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New record of an established population of the Seminole rams-horn, *Planorbella duryi* (Wetherby, 1879) (Gastropoda: Planorbidae) in continental France

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Abstract. *Planorbella duryi*, a thermophilic freshwater snail, has been increasingly found beyond its native range mainly due to releases related to the aquarium trade. This study reports the establishment of a novel *P. duryi* population within a thermal spring in Juvignac (Herault, France), a recently documented aquarium dumping hotspot. All life stages of *P. duryi* were observed throughout our study, conducted from December 2023 to November 2024, which suggests a successful establishment. Morphological identification was confirmed by molecular analysis (DNA barcoding). Additionally, an ectoparasite, identified as a member of the *Chaetogaster limnaei* species complex, was isolated from one *P. duryi* specimen, representing the first record in this host. Other parasites, such as digenean trematodes, were not observed. While current evidence suggests *P. duryi* poses minimal ecological threat in continental France due to its limited distribution and competitive disadvantages compared to native snails, ongoing aquarium dumping could facilitate further spread and introduction of associated parasites, potentially altering ecological dynamics.

Key words. Freshwater snail, aquarium trade, invasive species, DNA barcoding, parasites

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Introduction

Planorbidae is the most species-rich limnic pulmonate family among freshwater gastropods (Albrecht *et al.* 2006; Böhm *et al.* 2021), and *Planorbella duryi* (Wetherby, 1879), Seminole rams-horn, is a highly adaptable species of planorbid in both lentic and lotic waters (Alexandrowicz 2003). This species is endemic to Florida (USA), where it can be found in large numbers, particularly in the Everglades, which are characterized by a tropical savannah climate as per the Köppen classification (Pilsbry 1934; Appleton 1977). Due to its ease of care, high fertility, and appealing colours, *P. duryi* is a very popular aquarium snail (Vimpère 2004; van Leeuwen *et al.* 2025; Walker 2025). Releases and escapes linked to the aquarium trade have facilitated this species' spread beyond its native range (Frandsen & Madsen 1979; Walker 2025). To date, *P. duryi* has been recorded from most of the Caribbean islands and numerous countries of Central America, South America, Europe, Asia, and Africa (Alexandrowicz 2003; Seddon 2011; Saito *et al.* 2023; Nekhaev

et al. 2024; van Leeuwen *et al.* 2025). Notably, it was first recorded in thermal waters in continental (i.e. Metropolitan) France (Vendée department) by Vimpère (2004).

Although *P. duryi* appears to be the most widely distributed planorbid species, data on its established or extinguished feral populations and their potential ecological impacts remain scarce. Their introduction in the early 1970s and 80s in Tanzania and Saudi Arabia as biological control agents for native snails, intermediate hosts for trematode parasites causing human schistosomiasis, together with later laboratory experiments have demonstrated low competition and dispersal abilities (Madsen 1990). Hence, once introduced and established outside their native range, *P. duryi* has mostly remained constrained to few sites (Pointier *et al.* 2005). More recently, Diéguez Fernández *et al.* (2022) found no evidence of negative effects on Guatemalan local fauna and flora but highlighted significant knowledge gaps. These knowledge gaps complicate any potential regulation of the trade of *P. duryi* and contribute to its exclusion from legal directives or conservation-related policies (Seddon 2011; EEA 2025).

While conducting a study at a thermal spring in southern France, recently documented as an aquarium dumping hotspot (Jamonneau *et al.* 2025; Prati *et al.* 2025), we encountered aquatic molluscs resembling *P. duryi*. Their identification was further confirmed through morphological analysis and DNA barcoding using the cytochrome oxidase subunit I gene. An ectoparasite belonging to the *Chaetogaster limnaei* von Baer, 1827 species complex was also detected among examined specimens.

Material and Methods

Snails resembling *Planorbella duryi* were observed between December 2023 and November 2024 in the Fontcaude thermal park in Juvignac (Hérault, France; 43.6277°N, 003.8119°E) while investigating feral populations of *Poecilia reticulata* (Peters, 1859) and *Neocaridina davidi* (Bouvier, 1904). The site, a known aquarium-dumping hotspot, is fed by warm water from a thermal spring; therefore, water temperature in its upper part remains above 20 °C throughout the year (Jamonneau *et al.* 2025; Prati *et al.* 2025). In March 2024, two individuals supposed to belong to *P. duryi* were collected with hand nets as per prefectural authorization (id: DDTM34-2024-05-14915). They were later morphologically identified as per Glöer (2019), screened for endo- and ectoparasites, and molecularly identified.

As no endoparasite was visually detected, DNA was solely isolated from snails and an ectoparasite likely belonging to the genus *Chaetogaster,* using a modified salt-precipitation protocol (Grabner *et al.* 2015), and a COI fragment was amplified using the universal eukaryotic primers LCO1490 and HCO2198 (Folmer *et al.* 1994). All PCR reactions and the PCR setting for the LCO1490-HCO2198 primers followed Prati *et al.* (2024). PCR products of the snails and the ectoparasite were sent unpurified to Microsynth Seqlab (Germany) for Sanger sequencing using the LCO1490 primer.

Raw sequences were quality-checked and edited using Geneious Prime v. 2025.0.2 (GraphPad Software LLC) and compared against GenBank records using BLASTN (https://blast.ncbi.nlm.nih.gov). Snails and ectoparasite sequences were aligned using the MAFFT v. 7.490 algorithm with standard settings (Katoh *et al.* 2019). Maximum-likelihood phylogenetic trees with bootstrap support values (1,000 replicates) were produced in IQ-Tree v. 2.4.0 (Minh *et al.* 2020) using the TVM+F+G4 substitution model for snails and GTR+F+I for ectoparasites, both based on Bayesian Information Criterion (BIC) scores. The respective outgroups were *Bulinus tropicus* (Krauss, 1848); GenBank access number OP233088) and *Chaetogaster suzensis* Vivien *et al.* 2024 (PP996437). The names and circumscription of the genus *Planorbella* follow Rempel (2021) and Nekhaev *et al.* (2024), while those of *Chaetogaster* follow Vivien *et al.* (2024).

Results

The collected snails showed morphological traits pointing to *Planorbella duryi*: translucent, brown shell, coiled in a plane with a flat left side and a deeply umbilicate right side (Fig. 1). This allowed us to exclude native planorbid species (Glöer 2019). Morphological characteristics were corroborated by molecular identification; all sequenced snails belonged to the same haplotype of *P. duryi*, which showed 99.67% similarity to an individual (MF458795) previously collected in the Durance River in south-eastern France (Corse *et al.* 2017) (Fig. 2A). The detection of uninterrupted presence of the snail between December 2023 and November 2024, as well as the observation of individuals in all life stages, indicate that *P. duryi* has established a self-sustaining population in the thermal park in Juvignac.

The ectoparasite, isolated from inside the shell of one of the two *P. duryi* examined, was not morphologically identified at species level since taxonomy of the genus *Chaetogaster* remains partially unresolved (Smythe *et al.* 2015; Vivien *et al.* 2024). Nevertheless, molecular identification indicated that the ectoparasite belongs to the *Chaetogaster*

Figure 1. *Planorbella duryi* specimen from the thermal park of Juvignac. © Jean-François Cart.

limnaei species complex and showed 98.97% similarity to an individual (KF952350) previously isolated from *Physella gyrina* (Say, 1821) (Physidae) from the United States. The phylogenetic position of the isolated ectoparasite indicates it belongs to an ectosymbiont lineage *sensu* Smythe *et al.* (2015).

Discussion

The presence of *Planorbella duryi* in continental France is not a novelty. To date, the only confirmed feral population is that found in the outflow of an ornamental fish farm in the Department of Vendée (Vimpère 2004). There, as well as in the Fontcaude thermal park in Juvignac, water comes from a natural subterranean thermal spring. While there are no updates on its whereabouts since the abovementioned publication, the fish farm is still operating. If the warm-water outflow has not been interrupted over the last 20 years and no eradication measures have been implemented, the snails may still be there.

Subsequent observations of *P. duryi* have been reported in continental France, but the amount of information provided is scarce. For instance, Bertrand (2020) noted the presence of the species during a malacological survey conducted between 2003 and 2013 in the Bois de Païolive Natura 2000 site in southern France, Department of Ardèche. However, there is no information on when and how many times *P. duryi* was detected over the course of the sampling campaign. Nor were information on its establishment and confirmation of its identification through molecular analyses provided. On the other hand, molecular identification was provided for four *P. duryi* individuals mislabelled as *Planorbarius corneus* (Linnaeus, 1758) collected in the Durance River, southern France, while sampling construction materials for metabarcoding libraries (Corse *et al.* 2017). Similarly, there was not any information regarding a possible establishment. It is important to note that *P. duryi* has also been found in garden centres in France (Beckmann 1987; V. Prié unpublished data, in Montpellier), although these environments cannot be considered as natural habitats. Therefore, apart from the first population of *P. duryi* in France, recorded by

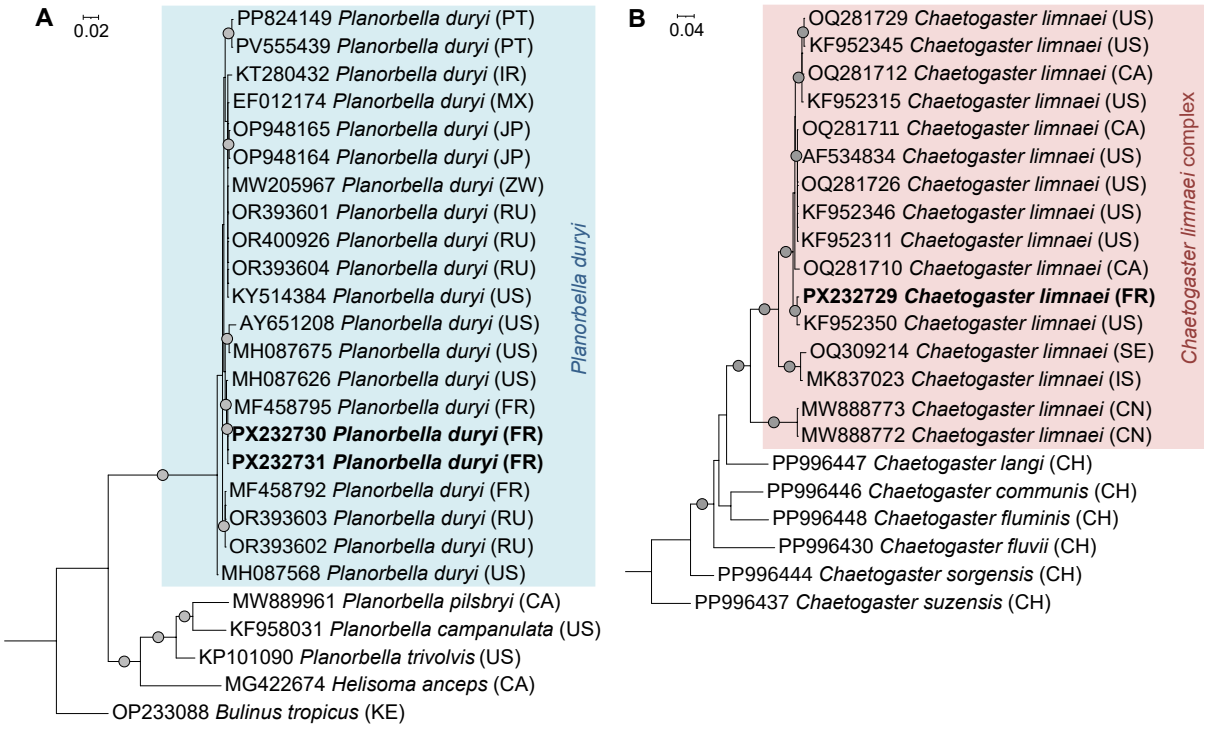

Figure 2. Maximum-likelihood phylogenetic trees. **A**, *Planorbella duryi*. **B**, *Chaetogaster limnaei* species complex. Grey dots represent bootstrap support values above 90%. Sequences obtained in this study are indicated in bold. Abbreviations: Canada (CA), China (CN), France (FR), Iceland (IS), Iran (IR), Japan (JP), Kenya (KE), Mexico (MX), Portugal (PT), Russia (RU), Sweden (SE), Switzerland (CH), United States (US), and Zimbabwe (ZW).

Vimpère (2004) several years ago and whose current status is unclear due to the lack of recent data, the only certainly known feral population in the country is the one mentioned in this article.

In continental France, formerly as well as currently established *P. duryi* populations appear, until now, to be restricted to thermal waters, which aligns with the species' thermophilic nature. Nonetheless, the aforementioned observations suggest that populations may also exist in colder water, at least temporarily (i.e. during the warmest months) or in proximity to anthropogenic structures such as low-head dams, which can locally increase water temperature (Zaidel *et al.* 2021; Bois *et al.* 2023). This suggests that an increase in established populations of *P. duryi* across continental France and neighbouring countries may occur in the foreseeable future, especially as Western Europe is one of the fastest warming regions at mid-latitudes (van Oldenborgh *et al.* 2009) and as aquarium dumping remains a common practice (Brown *et al.* 2025). However, *P. duryi* is unlikely to become a non-native invasive species of economic or ecological concern in continental France, even when suitable habitats are available, due to its poor competitive performances against other snails (Pointier *et al.* 2005; Diéguez Fernández *et al.* 2022. Nevertheless, like other planorbids, *P. duryi* is a known host for several parasites that might eventually be co-introduced and may potentially persist in the environment, even if the host does not (Sharp 2008; Simberloff *et al.* 2013). Within this context, digenean trematodes is a group of particular concern.

Digenean trematodes are among the most common parasites found in *P. duryi* (Sharp 2008). Although medically relevant trematode species are not known from this host, trematodes can play an important role in ecosystems as they regulate host population dynamics and play an essential role in food web functioning (Morgan *et al.* 2002; Kuris *et al.* 2008). However, due to an exiguous sample size, surely insufficient in this study to detect low-prevalence infections, no infections were detected. Interestingly, an ectosymbiont belonging to the *C. limnaei* species complex was detected in one of the specimens sampled. Its presence may have further contributed to the apparent absence of trematode infection, as this ectosymbiont is known to feed on trematode cercariae and could exert a protective effect on infected snails (Zimmerman *et al.* 2011; Muñiz-Pareja & Iturbe 2018).

The *C. limnaei* species complex comprises cosmopolitan freshwater oligochaetes which have been reported in

more than 40 species of freshwater snails from at least 10 families, including Planorbidae (Fried *et al.* 2008; Smythe *et al.* 2015). However, to our knowledge, this study is the first record of any *C. limnaei* species complex infection in *P. duryi*. This oligochaete occurs in two forms: a "commensal" ectosymbiotic form, found in our samples, and a parasitic form. The ectosymbiotic form lives on the outer surface or just inside the snail shell, primarily feeding on planktonic organisms such as diatoms, rotifers, and trematode cercariae, but it is also suspected to feed on the host mantle tissue and is known to negatively impact growth in heavily infected hosts (Höckendorff *et al.* 2015). The parasitic form is found in the renal system of the host, where it feeds on kidney cells (Smythe *et al.* 2015). Smythe et *al.* (2015) also demonstrated that different lineages within the *C. limnaei* species complex exert lineage-specific effects on the snail hosts. Hence, this ectosymbiont might have varying impacts on other snail species cohabiting with *P. duryi,* possibly influencing interspecies dynamics within the community.

Our finding further highlights an ongoing practice of aquarium dumping on the site. However, we do not expect *P. duryi* to expand into nearby waterbodies (such as the Mosson River) due to thermal constraints. While *P. duryi* spread might be limited, that of potential exotic parasites introduced alongside the host, such as digenean trematodes, might not be so restricted and may lead to unexpected consequences.

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References

Albrecht C, Kuhn K, Streit B. 2006. A molecular phylogeny of Planorboidea (Gastropoda, Pulmonata): insights from enhanced taxon sampling. *Zoologica Scripta* **36**: 27–39. doi: 10.1111/j.1463-6409.2006.00258.x

Alexandrowicz SW. 2003. *Planorbella duryi* (Wetherby, 1879) from the crater-lake Albano (central Italy). *Folia Malacologica* **11**: 89–93. doi: 10.12657/folmal.011.009

Appleton CC. 1977. The exotic fresh-water snail *Helisoma duryi* (Wetherby, 1879) (Planorbidae) in Southern Africa. *Zoologische Mededelingen* **52**: 125–135.

Beckmann KH. 1987. *Land- und Süßwassermollusken der Maltesischen Inseln*. Friedrich-Held-Gesellschaft, Munchen, 38p.

Bertrand A. 2020. Notes d'observations de mollusques continentaux d'Andorre, d'Espagne et de France. *Folia Conchyliologica* **53**: 27–34.

Böhm M, Dewhurst-Richman NI, Seddon M, Ledger SEH, Albrecht C, Allen D, Bogan AE, Cordeiro J, Cummings KS, Cuttelod A, Darrigran G, Darwall W, Fehér Z, Gibson C, Graf DL, Köhler F, Lopes-Lima M, Pastorino G, Perez KE, Smith K, Damme D van, Vinarski MV, Proschwitz T von, Rintelen T von, Aldridge DC, Aravind NA, Budha PB, Clavijo C, Van Tu D, Gargominy O, Ghamizi M, Haase M, Hilton-Taylor C, Johnson PD, Kebapçi Ü, Lajtner J, Lange CN, Lepitzki DAW, Martínez-Ortí A, Moorkens EA, Neubert E, Pollock CM, Prié V, Radea C, Ramirez R, Ramos MA, Santos SB, Slapnik R, Son MO, Stensgaard AS, Collen B. 2021. The conservation status of the world's freshwater molluscs. *Hydrobiologia* **848**: 3231–3254. doi: 10.1007/s10750-020-04385-w

Bois P, Beisel JN, Cairault A, Flipo N, Leprince C, Rivière A. 2023. Water temperature dynamics in a headwater forest stream: Contrasting climatic, anthropic and geological conditions create thermal mosaic of aquatic habitats. *PLOS ONE* **18**: e0281096. doi: 10.1371/journal.pone.0281096

Brown JV, Kelso WE, Diaz R, Daniel WM, Brassard HM, Kaller MD. 2025. Invasive species in the aquarium trade: survey of attitudes, behaviors, and knowledge among US participants. *Hydrobiologia*. doi: 10.1007/s10750-025-05930-1

Corse E, Meglécz E, Archambaud G, Ardisson M, Martin JF, Tougard C, Chappaz R, Dubut V. 2017. A from-bench-top-to-desktop workflow for validating HTS data and for taxonomic identification in diet metabarcoding studies. *Molecular Ecology Resources* **17**: e146–e159. doi: 10.1111/1755-0998.12703

Diéguez Fernández L, Muñoz MVM, Laveaga DDV, Sandoval JAJ, Duarte RF, Sosa Cabrera I, Arruti AEP. 2022. First Record of *Planorbella Duryi* (Wetherby, 1879) (Gastropoda: Planorbidae) (= *Helisoma Duryi* Wetherby, 1879) in Jutiapa, Guatemala. *Acta Scientific Veterinary Sciences* **4**: 92–94. doi: 10.31080/ASVS.2022.04.0395

EEA. 2025. European Environmental Agency. *Planorbella duryi* (Wetherby, 1879). https://eunis.eea.europa.eu/species/286060. Accessed on 2025-09-25.

Folmer O, Black M, Hoeh W, Lutz R, Vrijenhoek R. 1994. DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology* **3**: 294–299.

Frandsen F, Madsen H. 1979. A review of *Helisoma duryi* in biological control. *Acta Tropica* **36**: 67–84.

Fried B, Huffman JE, Saxton TM, Peoples RC. 2008. The association of *Zygocotyle lunata* and *Echinostoma trivolvis* with *Chaetogaster limnaei*, an ectosymbiont of *Helisoma trivolvis*. *Journal of Parasitology* **94**: 553–554.

Glöer P. 2019. *The Freshwater Gastropods of the West-Palaearctis. Fresh- and Brackish Waters Except Spring and Subterranean Snails. Identification Key, Anatomy, Ecology, Distribution.* Biodiversity Research Lab, Hetlingen, 399 pp.

Grabner DS, Weigand AM, Leese F, Winking C, Hering D, Tollrian R, Sures B. 2015. Invaders, natives and their enemies: distribution patterns of amphipods and their microsporidian parasites in the Ruhr Metropolis, Germany. *Parasites & Vectors* **8**: 419. doi: 10.1186/s13071-015-1036-6

Höckendorff S, Früh D, Hormel N, Haase P, Stoll S. 2015. Biotic interactions under climate warming: temperature-dependent and species-specific effects of the oligochaete *Chaetogaster limnaei* on snails. *Freshwater Science* **34**: 1304–1311. doi: 10.1086/683606

Jamonneau T, Reyes Camargo AC, Ben Halima I, Prati S, Denys G. 2025. Evidence of an established population of *Poecilia reticulata* and *Neocaridina davidi* in metropolitan France. *Cybium: International Journal of Ichthyology*. doi: 10.26028/cybium/2024-034

Katoh K, Rozewicki J, Yamada KD. 2019. MAFFT online service: multiple sequence alignment, interactive sequence choice and visualization. *Briefings in Bioinformatics* **20**: 1160–1166. doi: 10.1093/bib/bbx108

Kuris AM, Hechinger RF, Shaw JC, Whitney KL, Aguirre-Macedo L, Boch CA, Dobson AP, Dunham EJ, Fredensborg BL, Huspeni TC, Lorda J, Mababa L, Mancini FT, Mora AB, Pickering M, Talhouk NL, Torchin ME, Lafferty KD. 2008. Ecosystem energetic implications of parasite and free-living biomass in three estuaries. *Nature* **454**: 515–518. doi: 10.1038/nature06970

Madsen H. 1990. Biological methods for the control of freshwater snails. *Parasitology Today* **6**: 237–241. doi: 10.1016/0169-4758(90)90204-h

Minh BQ, Schmidt HA, Chernomor O, Schrempf D, Woodhams MD, Haeseler A von, Lanfear R. 2020. IQ-TREE 2: new models and efficient methods for phylogenetic inference in the genomic era. *Molecular Biology and Evolution* **37**: 1530–1534. doi: 10.1093/molbev/msaa015

Morgan JAT, DeJong RJ, Jung Y, Khallaayoune K, Kock S, Mkoji GM, Loker ES. 2002. A phylogeny of planorbid snails, with implications for the evolution of *Schistosoma* parasites. Molecular Phylogenetics and Evolution **25**: 477–488. doi: 10.1016/s1055-7903(02)00280-4

Muñiz-Pareja FC, Iturbe-Espinoza PA. 2018. Effectiveness of *Chaetogaster limnaei* as a controller of *Fasciola hepatica* in experimental infections of *Galba truncatula*. *Tropical Parasitology* **8**: 88.

Nekhaev IO, Babushkin ES, Khrebtova IS, Kondakov AV, Aksenova OV, Vinarski MV. 2024. Detection of two species of non-indigenous freshwater snails in Arctic Siberia. *Molluscan Research* **44**: 152–159. doi: 10.1080/13235818.2024.2315525

Pilsbry HA. 1934. Review of the Planorbidae of Florida, with notes on other members of the family. *Proceedings of the Academy of Natural Sciences of Philadelphia* **86**: 29–66.

Pointier JP, David P, Jarne P. 2005. Biological invasions: the case of planorbid snails. *Journal of Helminthology* **79**: 249–256. doi: 10.1079/joh2005292

Prati S, Grabner DS, Hupało K, Weiperth A, Maciaszek R, Lipták B, Bojko J, Bérces F, Sures B. 2024. Invisible invaders: range expansion of feral *Neocaridina davidi* offers new opportunities for generalist intracellular parasites. *Biological Invasions* **26**: 2499–2523. doi: 10.1007/s10530-024-03324-3

Prati S, Reyes Camargo AC, Jamonneau T, Halima IB, Sures B. 2025. Seasonal exchange of microsporidian parasites between native and non-native pet-traded freshwater crustaceans: is parasite spillover favored over spillback? *Parasite* **32**: 61. doi: 10.1051/parasite/2025053

Rempel EM, Marcus JM, Detwiler JT. 2021. The complete mitochondrial genome of the file ramshorn snail *Planorbella pilsbryi* (Mollusca: Gastropoda: Hygrophila: Planorbidae). *Mitochondrial DNA Part B* **6**: 3181–3183. doi: 10.1080/23802359.2021.1975508

Saito T, Uchida S, Chiba S. 2023. First records of introduced *Planorbella duryi* (Wetherby, 1879) (Gastropoda: Hygrophila: Planorbidae) in Japan. *American Malacological Bulletin* **40**: 80–89. doi: 10.4003/006.040.0101

Seddon MB. 2011. The IUCN Red List of threatened species. *Planorbella duryi* (Europe assessment). https://apistaging.iucnredlist.org/fr/species/156073/4885770. Accessed on 2025-09-25.

Sharp PR. 2008. Identification, distribution, and probability of infection in sympatric gastropods by digenean parasites at Pahay-okee, Everglades National Park using molecules and morphology. *ProQuest ETD Collection for FIU*: 1–387.

Simberloff D, Martin JL, Genovesi P, Maris V, Wardle DA, Aronson J, Courchamp F, Galil B, García-Berthou E, Pascal M, Pyšek P, Sousa R, Tabacchi E, Vilà M. 2013. Impacts of biological invasions: what's what and the way forward. *Trends in Ecology & Evolution* **28**: 58–66. doi: 10.1016/j.

tree.2012.07.013

Smythe AB, Forgrave K, Patti A, Hochberg R, Litvaitis MK. 2015. Untangling the ecology, taxonomy, and evolution of *Chaetogaster limnaei* (Oligochaeta: Naididae) species complex. *The Journal of Parasitology* **101**: 320–326. doi: 10.1645/13-465.1

van Leeuwen SJ, Bakker PAJ, Neckheim CM. 2025. The non-marine molluscs of Bonaire (Mollusca). *Nederlandse Faunistische Mededelingen* **64**: 345–402.

van Oldenborgh GJ, Drijfhout S, Ulden A van, Haarsma R, Sterl A, Severijns C, Hazeleger W, Dijkstra H. 2009. Western Europe is warming much faster than expected. *Climate of the Past* **5**: 1–12. doi: 10.5194/cp-5-1-2009

Vimpère J. 2004. Introduction en France continentale d'un gastéropode d'eau douce originaire de Floride: *Planorbella duryi* (Wetherby, 1879), (Mollusca: Gastropoda: Pulmonata). *Le Naturaliste Vendéen* **4**: 127–130.

Vivien R, Lafont M, Issartel C, Ferrari BJD, Martin P. 2024. The genus *Chaetogaster* Baer, 1827 (Annelida, Clitellata) in Switzerland: a first step toward cataloguing its molecular diversity and description of new species on a DNA sequence basis. *Biology* **13**: 693. doi: 10.3390/biology13090693

Walker T. 2025. Alien molluscs in British and Irish hothouses. *Journal of Conchology* **45**: 494–519. doi: 10.61733/jconch/4544

Zaidel PA, Roy AH, Houle KM, Lambert B, Letcher BH, Nislow KH, Smith C. 2021. Impacts of small dams on stream temperature. *Ecological Indicators* **120**: 106878. doi: 10.1016/j.ecolind.2020.106878

Zimmermann MR, Luth KE, Esch GW. 2011. Complex interactions among a nematode parasite (*Daubaylia potomaca*), a commensalistic annelid (*Chaetogaster limnaei limnaei*), and trematode parasites in a snail host (*Helisoma anceps*). *Journal of Parasitology* **97**: 788–791. doi: 10.1645/ge-2733.1

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