With the correct taxa assignment, we hope that ongoing detailed phylogeographic analyses may help resolve the evolutionary history of *T. striolatus*.

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### REFERENCES

- BANK RA 2011 *Fauna Europaea*, version 2.4. Available from: <http://www.fauna-eu.org> (May 20, 2019)
- BANK RA & NEUBERT E 2017 *Checklist of the land and freshwater Gastropoda of Europe*. Last update: July 16<sup>th</sup>, 2017. Available from: <https://www.mollusca-base.org> (March 20, 2021)
- CUCHERAT X & DEMUYNECK S 2006 Catalogue annoté des Gastéropodes terrestres (Mollusca, Gastropoda) de la région Nord – Pas-de-Calais. *MalaCo, Le journal électronique de la malacologie continentale française* 2: 40–91.
- DANCE SP 1970 “Le fanatisme du nobis”: a study of J.-R. Bourguignat and the “Nouvelle Ecole”. *Journal of Conchology* 27: 65–86.
- EHRMANN P 1933 Mollusken (Weichtiere). In P. Brohmer, P. Ehrmann & G. Ulmer (eds) *Die Tierwelt Mitteleuropas, Vol. 2*. 1–264 Quelle and Meyer, Leipzig.
- ELLIS AE 1969 *British Snails*. 2<sup>nd</sup> Ed. Clarendon Press, Oxford, 298 pp.
- FALKNER G 1982 Zur Problematik der Gattung *Trichia* (Pulmonata, Helicidae) in Mitteleuropa. *Mitteilungen der Deutschen Malakologischen Gesellschaft* 3: 30–33.
- FALKNER G, BANK RA & VON PROSCHWITZ T 2001 Check-list of the non-marine Molluscan Species-group taxa of the States of Northern, Atlantic and Central Europe (CLECOM 1). *Heldia* 4: 1–76.
- FALKNER G, RIPKEN TEJ & FALKNER M 2002 *Mollusques continentaux de la France: Liste de Référence annotée et Bibliographie*. Muséum national d'Histoire naturelle, Paris, 350 pp.
- FORCART L 1965 New researches on *Trichia hispida* (Linnaeus) and related forms. *Proceedings of the first European Malacological Congress, 1962*, pp. 79–93.
- ICZN 1999 *International Code of Zoological Nomenclature, 4<sup>th</sup> Edition*. International Trust for Zoological Nomenclature, c/o The Natural History Museum, London, xxix +1–306 pp.
- KERNEY MP, CAMERON RAD & JUNGBLUTH JH 1983 *Die Landschnecken Nord- und Mitteleuropas*. Paul Parey, Hamburg und Berlin, 384 pp.
- KICKX J 1830 *Specimen inaugurale exhibens synopsis molluscorum Brabantiae Australi indigenorum*. Michel, Lovanii, 1–97 pp.
- KRUCKENHAUSER L, DUDA M, BARTEL D, SATTMANN H, HARL J, KIRCHNER S & HARING E 2014 Paraphyly and budding speciation in the hairy snail (Pulmonata, Hygromiidae). *Zoologica Scripta* 43: 273–288. <https://doi.org/10.1111/zsc.12046>
- LOCARD A 1882 *Prodrome de la malacologie française. Catalogue général des mollusques vivants de France*.

- Mollusques terrestres, des eaux douces et des eaux saumâtres*. Georg, Baillièere, Lyon, Paris, 462 pp.
- LOCARD A 1888 Contributions à la faune malacologique française. XII. Études critiques sur les *Helix* du groupe de l'*Helix rufescens* Pennant (*Helix striolata*, *H. rufescens*, *H. montana*, *H. cælata*, *H. circinata*, *H. clandestina*). *Annales de la Société Linnéenne de Lyon (Nouvelle Série)* **34**: 309–370.
- LOCARD A 1894 *Conchyliologie française. Les coquilles terrestres de France. Description des familles, genres et espèces. Avec 515 figures dessinées d'après nature et intercalées dans le texte*. Paris, 370 pp.
- MOORKENS E & SPEIGHT MCD 2001 The CLECOM project list of Irish non-marine Mollusca. *Bulletin of the Irish Biogeographical Society* **25**: 95–104.
- NAGGS F 1985 Some preliminary results of a morphometric multivariate analysis of the *Trichia* (Pulmonata: Helicidae) species groups in Britain. *Journal of Natural History* **19**: 1217–1230. <https://doi.org/10.1080/00222938500770771>
- NEIBER MT, RAZKIN O & HAUSDORF B 2017 Molecular phylogeny and biogeography of the land snail family Hygromiidae (Gastropoda: Helicoidea). *Molecular Phylogenetics and Evolution* **111**: 169–184. <https://doi.org/10.1016/j.ympev.2017.04.002>
- NORDSIECK H 1993 Das System der paläarktischen Hygromiidae (Gastropoda: Stylommatophora: Helicoidea). *Archiv für Molluskenkunde* **122**: 1–23.
- O'BRIEN SJ & MAYR E 1991 Bureaucratic mischief: Recognizing endangered species and subspecies. *Science* **251**: 1187–1188. <https://doi.org/10.1126/science.251.4998.1187>
- PROČKÓW M 2009 The genus *Trochulus* Chemnitz, 1786 (Gastropoda: Pulmonata: Hygromiidae) – a taxonomic revision. *Folia Malacologica* **17**: 101–176. <https://doi.org/10.2478/v10125-009-0013-0>
- PROČKÓW M, KUŹNIK-KOWALSKA E & MACKIEWICZ P 2017a The influence of climate on shell variation in *Trochulus striolatus* (C. Pfeiffer, 1828) (Gastropoda: Hygromiidae) and its implications for subspecies taxonomy. *Annales Zoologici* **67**: 199–220. <https://doi.org/10.3161/00034541ANZ2017.67.2.002>
- PROČKÓW M, KUŹNIK-KOWALSKA E, PIENKOWSKA JR, ŹEROMSKA A & MACKIEWICZ P 2021 Speciation in sympatric species of land snails from the genus *Trochulus* (Gastropoda, Hygromiidae). *Zoologica Scripta* **50**:16–42. <https://doi.org/10.1111/zsc.12458>
- PROČKÓW M, PROČKÓW J, BŁAŻEJ P & MACKIEWICZ P 2018 The influence of habitat preferences on shell morphology in ecophenotypes of *Trochulus hispidus* complex. *Science of the Total Environment* **630**: 1036–1043. <https://doi.org/10.1016/j.scitotenv.2018.02.311>
- PROČKÓW M, STRZAŁA T, KUŹNIK-KOWALSKA E & MACKIEWICZ P 2014 Morphological similarity and molecular divergence of *Trochulus striolatus* and *T. montanus*, and their relationship to sympatric congeners (Gastropoda: Pulmonata: Hygromiidae). *Systematics and Biodiversity* **12**: 366–384. <https://doi.org/10.1080/14772000.2014.925986>
- PROČKÓW M, STRZAŁA T, KUŹNIK-KOWALSKA E, PROČKÓW J & MACKIEWICZ P 2017b Ongoing speciation and gene flow between taxonomically challenging *Trochulus* species complex (Gastropoda: Hygromiidae). *PLoS ONE* **12**: e0170460. <https://doi.org/10.1371/journal.pone.0170460>
- WELTER-SCHULTES FW 2012 *European non-marine molluscs, a guide for species identification*. Planet Poster Editions, Göttingen, 679 pp.