

Nomenclature of Helicidae (Gastropoda: Pulmonata) endemic to the Balearics

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The nomenclature of the endemic helicids of the Balearic Islands is revised along with the current state of taxonomic knowledge about them. The names used for these taxa have been subject to a turmoil of opinions and misconceptions. Likewise, published phylogenetic trees are affected by topological artifacts.

The revised taxonomy is in agreement with the archipelago's historical biogeography. Three adaptively distinct genera are accepted: *Allognathus* Pilsbry, 1888, *Iberellus* Hesse, 1908 and *Tramuntanicola* Altaba, 2022. The former includes a single species: *A. graellsianus* (Pfeiffer, 1848), endemic to the northern Serra de Tramuntana in Mallorca. This species name was proposed in substitution for *Helix grateloupi* Graells, 1846, which is preoccupied by *H. grateloupi* Pfeiffer, 1842 from Madagascar. In *Iberellus* four species are recognized: *I. balearicus* (Rossmässler, 1838), endemic to the southern serra de Tramuntana and originally described as a variety of *Helix hispanica* Rossmässler, 1838 (preoccupied by *Helix lactea* var. *hispanica* Potiez & Michaud, 1835 and referring to a species belonging into *Iberus* Montfort, 1810); *I. minoricensis* (Mittre, 1842), endemic to Menorca and adjacent islets (and locally introduced into Ibiza), with the microinsular subspecies *I. minoricensis palumbariae* Aguilar-Amat, 1933; *I. companyonii* (Aleron in Companyo, 1837), endemic to Mallorca (except Tramuntana) and locally introduced into the Catalan coast, that was originally proposed in synonymy, is the type of *Iberellus* by original designation, and includes the microinsular subspecies *I. c. horadadae* Jaekel, 1952; and *I. pythiusensis* Bofill & Aguilar-Amat, 1924, endemic to the Pytiusics, for which the subgenus *Nesiberus* Haas, 1934 can be used, possibly including *I. tanitianus* Forés & Vilella, 1992. *Tramuntanicola* comprises only one species, endemic to northern Tramuntana: *T. culminalis* Altaba, 2022.

From this basis it should now be easier to proceed with studies on the phylogeny, ecology, evolution and conservation of these valuable species.

Keywords: Mollusca, Stylommatophora, Helicidae, Allognathini, Balearic Islands, zoological nomenclature, taxonomy, endemism.

Nomenclatura dels Helicidae (Gastropoda: Pulmonata) endèmics de les Balears

Es revisa la nomenclatura dels helícids endèmics actuals coneguts de les Balears. Els noms emprats per a aquests tàxons han estat subjectes a una confusió d'opinions i concepcions errònies. De la mateixa manera, els arbres filogenètics publicats són afectats per artefactes topològics.

La revisió taxonòmica està en concordança amb la història biogeogràfica de l'arxipèlag. S'accepten tres gèneres diferenciats adaptativament: *Allognathus* Pilsbry, 1888, *Iberellus* Hesse, 1908 i *Tramuntanicola* Altaba, 2022. El primer inclou una sola espècie: *A. graellsianus* (Pfeiffer, 1848), endèmica de la part septentrional de la serra de Tramuntana a Mallorca. Aquest nom específic va ser proposat en substitució d'*Helix grateloupi* Graells, 1846, el qual estava ocupat prèviament per *H. grateloupi* Pfeiffer, 1842 de Madagascar. Al segon gènere hom hi reconeix quatre espècies: *I. balearicus* (Rossmässler, 1838), endèmica de la part central i meridional de la serra de Tramuntana i descrita originalment com a varietat d'*Helix hispanica* Rossmässler, 1838 (pertanyent aquesta a *Iberus* Montfort, 1810 i ocupada abans per *Helix lactea* var. *hispanica* Potiez & Michaud, 1835); *I. minoricensis* (Mittre, 1842), endèmica de Menorca i els illots adjacents (i localment introduïda a Eivissa), amb la subespècie *I. minoricensis palumbariae*

Aguilar-Amat, 1933; *I. companyonii* (Aleron in Companyo, 1837), endèmica de Mallorca (excepte Tramuntana) i localment introduïda a la costa catalana, que fou proposada originalment en sinonímia, és el tipus d'*Iberellus* per designació original, i inclou la subespècie microinsular *I. c. horadadae* Jaekel, 1952; i *I. pythiusensis* Bofill & Aguilar-Amat, 1924, endèmica de les Pitiüses, per la qual hom pot emprar el subgènere *Nesiberus* Haas, 1934 i que possiblement inclou *I. tanitianus* Forés & Vilella, 1992. *Tramuntanicola* comprèn només una espècie, endèmica de la Tramuntana nord: *T. culminalis* Altaba, 2022.

Des d'aquesta base hauria de ser més fàcil continuar amb estudis sobre la filogènia, l'ecologia, l'evolució i la conservació d'aquestes valuoses espècies.

Mots clau: Mollusca, Stylommatophora, Helicidae, Allognathini, illes Balears, nomenclatura zoològica, taxonomia, endemisme.

Taxonomy in the 21st century, far from being an outdated, obscure endeavour, has become the keystone of conservation biology (May, 1990; Dubois, 2003; Mace, 2004; Khuroo et al., 2007; Dubois, 2017; Thomson et al., 2018). The precise knowledge of species and higher rank taxa constitutes a prerequisite for efficient, effective protection of biodiversity (Altaba, 1997, 2014; Isaac et al., 2004, 2007, 2012). Thus, it is fundamental to maintain scholarship and intellectual honesty as pillars of taxonomy as a field able to fulfill its most important contemporary role.

The nomenclature and systematics of helicid land snails endemic to the Balearic Islands (Fig. 1) have been subject to a turmoil of opinions and misconceptions. Belonging to the tribe Allognathini Westerlund, 1903, the sister genera *Allognathus* Pilsbry, 1888 and *Iberellus* Hesse, 1908 have experienced major rearrangements for no clear reasons, with the number of species and subspecies recognized varying widely. As a case in point, Chueca et al. (2013) propose to accept a single endemic genus encompassing two monotypic subgenera: *A. (A.) grateloupi* (Graells, 1846) and *A. (I.) hispanicus* (Rossmässler, 1838). Later on, Chueca et al. (2015) further modified this scheme, using the name *A. (A.) graellsianus* (Pfeiffer, 1848) for the former and segregating a third species called by them *A. (I.) companyonii* (Rossmässler, 1838), this one including some five subspecies. More recently, Neiber et al. (2021) increased the confusion with six subspecies for the latter. It is remarkable that all these proposals are based on false premises, such as artifacts in molecular phylogenetic inference and a presumed absence of fossil record, and a seriously biased cherry-picking of the existing literature.

The goal of this paper is to propose an alternative view on proposals that are contrary to prevalent usage, have no correct basis, mask existing biodiversity, involve misunderstandings of biological nomenclature and may have unwanted consequences upon biodiversity conservation. Therefore, a revision of the nomenclature of these island endemics is presented here together with a revised taxonomy. The aim of this work is to set the basis for further research into this group of endemic land snails. These restricted-range endemics must be protected above and beyond byzantine arguments that need to be closed for good.

Materials and Methods

A thorough revision of the literature was performed in order to uncover nomenclature acts and taxonomic opinions concerning the helicids endemic to the Balearic Islands. Virtually all of the Balearic Archipelago has been sampled during the last 50 years; all materials are in the author's museum collection. Museum collections and libraries have been examined at the Museu de Ciències Naturals de Barcelona (MCNB), The Academy of Natural Sciences of Philadelphia (ANSP), Museo Nacional de Ciencias Naturales (MNCN, Madrid), and Muséum d'Histoire Naturelle de Genève (MHNG). Consultation by mail with other museums has also been performed. The International Code of Zoological Nomenclature (hereafter the Code; ICZN, 2000) has been strictly followed. A reanalysis of gene sequences available at Genbank has also been performed, but that will be published separately; the classification presented herein is not in conflict with the revised phylogenetic tree.



FIGURE 1. Shells of the various species of Allognathines endemic to the Balearic archipelago (catalog numbers from the author's Museological Collection). **A:** *Allognathus graellsianus*, Binifaldó (Escorca, Mallorca), 22.iv.2013, CRA-13883-1; **B:** *Tramuntanicola culminalis* (puig de Massanella, Escorca, Mallorca), 27.vi.1992, CRA-4339-1, holotype; **C:** *I. (I.) balearicus*, font des Polls (Valldemossa, Mallorca), 14.v.1998, CRA-8442, neotype; **D:** *I. (I.) minoricensis*, Trebalúger (es Castell, Menorca), 10.vii.1978, CRA-1159-1; **E:** *Iberellus (I.) companyonii*, es cap Blanc (Llucmajor, Mallorca), 5.viii.1993, CRA-4740-1; **F:** *I. (Nesiberus) pythiusensis*, es Pouàs (Sant Antoni de Portmany, Eivissa), 27.x.1994, CRA-5298-1. Scale bar = 10 mm.

Conquilles de les diverses espècies d'allognatinats endèmiques de l'arxipèlag Balear (números de catàleg de la col·lecció museològica de l'autor). **A:** *Allognathus graellsianus*, Binifaldó (Escorca, Mallorca), 22.iv.2013, CRA-13883-1; **B:** *Tramuntanicola culminalis* (puig de Massanella, Escorca, Mallorca), 27.vi.1992, CRA-4339-1, holotip; **C:** *I. (I.) balearicus*, font des Polls (Valldemossa, Mallorca), 14.v.1998, CRA-8442, neotip; **D:** *I. (I.) minoricensis*, Trebalúger (es Castell, Menorca), 10.vii.1978, CRA-1159-1; **E:** *Iberellus (I.) companyonii*, es cap Blanc (Llucmajor, Mallorca), 5.viii.1993, CRA-4740-1; **F:** *I. (Nesiberus) pythiusensis*, es Pouàs (Sant Antoni de Portmany, Eivissa), 27.x.1994, CRA-5298-1. Escala = 10 mm.

Results

***Allognathus graellsianus* is the correct name**

In his pioneering “Catálogo de los moluscos terrestres y de agua dulce de España”, Mariano de la Paz Graells (1846) ably described and figured a species endemic to the northern Serra de Tramuntana mountain range in Mallorca, which he called *Helix grateloupi* Graells, 1846. However, this species name had already been used: *Helix grateloupii* Pfeiffer, 1842 was validly proposed as a synonym (through bibliographic indication; Pfeiffer, 1842: 99) of a species from Madagascar (now included in the family Ariophantidae) that had been described as *H. rufescens* Grateloup, 1840. The latter was preoccupied earliest by *H. rufescens* Pennant, 1777; this is obviously a juvenile of *Arianta arbustorum* (Linnaeus, 1758). *Helix grateloupii* was subsequently validated (article 11.6.1 of the Code) by Pfeiffer (1846: 13), and later on described in detail (Pfeiffer, 1848: 69). Thus, the combination *Kalidos rufescens* (Grateloup, 1840) to designate the Malagasy species (Fischer-Piette et al., 1966: 26, 1994: 254) is incorrect, as it must be *K. grateloupii* (Pfeiffer, 1842).

When discovering the conflict of *H. grateloupi*, Ludwig Pfeiffer (1848: 437) proposed *H. graellsiana* Pfeiffer, 1848 for the species discovered by Graells. During the second half of the 19th century some authors used the name initially proposed by Graells (Bourguignat, 1864; Kobelt, 1871; Paetel, 1889), while others chose to use *graellsiana* (for example, Reeve & Sowerby, 1851–1854; Hidalgo, 1875). Among the latter is Henry Augustus Pilsbry (Tryon & Pilsbry, 1888), who designated *H. grateloupi* Graells, 1846 as the type of his new genus *Allognathus* Pilsbry in Tryon & Pilsbry, 1888. However, he soon corrected this, stating *H. graellsiana* is the type (Tryon & Pilsbry, 1894). Throughout the 20th century (Hesse, 1915; Gasull, 1964, 1967; Breure & Gittenberger, 1982; Altaba, 1991), the species was correctly known (and legally protected since 2008) as *A. graellsianus* (Pfeiffer, 1848).

At the onset of the 21st century, and attending only to the priority principle (but ignoring the species from Madagascar), Schileyko (2006) proposed to return to the name coined by Graells; this was followed by several authors (Welter-Schultes, 2012; Chueca et al., 2013; Altaba & Ríos Jiménez, 2021). However, Welter-Schultes (2012), justifies his choice considering that

H. grateloupii Pfeiffer, 1842 might not have been intentionally proposed as a new name (this contradicts the original text), or alternatively that it could have been proposed in synonymy (which is not the case, nor would it affect the availability and date of a name once used first in 1848); it is clear that both Graells and Pfeiffer were never confusing the Malagasy and Mallorcan species. After such oscillating history, the coin eventually falls heads up for Pfeiffer.

Another problematic conclusion is that of Beckmann (2007), who in his posthumous book on the land and freshwater mollusks of the Balearics maintains the remarkable stand that the name erected by Graells (1846) would be a *nomen nudum*. Beckmann (2007) cited Fig. 7-8 in the booklet by Graells; with that alone, he should have reached the conclusion that such a name accompanied by a figure has an indication (in the sense of Article 12.2.7 of the Code).

Another mistake is the spelling “*H. graellsii*” proposed by Bourguignat (1864: 356). Nobody seems to have followed him. This constitutes an incorrect subsequent spelling (Art. 33.3 of the Code).

There is another synonym for this species: *Helix tessellata* Férussac in Férussac & Deshayes, 1851. Based on an explicit reference to the Mallorcan species (Férussac in Deshayes, 1819–1851: 232), it is a junior subjective synonym. Besides, this name is preoccupied by *H. tessellata* Pfeiffer, 1842. The latter has been attributed to the mention by Anton (1839: 36, n° 1359), but this author only wrote the name without giving any description; Pfeiffer (1842: 40) describes it adequately, mentioning a letter from Anton and attributing the name to Mühlfeld. This species is now included in the (sub)genus *Stephanoda* Albers in Albers & Martens, 1860 (Endodontidae); it is endemic to the island of Juan Fernández in the southeastern Pacific (Anton, 1839: 36; Pfeiffer, 1848; Albers & Martens, 1860; Solem, 1978; Stuardo & Vega, 1985; Valdovinos, 1999). The invalidity of the name *H. tessellata* Férussac was already detected by Pfeiffer (1848: 117), so it has never been used.

***Iberellus balearicus*, not “*I. hispanicus*”**

Starting in 1835, Valery-Louis-Victor Potiez and André-Louis-Gaspard Michaud serialized their valuable “Galerie des Mollusques” (Potiez & Michaud, 1835-1838). Over time, the installments underwent

obvious changes in paper, typographic composition and the format of plates (where publication date is printed); eventually, they were (also) offered bound together as the first volume at the end of 1838 (Paulucci, 1879; Falkner et al., 2002). By the third installment, at the end of 1835 (p. 89), they published the novel *Hispanicâ* variety of *Helix lactea* Müller, 1774. The latter is now unanimously placed in the genus *Otala* Schumacher, 1817. For taxonomy, *Otala lactea* var. *hispanica* (Potiez & Michaud, 1835) is irrelevant, as it designates simply those specimens whose aperture is very dark; in terms of nomenclature, it preoccupies the name *hispanica/us/um* for taxa of specific rank within the (once large) genus *Helix* Linnaeus, 1758. The availability of the work by Potiez and Michaud prior to 1838 has been questioned (Kadolsky, 2012). As a matter of fact, it appears in a book catalogue for that year (Anonymous, 1839). However, it is also clear that the work was printed in installments. For example, this is obvious from the footnote on page 120 (Falkner et al., 2002: 103). This points unambiguously at various dates of publication for the different parts of the book; the relevant part here was issued in 1835. Serializing books was commonplace throughout the 19th century across Europe and the United States (Brake & Demoor, 2009), and many malacological works were issued in this way (including Tryon & Pilsbry, 1894-1895). There is no reason whatsoever to assume the authors would have been careful to print the date on the installments only to keep the expensive (and uneven) serial at home for three years.

Thus, when Emil Adolf Rossmässler presented in his monumental work on the European land and freshwater snails (likewise printed and undoubtedly distributed by installments) his *Helix hispanica* Rossmässler, 1838, this name (extracted from a manuscript catalogue by Partsch) was already preoccupied. Such description, corresponding to figure number 460 (in plate 33), has repeatedly been interpreted as belonging to a species endemic to the Serra de Tramuntana in Mallorca, whose common name is “caragol de serp” (snake’s snail). Two issues therein have remained eclipsed but deserve mention.

In the first place, Rossmässler (1838: 15) states that his *H. hispanica* shows a noteworthy variation. In reality, it encompassed several species from the Balearics and southernmost Spain. The specimen figured does not

belong to any *Iberellus*: the columellar callus covering the umbilicus almost completely, the markedly descending aperture and the color pattern consisting of five narrow, well defined bands (two continuous below and three broken above) make a combination of traits absent from any native Balearic helicid. However, they support the identification of the figured shell as an Andalusian endemic the same author described a few years later: *H. guiraoanus* var. *angustatus* Guirao in Rossmässler, 1854. Graells (1846) erroneously identified the “caragol de serp” as *H. hispanica*, but in exchange was right in thus identifying some specimens he had received from Jaén. Likewise, Hidalgo (1875) mentioned from the Balearics *Helix marmorata* (Férussac in Férussac & Deshayes, 1831), also endemic to Andalusia; he soon corrected the mistake, identifying them as *H. balearica* (Hidalgo, 1978, 1890).

Rossmässler’s *angustatus* is now included in the genus *Iberus* Montfort, 1810, endemic to the south and east of the Iberian Peninsula and including several taxa of unclear rank (Boettger, 1938; García San Nicolás, 1957; Elejalde et al., 2008; Bank & Luijten, 2014). Assuming two *Iberus* specimens in the Senckenberg Museum would be the type series, and that the type locality given by Rossmässler (1854) would be wrong, Martínez-Ortí & Robles (2012) designated a lectotype, along with other alterations to the nomenclature of the genus. Whether such changes are warranted is dubious (Bank & Luijten, 2014); at any rate, they don’t affect the current understanding of *I. angustatus*.

A second aspect of the description of *Helix hispanica* is critical. Rossmässler (1838) mentions in synonymy the manuscript names *H. speciosa* and *H. balearica*, attributed to Ziegler. Some authors have considered that such names were introduced merely as synonyms (Beckmann, 2007; Welter-Schultes, 2012; Chueca et al., 2013). However, such reading is incorrect: under the heading dedicated to the varieties of his new species, Rossmässler explicitly mentions one of them with scientific name: “Ziegler besitzt eine anders gefärbte und etwas kugeliger Form, welche er *H. balearica* nennt” [Ziegler has a differently colored and somewhat more spherical form, which he calls *H. balearica*]. This sentence, albeit bearing limited information, contains diagnostic traits, thus constituting the formal description of a taxon of subspecific rank: *H. hispanica* var. *balearica* Rossmässler, 1838.

Rossmässler considered both *balearica* and *hispanica* as belonging to the same (wide) species, selecting the latter name for the set. In fact, there are several species whose names are universally used even if they were described in the same work as synonymous: *Pupa frumentum* var. *illyrica* Rossmässler, 1835 (currently *Granaria illyrica* (Rossmässler, 1835)), *Helix foetens* var. *achates* Rossmässler, 1835 (currently *Chilostoma achates* (Rossmässler, 1835)), *Helix candidula* var. *muehlfeldtiana* Rossmässler, 1837 (currently *Xerocrassa muehlfeldtiana* (Rossmässler, 1837)), *Helix setosa* var. *setigera* Rossmässler, 1836 (currently *Helicigona setigera* (Rossmässler, 1836)), *Helix villosa* var. *villosula* Rossmässler, 1838 (currently *Trochulus villosulus* (Rossmässler, 1838)) and *Helix arbustorum* forma *stenzii* Rossmässler, 1835 (currently *Arianta stenzii* (Rossmässler, 1835)).

A further quirk of *Helix hispanica* is the suggestion by Graells (1846, footnote), that this name could be in conflict with *H. hispana* Linnaeus, 1758 (p. 772: Vermes Testacea number 599; also in Linné, 1767). Unfortunately, nobody seems to have clarified what this Linnean species might be. At any rate, the words *hispana* and *hispanica* are not strictly equivalent (although undesirably similar: Recommendation 58 A of the Code), so the problem does not exist. However, Rossmässler (1854) accepted Graells' suggestion, not without bitterly complaining, and thus recovered the name he had already given to a variety: he proposed *H. balearica* as the valid species name. In terms of nomenclature, this just meant raising *balearica* to species rank in order to avoid a supposed homonymy; for taxonomy, a chimaera was made even more bizarre, with the type series of *H. hispanica* now representing a different taxon. Although nobody dismissed this change, it was unjustified and clearly is in conflict with the original description of *H. balearica*.

For over 150 years almost everybody followed Rossmässler (1854) in calling the “caracol de serp” as *balearica*. Until the erroneous interpretation of original sources by Beckmann (2007), leading to the novel proposal by Welter-Schultes (2012), Chueca et al. (2013, 2015) and Neiber et al. (2021) to use the combination *Iberellus hispanicus* (Rossmässler, 1838). Such a name is inadmissible.

Having a keen eye for detecting differences in shell shapes, Bourguignat (in Pechaud, 1883) was right — albeit at odds with his contemporaries— in claiming

that the specimen figured initially as *Helix hispanica* and later called *H. balearica* by Rossmässler did not agree with any of the specimens he had received from the mountains of Mallorca. He thus described three new species: *H. ramisi* Bourguignat in Pechaud, 1883, *H. valdemusana* Bourguignat in Pechaud, 1883 and *H. eustapa* Bourguignat in Pechaud, 1883. I have examined the types in the Bourguignat collection at MHNG and it is clear they all come from the southern part of the Serra de Tramuntana range. They represent individual variations of the same species, which grows slightly larger at higher elevation, although there is considerable variability in size even within microhabitats. It is likely they were all collected at the same locality, in the vicinity of the mountain village called Valldemossa (hence the fictitiously Latinized demonym *valdemusana*). The three are subjective junior synonyms of *H. balearica* in its original sense. Nobody appears to have ever used these three of Bourguignat's names, his correct assessment being lost amidst a pleiad of confusing or superfluous nominal species.

Attending to its description (as well as its origin indicated as adjective), *balearica* fits perfectly to the “caracol de serp” living in the southern part of the Serra de Tramuntana. The taxon living in the northern part of this mountain range is anatomically distinct, clearly more discoidal and often strongly depressed; it has recently been described as *Tramuntanicola culminalis* Altaba, 2022. In order to prevent further arbitrary changes, a neotype has also been designated for *Iberellus balearicus* from near Valldemossa (Altaba, 2022).

***Helix companyonii* is an available name**

Outside the Serra de Tramuntana, throughout most of Mallorca one can find the much smaller *Iberellus*, readily separated from the “caracol de serp”; these have an even more complicated nomenclature history (Forés, 2004a, b; Altaba, 2007a, b). The first mention of this lowland species refers, quite remarkably, to French Catalonia, where it was likely introduced when that part of the continent belonged to the Kingdom of Mallorca in the late Middle Age. The finding was made public in 1837 at the Société Philomatique de Perpignan, where the naturalist Louis Companyo presented a collection of land snails of the Department, perfectly ordered and labeled, assembled by J. Aleron. The latter had found a

new species which he called *Helix Companyonii* in honor of his friend and mentor (Companyo, 1837). This collection has been on public display ever since (Bourgat & Belledent, 1983; Bourgat, 1994). Moreover, Companyo himself took care to ensure that any interested colleagues would receive specimens of the new species. Thus, there has never existed any doubt about the identity of this species.

The obvious problem is that throughout his brief address to the enlightened scientific society, Companyo (1837) failed to point at even a single diagnostic trait; he only stated: “Cette espèce se rapproche beaucoup de l'*helix serpentina* et *ondulata*; nous ne pouvons asseoir encore notre jugement, cependant nous pensons qu'elle n'a pas été décrite” [This species much resembles *Helix serpentina* and *H. ondulata*; we cannot still settle our judgement, yet we think it has not been described.]. This description is so poor that it might qualify as a *nomen nudum* (Hidalgo, 1878, 1890, 1918; Jaeckel, 1952; Paul, 1982a, 1982b, 1985; Paul & Altaba, 1992; Alonso-Zarazaga, 2004; Welter-Schultes, 2012; Chueca et al., 2013). Another interpretation is that of Chueca et al. (2013), who claim the abovementioned sentence is an explicitly negative will to publicize the species; this view has no grounds and is anyway irrelevant for old literature. What Companyo (1837) did was to mention the name proposed by his friend Aleron. However, he did so provisionally, considering it as a synonym. So he did not provide a description such as to make the name available, but neither did he propose a simple *nomen nudum*. Such synonymy can be inferred to affect the first species mentioned: *H. serpentina* Férussac, 1821. This is now included in the genus *Marmorana* Hartmann, 1844, distributed across the Tyrrhenian region (Giusti et al., 1995).

Thus, as soon as someone used the name mentioned in synonymy by Companyo (1837), the name *H. companyonii* Companyo, 1837 was rendered available (Articles 11.6.1 and 50.7 of the Code). This already occurred in the work by Dupuy (1848, plate published in 1847, by installments), where the species is described in great detail under this name and correctly attributing it to Companyo. Dupuy (1847: xxvi) acknowledges having received from Companyo “les espèces les plus rares des Pyrénées Orientales” [the rarest species of the Eastern Pyrenees]. Later on (Dupuy, 1848: 120, 121) he quotes a letter from Companyo dated in 1847. Moreover, Dupuy

examined the two specimens in the collection prepared by Aleron and labeled them as types (Forés, 2004b).

A fact worth mentioning is the virtual —perhaps real— extinction of *Iberellus companyonii* from its type locality (Altaba, 2007b). It is still mentioned from the vicinity of Banyuls de la Marenda (Banyuls-sur-mer), albeit every time as less common, by various authors throughout the 19th century (Drouet, 1855; Companyo, 1863; Massot, 1872; Locard, 1882, 1894; Granger, 1884). At the onset of the 20th century its existence in France was deemed doubtful (Germain, 1929, 1930). It has probably been extinct in France for over one hundred years; it is thus absent from a widely used field guide to the land snails of northwestern Europe (Kerney et al., 1999), as well as from a proposal of species in need of protection in the Languedoc-Roussillon region (Bertrand, 2004). However, it is unclear why this species is not even mentioned in a critical review of the terrestrial and freshwater molluscan fauna of European France (Falkner et al., 2002). *I. companyonii* was locally introduced into other localities on the Catalan coast (mostly the old buildings and fortresses in the cities of Barcelona and Tarragona); today it is almost extinct on the continent, with a last population in the Roman city wall of Tarragona (Servain, 1880; Aguilar-Amat, 1914; Rosals, 1914; Cazorro et al., 1916; Haas, 1929; Gasull, 1964; Cuerda, 1975, 1989; Bech, 1990; Altaba 1991, 1993, 2007b; Paul & Altaba, 1992; Forés 2004a). Perhaps being an allochthonous species it might not deserve any special protection, but such action has actually been asked for in the case of other species locally naturalised along the French and Spanish Mediterranean coastline.

A rich mine of synonyms

Numerous authors have used the species name *companyonii*, correctly attributing it to its first mention (Aleron, 1842; Rossmässler, 1854; Moquin-Tandon, 1855; Drouet, 1855; Companyo, 1863; Granger, 1884; Schubert, 1891; Bofill & Haas, 1920; Bofill et al., 1921; Bofill & Aguilar-Amat, 1924; Haas, 1929; Aguilar Amat, 1933; Ortiz de Zárate, 1946; Jaeckel, 1952; Gasull 1964, 1971, 1972, 1984; Compte Sart, 1968; Bech, 1983, 1989, 1990; Forés & Vilella, 1995; Quintana, 1996; Pons & Palmer, 1996; Seguí et al., 1998; Altaba, 2007a). Others have used a variety of spellings: “*companyoni*” (Brown, 1866; Barceló y Combis, 1873, 1876; Hidalgo, 1875, 1878, 1890; Locard, 1881; Westerlund, 1889; Rosals, 1914; Cuerda et

al., 1986; Vicens & Gracia, 1991), or “*companyoi*” (Bourguignat, 1864; Massot, 1872; Fagot, 1879, 1890; Servain, 1880; Locard, 1882, 1894; Hesse, 1908, 1915, 1931, 1934; Rosals, 1913; Aguilar-Amat, 1914; Bofill & Chía, 1914; Bofill, 1917; Hidalgo, 1918; Germain, 1929, 1930, 1931; Gasull, 1964, 1966, 1967; Adrover & Cuerda, 1977; Cuerda, 1975, 1976, 1979, 1989, 1993; Cuerda & Sacarés, 1992), or “*compagno*” (Cazurro et al., 1916), or even “*compagnoni*” (Ortiz de Zárate, 1991) or “*compagnonii*” (Österreich-Toskana, 1871). Such alternative spellings derive from incorrect latinizations, thus constituting unjustified emendations (Brandon-Jones et al., 2007; Dubois, 2007). Besides, none has been on constant usage, so they are not available (Article 33.3 of the Code).

The efforts by *Companyo* to make the novelty widely known were likely insufficient to reach Rossmässler on time. The latter states that the species was known to him through a letter containing a description and illustration, signed by Anton (Rossmässler, 1839). This was a collector who described several extant and fossil molluscan species (Anton, 1839; Schniebs, 1995). However, Rossmässler writes “*H. Companyonii cuisn.*?” [*cuius nominis?*, whose name?], explicitly acknowledging he didn’t know whom to attribute the name. At any rate, he placed this misspelling in (authorless) synonymy of his *Helix hispanica* var. *pyrenaica* Rossmässler, 1839. However, the latter name was preoccupied by the well-known *H. pyrenaica* Draparnaud, 1805, currently in the genus *Norelona* Nordsieck, 1986 (Elonidae). Thus, almost nobody used the junior homonym; the work by Kobelt (1904) is a notable exception. Nobody used it before 1900, so it is not available (Art. 23.9.5 of the Code). Inadvertently, Alonso Zarazaga (2004) proposed the combination *Iberellus pyrenaicus* (Rossmässler, 1839) in a reply to Forés (2004a). Such an ill-founded proposal was uncritically followed by some authors (Alba et al., 2004; Schileyko, 2006; Quintana, 2009), even after being rejected for the reasons herein stated (Altaba, 2007b).

Chueca et al. (2013) make another, even more confusing proposal. They claim there was no inadvertent error by Rossmässler (1839) in writing *Companyonii*. The reasons behind such inference are based on questionable evidence far from the published work itself, whilst ignoring the evidence that the author didn’t even know where that name was coming from. The name *H.*

companyoni was used in the lists by Graells (1846) and Dohrn & Heynemann (1862), but only to avoid using *H. pyrenaica* for this species. On such slippery basis and with only these two citations, Chueca et al. (2013, 2015) propose the combination *Allognatus (iberellus) companyonii* Anton in Rossmässler, 1839; this contains an error and a wrong attribution, and is not the first available name published in synonymy. This combination is also used by Cadevall et al. (2020). It is relevant to note that Rossmässler (1854: 11) himself identified the numerous specimens he received from Barcelona as the var. *Companyonii*, thus correcting his previous mistake.

Iberellus companyonii has other synonyms, mostly originated by the “Nouvelle École”, whose tenets were to recognize every variation as a separate species deserving a name. The *Helix cantae* Bourguignat in Servain, 1880 has exactly the same type locality as the species discovered by Aleron, and is undistinguishable. This superfluous name was used just a few times (Locard, 1882, 1894; Fagot, 1890) and placed in synonymy early on (Bofill & Chía, 1914). Erroneously, Germain (1929, 1930) considered it a synonym of the common, well known *Pseudotachea splendida* (Draparnaud, 1801). Another wrong identification is that of Richardson (1980) assuming it might belong into *Otala* Schumacher, 1817.

Another two nominal species from the same prolific author are *Helix chorista* Bourguignat in Servain, 1880 and *H. tiranoi* Bourguignat in Servain, 1880, based on specimens collected in Barcelona; such names had limited success, the first being used just four times (Bofill, 1890; Fagot, 1890; Schuberth, 1891; Hesse, 1915, as *Iberellus choristus*) and the latter only once (Fagot, 1890). The null usefulness of both names is reflected in its early, definitive synonymization (Aguilar-Amat, 1914; Bofill & Chía, 1914; Bofill & Haas, 1920; Haas, 1929).

Somewhat different is the case of names introduced putting the cart before the horse. *Helix (Iberus) oberndorferi* Kobelt, 1882 was proposed under the preposterous hypothesis that the populations in the city of Palma would not be conspecific with those found on the Catalan coast (Kobelt, 1882; Moragues, 1886). In this unsupported sense it has been sporadically used (Hesse, 1915; Jaekel, 1952; Colom, 1957; Ortiz de Zárate, 1991; Pons & Palmer, 1996). Erring on the same side, but a bit further, Bourguignat (in Pechaud, 1883)

considers this name would belong to a hypothetical species introduced into Mallorca from Corsica. Such extravagance made him confident enough to reject the name proposed by Kobelt —with whom he cultivated an acrimonious animosity— and thus describe his own *H. palmana* Bourguignat in Pechaud, 1883 living in the same city. The latter name has never been used by anybody else.

The type of *Iberellus* is *Helix companyonii*

The stability of *Iberellus* is dependent upon adequately identifying its type species. This genus was proposed by Hesse (1908) with the picturesque spelling *Jberellus*, which no one has ever used —the incorrect subsequent spelling *Iberellus* has always been used and correctly attributed, so it must be preserved and deemed a correct original spelling (Article 33.3 of the Code; Borrero & Rosenberg, 2015). Hesse did not provide any type species, because it was briefly proposed as a substitute for *Balearica* Kobelt, 1904. The latter had been erected by Kobelt (1904) as a section encompassing various helicid species, including the Balearic endemics, within his quite wide concept of the genus *Iberus*. What Kobelt missed —and Hesse took profit from— is the fact that the name was already preoccupied by *Balearica* Brisson 1760, a genus of African cranes (which no one has ever seen in the Balearics, by the way). According to Hesse (1915), Welter-Schultes (2012) and Borrero and Rosenberg (2015), the type species of *Balearica* Kobelt, 1904 should be *Iberus (Balearica) balearicus* (Rossmässler, 1838), given that Kobelt (1904: 132) so writes when first mentioning his new subgenus; thus, it might seem to be the type species through absolute tautonymy.

However, putative etymologies based on implicit tautonymy must be carefully examined. For example, the type species of *Marmorana* is not *H. marmorata*, as one might infer —on the contrary, as shown by Welter-Schultes (2012), Hartmann (1844: 210) introduced it in association with a similar species under the combination *M. serpentina*. The same precaution is required to understand the listing by Kobelt (1904: 129). No type species are given therein, only examples. This is clear at the head of the listing, where he explicitly refers to the text thereafter for all novelties: “Ich rechtfertige dieselben im Einzelnen in den angehängten Anmerkungen.” [I justify them in detail in the adjoining notes.] And on page 157: “Marmorana geht nur

schwer trennbar in die Balearischen Arten (*Balearica* m.) über, zu denen ich vorläufig sowohl die Sippschaft der *Helix companyoi* als die der *Helix marmorata* rechne.” [Marmorana is difficult to separate from the Balearic species (my *Balearica*), among which I provisionally count the clan of *Helix companyoi*, as well as that of *Helix marmorata*.] According to this evidence, *H. companyonii* (albeit with an incorrect spelling) is explicitly the type of his *Balearica*, by original designation. This is also the type species of *Iberellus* (Articles 67.6, 68.1 and 68.2.1 of the Code).

One endemic in Menorca

The *Iberellus* living in Menorca are remarkably squat and can readily be told apart from their congenetics. The most widely known name applicable is *Helix minoricensis* Mittre, 1842. This was introduced accompanied by a detailed description, including a comparison similar to that made by Companyo: “L’Hélice de Mahon est voisine de l’*Helix serpentina*...” [*H. minoricensis* is close to *H. serpentina*...]. Given the doubts existing on the name *H. companyonii*, many authors have used *minoricensis* as a substitute (Maluquer, 1917; Aguilar-Amat, 1933; Sacchi, 1954, 1955, 1957, 1958a,b; Colom, 1957, 1964a,b, 1978; Jaeckel & Plate, 1964; Cuerda, 1965; Altimira, 1970; Horst, 1970; Álvarez, 1978; Schröder, 1978; Ginés, 1982; Paul, 1982a,b, 1985; Altaba, 1991, 1993, 2000; Pons & Damians, 1992; Gómez Moliner et al., 2000). However, *I. minoricensis* has been considered a distinct island endemic (Albers & Martens, 1860; Barceló y Combis, 1873, 1876; Brancsik, 1891; Schuberth, 1891; Hesse, 1915; Altaba, 2004, 2007a), sometimes as an insular subspecies or variety (Bofill & Aguilar-Amat, 1924; Colom, 1955, 1961; Jaeckel & Plate, 1964, 1965; Cuerda 1975, 1989).

Keeping on with his unabatable thirst for naming even what already had been named, Bourguignat (in Pechaud, 1883) proposed *H. minorica* Bourguignat in Pechaud, 1883 for exactly the same species described by Mittre (1842) from Maó, as well as the new species *H. sampoli* Bourguignat in Pechaud, 1883. The former is clearly a synonym; the latter also, being based on specimens from the same locality. Not surprisingly, no one has ever used either name.

The existence of a second endemic *Iberellus* in Menorca has been suggested on the basis of molecular genetic analyses: *minoricensis* proper including most

samples from this island, and a smaller clade falling closer to those from Mallorca (Chueca et al., 2015; Neiber et al., 2021). Such proposal cannot be accepted, as it stems from artifacts in phylogenetic reconstruction from DNA sequences and an unsupported nomenclature scheme (Altaba, in prep.). Likewise, the inconclusive analysis of shell shape by Quintana (2009) brings little information, being based on simple morphometrics and a chaotic nomenclature. The phylogeographic structure on the island remains to be better studied, but all evidence points at a single, exclusive lineage.

Microinsular subspecies

Two subspecific taxa have been described from peripheral islets: *Iberellus minoricensis palumbariae* Aguilar-Amat, 1933 from illa d'en Colom, off northeastern Menorca, and *I. m. horadadae* Jaekel, 1952 from na Foradada in the Cabrera Archipelago south of Mallorca. Whilst the former was carefully described and illustrated (Aguilar-Amat, 1933), Jaekel (1952) argued that a small island could not harbor an endemic subspecies —only to proceed erecting one of his own, less distinct and from an even tinier islet. Schileyko (2006) ranked the latter as a full species without any explanation; it is closely related to, and probably conspecific with *I. companyonii*. Chueca et al. (2013) consider both microinsular taxa as valid subspecies of the single species they accept for *Iberellus*; later on, Chueca et al. (2015) consider neither deserves any distinction.

In fact, both nominal subspecies are readily distinguishable, as clearly stated in their original descriptions. However, this is also true of several other populations of *Iberellus*, on other islets as well as in parts of the main islands (Gasull, 1964; Altaba 1993, 2000). No substantial genetic differentiation should be expected, but they might represent distinct lineages. Until a revision of the genus is presented, the two named subspecies should be retained.

An endemic in the Pytiusics

The *Iberellus* native to the southern Balearics, or Pytiusics, Eivissa and Formentera, are also distinctive. Two names are available for them: *Helix (Archelix) pythiusensis* Bofill & Aguilar-Amat, 1924 and *Iberellus tanitianus* Forés & Vilella, 1995. The former was carefully described, with detailed comparisons to other taxa and adequate illustrations (Bofill & Aguilar-Amat, 1924).

In contrast, nowhere in the original description of the latter (Forés & Vilella, 1995) is any trait mentioned to separate it from *H. pythiusensis*; neither do Chueca et al. (2013) indicate how the two nominal species can be told apart. The type series of *H. pythiusensis* includes specimens collected both on the Bledes islets off western Ibiza and on the main island, although the holotype is explicitly designated from the former locality. On the other hand, from the description of *I. tanitianus* it is unclear what the holotype or the type locality might be; being published before 2000, external evidence should be used to fill this gap (Article 74.1.1 of the Code). Yet, it is a taxon of questionable validity.

The anatomical traits of *I. tanitianus* discussed by Forés & Vilella (1995) and Chueca et al. (2013) are inconclusive and contradictory. For example, the latter state “el divertículo es un 60 % más largo que el conducto de la bursa” [the diverticle is 60 % longer than the bursa duct], but this contradicts their Figure 1, where it is obviously shorter. The shells of Ibizan *Iberellus* are fairly variable even within populations. For instance, the two figured paratypes of *I. tanitianus* were collected together, but differ markedly in globosity. Thus, there are no grounds at present to recognize two species in the Pytiusics. The nominal taxon *Allognathus (Iberellus) hispanicus elserae* Talaván Serna & Talaván Gómez, 2019, described on fairly globose shells from Ibiza (Talaván Serna & Talaván Gómez, 2019) appears to fall within the range of variation of the species which must bear the oldest name available, *Iberellus pythiusensis*.

Iberellus contains multiple species and subgenera

The only justification given by Chueca et al. (2013) to include all *Iberellus* in a single species consists of “resultados preliminares de estudios genéticos (datos no publicados)” [preliminary results of genetic studies (unpublished data)]. This is hardly defensible.

Morphological, anatomical, ecological and paleontological evidence indicate that one species exists on each main island, along with the mountain endemic *I. balearicus*. Diagnostic traits in shell shapes agree with small but diagnostic differences in genitalia. Anatomical similarity has occasionally been interpreted as supporting a single species (Ortiz de Zárate, 1946; Puente, 1994; Chueca et al., 2013), but this is a subjective, purely phenetic opinion based on crude anatomical data.

The molecular genetic phylogenies purported as supporting a single species (Chueca et al., 2015; Neiber et al., 2021), besides being affected by artifacts distorting clade structure (Altaba, in prep.), are mute in regard to species limits. Eventually, it should not be unexpected to find island endemics, given the isolation of the archipelago (Altaba, 2004) and the distinctive vegetation covering each island (Bolòs i Capdevila, 1996).

The genus *Nesiberus* Haas, 1934 was erected for *Helix pythiusensis* alone (Haas, 1934). It has occasionally been accepted (Schileyko, 2006), or placed as a subgenus of *Iberus* (Zilch, 1960), but without any justification. However, it can be meaningfully used for the southern clade of *Iberellus* at the subgenus rank (Altaba, 2007a).

***Iberellus* and *Allognathus* are separate genera**

The reasoning behind placing *Iberellus* within the same genus as *Allognathus* (e.g., Thiele, 1931; Bank et al., 2001) is that both genus-level taxa are considered too closely related, either anatomically (Gasull, 1964) or (phylo)genetically (Chueca et al., 2013, 2015; Neiber et al., 2021). Gasull (1964, 1967, 1971) placed *Allognathus* as a subgenus of *Iberellus*, but that was an incorrect priority inversion. The Balearic branch within *Allognathini* constitutes a well-defined lineage, just as with the Macaronesian one. In the latter, different genera are recognized (Neiber et al., 2021), with morphological and genetic differentiation equivalent to that existing inside the former; there is a considerable phylogenetic distance between the monospecific *Allognathus* and the *Iberellus* clade. So, one may have to choose between

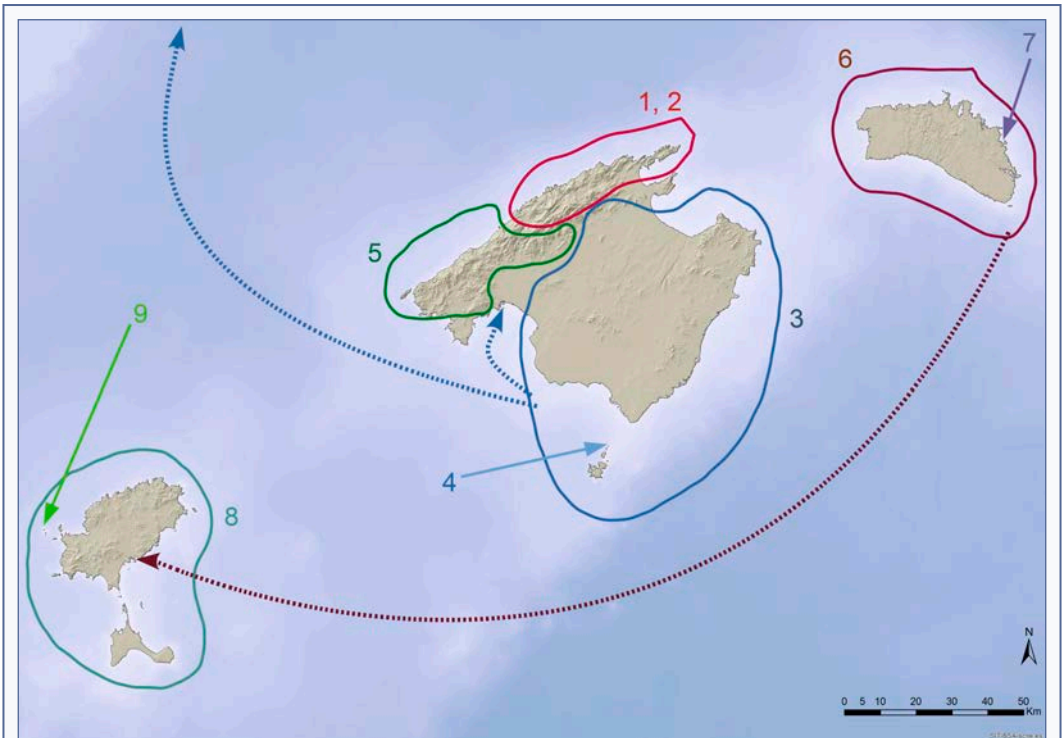


FIGURE 2. Geographic range of Allognathines endemic to the Balearic archipelago. Solid arrows point at microinsular endemics, dashed lines show anthropogenic introductions to Ibiza, Palma and the Catalan coast. **1:** *Allognathus graellsianus*; **2:** *Tramuntanicola culminalis*; **3:** *Iberellus* (*I.*) *companyonii*; **4:** *I. (I.) c. horadadae*; **5:** *I. (I.) balearicus*; **6:** *I. (I.) minoricensis*; **7:** *I. (I.) m. palumbariae*; **8:** *I. (Nesiberus) pythiusensis*; **9:** type locality of the latter, possibly a microinsular subspecies.

Distribució geogràfica dels al·lognatinis endèmics de l'arxipèlag Balear. Les fletxes contínues assenyalen endemismes microinsulars; les línies discontinües mostren introduccions antropogèniques a Eivissa, Palma i la costa catalana. **1:** *Allognathus graellsianus*; **2:** *Tramuntanicola culminalis*; **3:** *Iberellus* (*I.*) *companyonii*; **4:** *I. (I.) c. horadadae*; **5:** *I. (I.) balearicus*; **6:** *I. (I.) minoricensis*; **7:** *I. (I.) m. palumbariae*; **8:** *I. (Nesiberus) pythiusensis*; **9:** localitat tipus d'aquest darrer, probablement una subespècie microinsular.

synonymizing genera and the alternative —equally arbitrary— of increasing supraspecific taxa, eventually making them all monotypic. Either path would be rather useless.

If the genus rank has to bear any meaning, it is in relation to diverging adaptive fields (Wood & Collard, 1999; Cela-Conde & Altaba, 2002). Under this criterion, both *Allognathus* and *Iberellus* deserve full genus rank, given that their adaptations are clearly different (Breure & Gittenberger, 1982; Altaba & Ríos Jiménez, 2021; Juárez-Ruiz & Altaba, 2022). They share a rather uniform Bauplan in their reproductive anatomy, but lack of obvious differences therein occurs in other helioid clades. Moreover, placing too much weight on the genitalia is a monothetic concept of pulmonate systematics, an epistemological error leading to unrealistic classifications (as already pointed out by Hoagland & Davis, 1987). A comparable mistake was that of Westerland (1902), who erected the monotypic family Allognathidae on the basis of shell and radula, ignoring everything else.

Discussion and Conclusions

This paper clarifies the historically complex nomenclature of the extant helicids endemic to the Balearic Islands. The classification of published taxa, in application of the Code, is as follows (Fig. 2):

- Allognathus* Pilsbry in Tryon & Pilsbry, 1888
Allognathus graellsianus (Pfeiffer, 1848)
 = *Helix grateloupi* Graells, 1846 (non *H. grateloupi* Pfeiffer, 1842)
 = *H. graellsii* (misspelling)
 = *H. tessellata* Férussac in Férussac & Deshayes, 1851 (non *H. tessellata* Pfeiffer, 1842)
 Endemic to the northern Serra de Tramuntana (Mallorca).
- Tramuntanicola* Altaba, 2022
T. culminalis Altaba, 2022
 Endemic to the northern Serra de Tramuntana (Mallorca).
- Iberellus* Hesse, 1908
 = *Balearica* Kobelt, 1904 (non *Balearica* Brisson 1760)
 = *Iberellus* Hesse, 1908 (superseded original spelling)
Iberellus (*I.*) Hesse, 1908
Iberellus (*I.*) *companyonii* (Companyo, 1837)
 = *Helix hispanica* var. *pyrenaica* Rossmässler,

- 1839 (non *H. pyrenaica* Draparnaud, 1805)
 = *H. cantae* Bourguignat in Servain, 1880
 = *H. chorista* Bourguignat in Servain, 1880
 = *H. tiranoi* Bourguignat in Servain, 1880
 = *H. (Iberus) oberndorferi* Kobelt, 1882
 = *H. palma* Bourguignat in Pechaud, 1883
 = *I. companyonii*, *I. companyoni*, *I. companyoi*, *I. compagnoii*, *I. compagnoii*, *I. compagnoii* (misspellings)
 Endemic to Mallorca (not in the Serra de Tramuntana) and adjacent islets. Locally introduced to the Catalan coast (and almost extinct there).
I. c. horadadae Jaekel, 1952
 Endemic to na Foradada islet in the Cabrera Archipelago.

- Iberellus* (*I.*) *balearicus* (Rossmässler, 1838)
 = *Helix hispanica* (Rossmässler, 1838), partim (non *Helix lactea* var. *hispanica* Potiez & Michaud, 1835)
 = *H. ramisi* Bourguignat in Pechaud, 1883
 = *H. valdemusana* Bourguignat in Pechaud, 1883
 = *H. eustapa* Bourguignat in Pechaud, 1883
 Endemic to the southern Serra de Tramuntana (Mallorca).
- Iberellus* (*I.*) *minoricensis* (Mittre, 1842)
 = *H. minorica* Bourguignat in Pechaud, 1883
 = *H. sampoli* Bourguignat in Pechaud, 1883
 Endemic to Menorca and adjacent islets. Locally introduced into Ibiza.
- Iberellus minoricensis palumbariae* Agui-lar-Amat, 1933
 Endemic to illa d'en Colom.
- Iberellus* (*Nesiberus*) Haas, 1934
I. (Nesiberus) pythiusensis (Bofill & Agui-lar-Amat, 1924)
 = ? *Iberellus tanitianus* Forés et Vilella, 1995
 = *Allognathus* (*Iberellus*) *hispanicus elserae* Talaván Serna & Talaván Gómez, 2019
 Endemic to the Pythiusics (including surrounding islets).

This revised classification, where undescribed taxa might need to be added, is in agreement with the historical biogeography of the Balearic archipelago. The diversification of *Iberellus* followed the break-up

of the Balearic Promontory since the middle Miocene. However, *Allognathus* and later *Tramuntanicola* diverged at an earlier date, contributing to the uniqueness of the northern Tramuntana range. From this basis it should now be easier to proceed with studies on the phylogeny, ecology, evolution and conservation of these valuable species.

Acknowledgements

I am grateful to Emmanuel Tardy and Jean Mariaux for allowing the examination of types in the Bourguignat collection at MHNG; George Davis, Gary Rosenberg and Ken Emberton for support and help at ANSP; Francesc Español, Carles Altimira and Francesc Uribe for lengthy consultations at MCNB; Óscar Soriano for helping at MNCN; Carol Constantino and Rafel Matamales-Andreu for allowing the study of collections at MBCN; and Anita Escher and Robert Bourgat for answering my questions about the historical collection at NHMW and MHNP, respectively. I am in debt to Francisco Welter-Schultes, Maximino Forés and Miguel Alonso-Zarazaga for the many hours of friendly discussion, even if we don't agree on everything. Rafel Matamales-Andreu and Josep Juárez-Ruiz provided valuable insights and most useful discussions.

References

- Adrover, M. & Cuerda, J. 1977.** Nuevos yacimientos pleistocénicos con malacofauna terrestre en la Isla de Mallorca. *Bolletí de la Societat d'Història Natural de les Balears*, 21: 125–130.
- Aguilar-Amat, J. B. D' 1914.** La *Helix Companyoi* Aleron. de Sta. María del Mar de Barcelona. *Butlletí de la Institució Catalana d'Història Natural*, 14: 125–127.
- Aguilar-Amat, J. B. D' 1933.** Observacions malacològiques, 19. Contribució al coneixement de la fauna menorquina. *Butlletí de la Institució Catalana d'Història Natural*, 33: 334–338.
- Alba, D. M., Tarruella, A., Corbella, J., Vilella, M., Guillén, G., Prats, L. & Quintana, J. 2004.** Addenda a la llista dels mol·luscos continentals de Catalunya. *Spira*, 1(4): 1–10.
- Albers, J. C. & Martens, E.von 1860.** Die Heliceen nach natürlicher Verwandtschaft systematisch geordnet von Joh. Christian Albers. Zweite Ausgabe nach dem hinterlassenen Manuskript besorgt von Eduard von Martens. xviii + 359 pp. W. Engelmann. Leipzig.
- Aleron, J. 1842.** Conchyliologie. In Henry D.M.J.: Le guide en Roussillon, ou itinéraire du voyageur dans le département des Pyrénées-Orientales, contenant un aperçu de l'histoire de la province; L'indication de tout ce qui peut exciter l'intérêt ou la curiosité de l'artiste, de l'archéologue ou du simple amateur, en fait de monuments, de sites, d'anecdotes, etc.; Une course aux divers établissements thermaux, avec l'indication de la composition de leurs eaux; Enfin l'indication des principaux objets qui peuvent appeler, dans cette partie des Pyrénées, l'attention des naturalistes, en minéralogie, en zoologie et en botanique: 326–333. J.-B. Alzine. Perpignan.
- Alonso Zarazaga, M. A. 2004.** Precisiones sobre un artículo nomenclatural acerca de la validez "taxonómica" de *Iberellus companyonii* (Aleron, 1837) recientemente publicado (Mollusca, Pulmonata, Helicidae). *Graellsia*, 60: 101–105.
- Altaba, C. R. 1991.** Mol·luscs. In Altaba C.R. & Ros J. (Eds.): *Història natural dels Països Catalans*, vol. 8: Invertebrats no artròpodes: 375–416; 427–470. Enciclopèdia Catalana. Barcelona.
- Altaba, C. R. 1993.** Els caragols i llimacs terrestres (Mollusca: Gastropoda). In Alcover J.A, Fornós J. & Ballesteros E. (Eds): *Història natural de l'Arxipèlag de Cabrera*: 409–426. Moll & CSIC. Palma de Mallorca.
- Altaba, C. R. 1997.** Documenting biodiversity: the need for species identifications. *Trends in Ecology and Evolution*, 12: 358–359.
- Altaba, C. R. 2000.** Invertebrados terrestres. In: García Canseco V. (Ed.): *Parque Nacional Archipiélago de Cabrera*: 87–96. Esfagnos. Talavera de la Reina.
- Altaba, C. R. 2004.** La biodiversitat de les Illes Balears: un paradigma per a la conservació. / Biodiversity of the Balearic Islands: A paradigm for conservation. In Vilà M., Rodà F. & Ros J. (Eds.): *Jornades sobre biodiversitat i conservació biològica / Seminar on biodiversity and conservation*: 167–188; 371–389. Institut d'Estudis Catalans. Barcelona.
- Altaba, C. R. 2007a.** Hi ha caragols endèmics de Menorca? *Malacofauna Balearica*, 1: 5–15.
- Altaba, C. R. 2007b.** A la recerca del temps perdut: què és *Helix companyonii* (Pulmonata: Helicidae)? *Annales du Muséum d'Histoire naturelle de Perpignan*, 15: 13–26.
- Altaba, C. R. 2014.** Extinction resilience of island species: An amphibian case and a predictive model. *Diversity*, 6: 43–71; <https://doi.org/10.3390/d6010043>
- Altaba, C. R. 2022.** On the rocks, twice as better: an overseen land snail genus from the mountains of Mallorca (Mollusca, Gastropoda, Helicidae). *Folia Conchyliologica*, 65: 29–39.
- Altaba, C. R. & Ríos Jiménez, F. 2021.** An enigmatic rock-dwelling land snail from southernmost Iberia (Mollusca, Gastropoda, Helicidae). *Folia Conchyliologica*, 60: 35–44.
- Altimira, C. 1970.** Moluscos y conchas recogidos en cavidades subterráneas. *Speleon*, 17: 67–75.
- Álvarez, B. M. 1978.** Estudio comparado de los moluscos terrestres de Menorca. 56 pp. B. Mateo Álvarez. Maó.
- Anonymous. 1839.** Bibliographie de la France, ou Journal général de l'Imprimerie et de la Librairie, et des cartes géographiques, gravures, lithographies et oeuvres de musique. 265 pp. Pillet Ainé. Paris.
- Anton H. E. 1839 [1838].** Verzeichniss der Conchylien welche sich in der Sammlung von Hermann Eduard Anton befinden. xvi + 110 pp. Anton. Halle.

- Bank, R. A., Bouchet, P., Falkner, G., Gittenberger, E., Hausdorf, B., Proschwitz, T. von & Ripken, T. 2001.** Supraspecific classification of European non-marine Mollusca (CLECOM Sections I + II). *Heldia*, 4 (1/2): 77–128.
- Bank, R. A. & Luijten, L. 2014.** Nomenclator of the taxa belonging to the genus *Iberus* Montfort, 1810 (Gastropoda: Pulmonata, Helicidae). *Basteria*, 78: 89–98.
- Barceló y Combis, F. 1873.** Moluscos terrestres y de agua dulce de las Islas Baleares y catálogo metódico de los mismos. *Revista Balear de Literatura, Ciencias y Artes*, 2: 6–9, 30–32.
- Barceló y Combis F. 1876.** Nuevos apuntes para la fauna balear: Catálogo de los reptiles y de los moluscos terrestres y de agua dulce observados en las islas Baleares. 18 pp. P.J. Gelabert. Palma de Mallorca.
- Bech, M. 1983.** Actualització de la fauna malacològica terrestre i d'aigua dolça de Catalunya, i la seva posició sistemàtica. *Butlletí de la Institució Catalana d'Història Natural*, 49: 19–30.
- Bech, M. 1989.** Dades malacològiques sobre alguns mol·luscs recollits en cavitats subterrànies a l'illa de Menorca. *Endins*, 14–15: 77–79.
- Bech, M. 1990.** Fauna Malacològica de Catalunya. Mol·luscs terrestres i d'aigua dolça. Treballs de la Institució Catalana d'Història natural, 12: 1–229.
- Beckmann, K. H. 2007.** Die land- und Süßwassermollusken der Balearischen Inseln. 255 pp. Conchbooks. Hackenheim.
- Bertrand, A. 2004.** Mollusques terrestres et aquatiques de Languedoc-Roussillon. Espèces déterminantes dans le cadre de la mise à jour des ZNIEFF. Documents malacologiques, hors-série n° 3: 1–29.
- Boettger, C. R. 1938.** Die Veränderlichkeit der Schale von *Iberus guatieranus* L. Bericht der Senckenbergischen Naturforschenden Gesellschaft, 3: 183–197.
- Bofill, A. 1890.** Contribution à la faune malacologique de la Catalogne. *Bulletin de la Société malacologique de France*, 7: 251–279.
- Bofill, A. 1917.** Moluscos ingressats en el Museu des del mes de juny de 1916. *Anuari de la Junta de Ciències Naturals de Barcelona*, 2: 533–549.
- Bofill, A. & Aguilar-Amat J. B. D' 1924.** Malacologia de les Illes Pitiüses. Treballs del Museu de Ciències Naturals de Barcelona, 10 (3): 1–17.
- Bofill, A. & Chía, M. de. 1914.** Fauna malacològica de Catalunya. I. Introducció. Llista alfabètica dels noms amb els quals s'han citat moluscs a Catalunya. 49 pp. Institut d'Estudis Catalans. Barcelona.
- Bofill, A. & Haas, F. 1920.** Estudi sobre la malacologia de les valls pirenaïques. Conca del Llobregat. Treballs del Museu de Ciències Naturals de Barcelona, 3: 381–831, làms. i-iv, 1 map.
- Bofill, A., Haas, F. & Aguilar-Amat J. B. D' 1921.** Estudi sobre la malacologia de les valls pirenaïques. VI. Conques del Besòs, Ter, Fluvià, Muga i litorals intermitges. Treballs del Museu de Ciències Naturals de Barcelona, 3: 837–1241, làms. 1–4.
- Bolòs i Capdevila O. de. 1996.** La vegetació de les Illes Balears. 267 pp. Institut d'Estudis Catalans. Barcelona.
- Borrero, F. J. & Rosenberg, G. 2015.** The Paul Hesse Collection at the Academy of Natural Sciences of Philadelphia, with a review of names for Mollusca introduced by Hesse. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 164: 43–100.
- Bourgat, R. 1994.** Perpignan Museum, from natural history cabinet to municipal institution. *Journal of the History of Collections*, 7: 73–79.
- Bourgat, R. & Belledent, F.-G. 1983.** Notice historique sur le Muséum d'Histoire Naturelle de Perpignan. *Bulletin de la Société Agricole, Scientifique et Littéraire des Pyrénées-Orientales*, 91: 137–155.
- Bourguignat, J. R. 1864.** Malacologie de l'Algérie, ou histoire naturelle des animaux mollusques terrestres et fluviatiles recueillis jusqu'à ce jour dans nos possessions du nord de l'Afrique. Tome second. 380 + [27] + 4 pp, 27 pls. Challamel Ainé and Bastide. Paris and Alger.
- Brandon-Jones, D., Duckworth, J. W., Jenkins, P. D., Rylands, A. B. & Sarmiento E. E. 2007.** The genitive of species-group scientific names formed from personal names. *Zootaxa*, 1541: 41–48.
- Brake, L., Demoor, M. (eds.) 2009.** Dictionary of nineteenth-century journalism in Great Britain and Ireland. 1014 pp. Academia Press and The British Library. Gent and London.
- Brancsik, K. 1890.** Consignatio systematica specierum in itinere bosnensi anno 1888 per me collectarum, novaque data ad faunam molluscarum Bosniae ac Hercegovinae. *A Trencsén Vármegyei Természettudományi Egyelet*, 11/12: 68–76, Tab. I-II.
- Breure, A. S. H. & Gittenberger, E. 1982.** The rock-scraping radula, a striking case of convergence (Mollusca). *Netherlands Journal of Zoology*, 32 (3): 307–312.
- Brisson, M. J. 1760.** Ornithologie ou méthode contenant la division des oiseaux en ordres, sections, genres, espèces & leurs variétés. A laquelle on a joint une description exacte de chaque espèce, avec les citations des auteurs qui en ont traité, les noms qu'ils leur ont donnés, ceux que leur ont donnés les différentes nations, & les noms vulgaires. Ouvrage enrichi de figures en taille-douce. Tome 1. xxiv + 526 + lxxiii pp., pl. I-XXXVII. Bauche. Paris.
- Brown, A. D. 1866.** Catalogue of the genera *Helix*, *Anostoma*, *Hypselostoma*, *Streptaxis*, *Tomigerus*, *Bulimus*, *Orthalicus*, *Partula*, in the collection of A. D. Brown. 2nd ed. 65 + [3] pp. Blanchard. Princeton (New Jersey).
- Cadevall, J., Corbella, J., Bros, V., Orozco, A., Guillén, G., Prats, L., Capdevila, M. 2020.** Els mol·luscs continentals de Catalunya i Andorra (península Ibèrica). Llista comentada. *Spira*, 7: 117–159.
- Cazurro, M., San Miguel, M. & Serradell, B. 1916.** Resumen de la excursión verificada a Tarragona a finales del pasado diciembre. *Boletín de la Real Sociedad Española de Historia Natural*, 16: 184–189.

- Cela-Conde, C. & Altaba, C. R. 2002.** Multiplying genera versus moving species: a new taxonomic proposal for the family Hominidae. South African Journal of Science, 98: 1-4.
- Chueca, L. J., Forés, M. & Gómez-Moliner, B. J. 2013.** Consideraciones nomenclaturales sobre las especies del género *Allognathus* (Gastropoda: Pulmonata: Helicidae) y estudio anatómico de *Allognathus hispanicus tantianus*. Iberus, 31 (1): 63-74.
- Chueca, L. J., Madeira, M. J. & Gómez-Moliner B. J. 2015.** Biogeography of the land snail genus *Allognathus* (Helicidae): middle Miocene colonization of the Balearic Islands. Journal of Biogeography, 42, 1845-1857.
- Colom, G. 1955.** Sobre la existencia de dos razas gigantes de Helicidos en las zonas de máximas alturas de la Sierra Norte de Mallorca. Boletín de la Sociedad de Historia Natural de Baleares, 1: 1-10, láms. 1-2.
- Colom, G. 1957.** Biogeografía de las Baleares. La formación de las islas y el origen de su flora y su fauna. 568 pp. Estudio General Luliano. Palma de Mallorca.
- Colom, G. 1961.** Les populations géantes d'hélicidés de la haute montagne de Majorque (Baléares). Publications du Conseil National pour la Recherche Scientifique, 94: 295-298.
- Colom, G. 1964a.** El medio y la vida en las Baleares. 292 pp. Estudio General Luliano. Palma de Mallorca.
- Colom, G. 1964b.** La connaissance du Pléistocène Baléare et l'origine de certains endémismes insulaires. Comptes Rendus de la Société de Biogéographie, 358: 62-67.
- Colom, G. 1978.** Biogeografía de las Baleares. La formación de las islas y el origen de su flora y su fauna. 2ª ed. 292 pp. Instituto de Estudios Baleáricos. Palma de Mallorca.
- Companyo, L. 1837.** Rapport de MM. Delocre et Companyo sur un Tableau contenant une collection de Mollusques terrestres et fluviatiles du Département des Pyrénées-Orientales, offert à la Société Philomatique par M. Aleron. Bulletin de la Société philomatique de Perpignan, 3: 85-104.
- Companyo, L. 1863.** Histoire naturelle du département des Pyrénées-Orientales. Tome troisième J.-B. 952 pp + 2 pls. Alzine. Perpignan.
- Compte Sart, A. 1968.** La fauna de Menorca y su origen. (Síntesis de la fauna de Menorca, su naturaleza y un ensayo acerca de su origen.) Revista de Menorca, número extraordinario: 5-212.
- Cuerda, J. 1965.** Données paléontologiques pour l'étude de la malacofaune terrestre des Baléares orientales. Rapports et procès-verbaux des réunions de la C.I.E.S.M.M., 18: 507-510.
- Cuerda, J. 1975.** Los tiempos cuaternarios en Baleares. 304 pp. + 20 láms. Instituto de Estudios Baleáricos. Palma de Mallorca.
- Cuerda, J. 1976.** Nota preliminar sobre el Cuaternari de Cabrera (Balears). Butlletí de la Institució Catalana d'Història Natural, 40: 45-58.
- Cuerda, J. 1979.** Formaciones cuaternarias de la Bahía de Palma. Guía de la Excursión nº 4 del VI Coloquio de Geografía. 23 pp. Universitat de les Illes Balears. Palma de Mallorca.
- Cuerda, J. 1989.** Los tiempos cuaternarios en Baleares. 2ª edición. 310 pp. + 20 láms. Conselleria de Cultura, Educació i Esports. Palma de Mallorca.
- Cuerda, J. 1993.** Notes sobre el Quaternari. In Alcover J.A, Fornós J. & Ballesteros E. (Eds): Història natural de l'Arxipèlag de Cabrera: 117-130. Moll & CSIC. Palma de Mallorca.
- Cuerda, J., Antich, S. & Soler A. 1986.** Las formaciones cuaternarias del Torrente de Cala Blava en la Bahía de Palma (Balears). Bolletí de la Societat d'Història Natural de les Balears, 29 [1985]: 75-86.
- Cuerda, J. & Sacarés, J. 1992.** El Quaternari al Migjorn de Mallorca. 304 pp. Direcció General de Cultura. Palma de Mallorca.
- Draparnaud, J. P. R. 1801.** Tableau des mollusques terrestres et fluviatiles de la France. 2 + 116. Renaud, Masson and Besson. Montpellier, Bossange and Paris.
- Draparnaud, J.-P.-R. 1805.** Histoire naturelle des mollusques terrestres et fluviatiles de la France. Ouvrage posthume. 9 + viii + 134, pls. 1-13. Plassan and Renaud. Paris and Montpellier.
- Dohrn, H. & Heynemann, F. D. 1862.** Zur Kenntniss der Molluskenfauna der Balearen. Malakologisches Blätter, 9: 99-111.
- Drouet, H. 1855.** Énumération des mollusques terrestres et fluviatiles vivants de la France continentale. Mémoires de la Société Royale, Liège, 10: 137-185.
- Dubois, A. 2003.** The relationships between taxonomy and conservation biology in the century of extinctions. Comptes Rendus Biologies, 326: 9-21.
- Dubois, A. 2007.** Genitives of species and subspecies nomina derived from personal names should not be emended. Zootaxa, 1550: 49-68.
- Dupuy, D. 1847-1852.** Histoire naturelle des Mollusques terrestres et d'eau douce qui vivent en France. xxxi + 737 pp. + 1 table (vol. 1), 31 pls. (vol. 2). Masson. Paris.
- Elejalde, M. A., Madeira, M. J., Arrébola, J. R., Muñoz, B. & Gómez-Moliner B. J. 2008.** Molecular phylogeny, taxonomy and evolution of the land snail genus *Iberus* (Pulmonata: Helicidae). Journal of Zoological Systematics and Evolutionary Research, 46 (3): 193-202.
- Fagot, P. 1879.** Histoire malacologique des Pyrénées françaises. I. Pyrénées-Orientales. Bulletin de la Société d'Histoire Naturelle de Toulouse, 13: 82-123.
- Fagot, P. 1890.** Histoire malacologique des Pyrénées françaises et espagnoles. Bulletin de la Société Ramond, 25: 131-158; 215-244.
- Falkner, G., Ripken, T. E. J. & Falkner, M. 2002.** Mollusques continentaux de France. Liste de Référence annotée et Bibliographie. Patri-moines naturels, 52: 1-350.
- Férussac, A. E. J. P. J. F. d'A. de & Deshayes G. -P. 1819-1851.** Histoire

- naturelle générale et particulière des mollusques terrestres et fluviatiles, tant des espèces que l'on trouve aujourd'hui vivantes, que des dépouilles fossiles de celles qui n'existent plus; classés d'après les caractères essentiels que présentent ces animaux et leurs coquilles. Tome 1: 8 + 184 pp., T. 2 (1): [3] + 402 pp.; T. 2 (2): 260 + 22 + [2] + xvi, Atlas 1: 70 pl., Atlas 2: 166 + 5 pl. J.-B. Baillière. Paris.
- Fischer-Piette, E., Bedoucha, J. & Salvat, F. 1966.** Mollusques terrestres de Madagascar. Ariophantidae. Mémoires du Muséum national d'Histoire naturelle, série A Zoologie, 40 (1) : 1–50, pls. I-IV.
- Fischer-Piette, E., Blanc, C. P., Blanc, F. & Salvat, F. 1994.** Gastéropodes terrestres pulmonés. Faune de Madagascar, 83: 1–552.
- Forés, M. 2004a.** Sobre la validez taxonómica de *Iberellus companyonii* (Aleron, 1837) (Pulmonata: Helicidae). Bolletí de la Societat d'Història Natural de les Balears, 45 [2002]: 137–189.
- Forés, M. 2004b.** Le Muséum de Perpignan devient le dépositaire des syntypes d'*Iberellus companyonii* (Aleron, 1837) constituant collectivement le type porte-nom. Annales du Muséum d'Histoire naturelle de Perpignan, 13: 35–39.
- Forés, M. & Vilella, M. 1995.** Una nueva especie de *Iberellus* Hesse, 1908 (Pulmonata: Helicidae) en la isla de Eivissa. Bolletí de la Societat d'Història Natural de les Balears, 36 [1993]: 17–29.
- García-San Nicolás, E. 1957.** Estudios sobre la biología, la anatomía y la sistemática del género *Iberus* Montfort, 1810. Boletín de la Sociedad Española de Historia Natural (Biología), 55: 199–390.
- Gasull, L. 1964.** Algunos moluscos terrestres y de agua dulce de Baleares. Boletín de la Sociedad de Historia Natural de Baleares, 9 [1963]: 3–80.
- Gasull, L. 1966.** Algunos moluscos terrestres y de agua dulce de Baleares. Boletín de la Sociedad de Historia Natural de Baleares, 11 [1965]: 7–161.
- Gasull, L. 1967.** La insularidad de las Islas Baleares desde el punto de vista de la malacología terrestre. Boletín de la Sociedad de Historia Natural de Baleares, 12 [1966]: 149–156.
- Gasull, L. 1971.** Adiciones y rectificaciones a la fauna malacológica terrestre y de agua dulce de las Baleares. Boletín de la Sociedad de Historia Natural de Baleares, 15 [1969]: 59–73.
- Gasull, L. 1972.** L'insularité des îles Baléares du point de vue de la malacologie terrestre. Rapports et Communications internationaux sur la Mer Méditerranéenne, 20: 553–557.
- Gasull, L. 1984.** Terrestrial and freshwater gastropods of the Pityuses (Eivissa and Formentera), excluding *Trochoidea* (*Xerocrassa*) Monterosato 1892. In Kuhnbièr H., Alcover J.A. y Guerau d'Arellano Tur C. (Eds.): Biogeography and ecology of the Pityusic Islands: 231–241. Kluwer Academic. Dordrecht.
- Germain, L. 1929.** Les Helicidae de la faune française. Archives du Muséum d'Histoire naturelle de Lyon, 13 [1928]: 1–484, pls. 1–6.
- Germain, L. 1930.** Mollusques terrestres et fluviatiles (première partie). Faune de France, 21: 1–478.
- Germain, L. 1931.** Mollusques terrestres et fluviatiles (deuxième partie). Faune de France, 22: 479–897, pls. 1–36.
- Ginés, A. 1982.** Inventario de especies cavernícolas de las Islas Baleares. Endins, 9: 57–75.
- Giusti, F., Manganelli, G. & Schembri, P. J. 1995.** The non-marine molluscs of the Maltese Islands. Monografie del Museo Regionale di Scienze Naturale di Torino, 15: 1–607.
- Gómez-Moliner, B., Alonso, M. R., Ibáñez, M., Araujo, R., Arconada, B., Martínez-Ortí, A., Pujante, A. M., Robles, F., Templado, J., Moreno, D., Luque, A., Altaba, C. R., Prieto, C., Puente, A. I., Altonaga, K., Arrébola, J. R., Rolán, E., Bros-Caton, V., Castillejo, J. & Álvarez-Halcón, R. M. 2000.** Listado final: fichas con argumentaciones científicas para la catalogación de especies de moluscos. Noticiario de la Sociedad Española de Malacología, 33: 45–47.
- Graells, M. P. 1846.** Catálogo de los moluscos terrestres y de agua dulce observados en España, y descripción y notas de algunas especies nuevas ó poco conocidas del mismo país. vi [+ i] + 23 [+ 2] pp., lám. [1]. Calleja. Madrid y Lima.
- Granger, A. 1884.** Musée Scolaire Deyrolle. Histoire naturelle de la France, 6e partie. Mollusques (Céphalopodes, Gastéropodes). 272 pp. + 19 pls. É. Deyrolle. Paris.
- Grateloup, J. P. S. de. 1840.** Description de plusieurs Coquilles nouvelles ou peu connues de Mollusques exotiques vivants. Actes de la Société Linnéenne de Bordeaux, 11 [1839]: 394–455, pls. I-IV.
- Haas, F. 1929.** Fauna malacológica terrestre y de agua dulce de Cataluña. Trabajos del Museo de Ciencias naturales de Barcelona, 13: 1–491. (Facsimile 1991: Treballs del Museu de Zoologia de Barcelona, 5: i–xxiv, 1–494–xxv–lxxv.)
- Haas, F. 1934.** Kurze Bemerkungen III. Archiv für Molluskenkunde, 66 (6): 354–357.
- Hartmann, J. D. W. 1844.** Erd- und Süßwasser-Gasteropoden der Schweiz. Mit Zugabe einiger merkwürdigen exotischen Arten. I. Band. xx + 227 pp., Taf. 1–84. Scheitlin & Zollikofer. St. Gallen.
- Hesse, P. 1908.** Kritische Fragmente. [IV–VI.] Nachrichtenblatt der Deutschen Malakozoologischen Gesellschaft, 40 (3): 131–141.
- Hesse, P. 1915–1920.** Iconographie der Land- & Süßwasser-Mollusken mit vorzüglicher Berücksichtigung der europäischen noch nicht abgebildeten Arten von E. A. Rossmässler. Neue Folge. Dreiundzwanzigster Band. [5] + 262 pp., Taf. 631–660. Kreidel. Wiesbaden.
- Hesse, P. 1931.** Zur Anatomie und Systematik paläarktischer Stylomatophoren. Zoologica, 31 (81): [1–2], 1–118, Taf. 1–16.
- Hesse, P. 1934.** Zur Anatomie und Systematik paläarktischer Stylomatophoren. Zweiter Teil. Zoologica, 33 (85): 1–59, Taf. 1–9.
- Hidalgo, J. G. 1875.** Catálogo iconográfico y descriptivo de los moluscos terrestres de España, Portugal y las Baleares. iv + 224 pp., 24 láms. S. Martínez. Madrid.

- Hidalgo, J. G. 1878.** Catalogue des mollusques terrestres des îles Baléares. Journal de Conchyliologie, 26: 213–237, pl. IX.
- Hidalgo, J. G. 1890.** Catálogo de los moluscos terrestres de las Islas Baleares. Memorias de la Real Academia de Ciencias de Madrid, 15: 165–191.
- Hidalgo, J. G. 1918.** Suplemento a la bibliografía crítica malacológica publicada en el tomo XV de las Memorias de la Real Academia de Ciencias. 41 pp. Imprenta Clásica Española. Madrid.
- Hoagland, K. E. & Davis, G. M. 1987.** The succineid snail fauna of Chittenango Falls, New York: taxonomic status with comparisons to other relevant taxa. Proceedings of the Academy of Natural Sciences of Philadelphia, 139: 465–526.
- Horst, D. V. D. 1970.** Beitrag zur Kenntnis der Molluskenfauna von Mallorca. Mitteilungen der Zoologisches Gesellschaft Brunau, 8: 117–127.
- ICZN (International Commission of Zoological Nomenclature). 2000.** International Code of Zoological Nomenclature. Fourth edition. xix + 156 pp. The International Trust for Zoological Nomenclature. London.
- Isaac, N. J. B., Mallet, J. & Mace, G. M. 2004.** Taxonomic inflation: its influence on macroecology and conservation. Trends in Ecology and Evolution, 19: 464–469.
- Isaac, N. J. B., Redding, D. W., Meredith, H. M. & Safi, K. 2012.** Phylogenetically-informed priorities for amphibian conservation. PLoS ONE 7: e43912. <https://doi.org/10.1371/journal.pone.0043912>
- Isaac, N. J. B., Turvey, S. T., Collen, B., Waterman, C. & Baillie, J. E. M. 2007.** Mammals on the EDGE: Conservation priorities based on threat and phylogeny. PLoS One 2: e296. doi:10.1371/journal.pone.0000296
- Jaekel, S. sen. 1952.** Die Mollusken der spanischen Mittelmeer-Inseln. Mitteilungen aus dem Zoologischen Museum Berlin, 28: 53–143, Taf. I–IV
- Jaekel, S. sen. & Plate, H.-P. 1964.** Beiträge zur Kenntnis der Molluskenfauna der Insel Mallorca. Malakologische Abhandlungen, 1: 53–87.
- Jaekel, S. sen. & Plate, H.-P. 1965.** Beiträge zur Kenntnis der Molluskenfauna der Insel Mallorca. Malakologische Abhandlungen, 2: 159–164.
- Juárez-Ruiz, J. & Altaba, C. R. 2022.** Evidències paleontològiques primerenques del gènere *Iberellus* Hesse, 1908 (Stylommatophora: Helicidae: Allognathini) en el Pliocè inferior de Mallorca, amb descripció d'*Iberellus colladoi* nov. sp. Nemus, 12: 189–195.
- Kadolsky, D. 2012.** Nomenclatural comments on non-marine molluscs occurring in the British Isles. Journal of Conchology, 41 (1): 65–90.
- Kerney, M. P., Cameron, R. A. D. & Bertrand, A. 1999 (reimpression 2006).** Guides des escargots et limaces d'Europe. 370 pp., 28 pls. Delachaux et Niestlé. Paris.
- Kobelt, W. 1871.** Catalog der im europäischen Faunengebiet lebenden Binnenconchylien. Mit besonderer Berücksichtigung der in Rossmässler's Sammlung enthaltenen Arten. xvi + 150 pp. T. Fischer. Cassel.
- Kobelt, W. 1882.** Diagnosen neuer Arten. Nachrichtenblatt der Deutschen Malakozoologischen Gesellschaft, 14 (8/9): 121–123.
- Kobelt, W. 1904.** Iconographie der Land- & Süßwasser-Mollusken mit vorzüglicher Berücksichtigung der europäischen noch nicht abgebildeten Arten von E. A. Rossmässler. Neue Folge. Elfter (Register-) Band. xii + 342 pp., Taf. I–VI. C.W. Kreidel. Wiesbaden.
- Khuroo, A. A., Dar, G. H., Khan, Z. S. & Malik, A. H. 2007.** Exploring an inherent interface between taxonomy and biodiversity: Current problems and future challenges. Journal for Nature Conservation, 15: 256–261.
- Linnaeus, C. 1758.** Systema naturæ per regna tria naturæ, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Tomus I. Editio decima, reformata. [1–4] + 1–824 pp. Laurentius Salvius. Holmia [Estocolmo].
- Linné, C. 1767.** Systema naturæ, Tom. I. Pars II. Editio duodecima reformata. 533–1327 + [1–37] pp. Laurentius Salvius. Holmia [Estocolmo].
- Locard, A. 1881.** Étude sur les variations malacologiques d'après la faune vivante et fossile de la partie centrale du Bassin du Rhône. Tome Second. 560 pp. H. Georg. Lyon.
- Locard, A. 1882.** Prodrome de Malacologie Française. Mollusques terrestres, des eaux douces et saumâtres. vi + 462 pp. H. Georg. Lyon.
- 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. 370 pp. J.-B. Baillière. Lyon and Paris.
- Mace, G. M. 2004.** The role of taxonomy in species conservation. Philosophical Transactions of the Royal Society of London, Series B, 359: 711–719.
- Maluquer, J. 1917.** Algunos moluscos terrestres de la isla de Cabrera. Boletín de la Real Sociedad Española de Historia Natural, 17: 394–396.
- Martínez-Ortí, A. & Robles, F. 2012.** On the taxonomical identity of some taxa of the Iberian endemic genus *Iberus* Montfort, 1810 (Gastropoda, Helicidae). Animal Biodiversity and Conservation, 35: 99–105.
- Massot, P. 1872.** Enumération des Mollusques terrestres et fluviatiles du département des Pyrénées-Orientales. Bulletin de la Société agricole, scientifique et littéraire des Pyrénées Orientales, 19: 1–116, pl. 1.
- May, R. M. 1990.** Taxonomy as destiny. Nature, 347: 129–130.
- Mittre, H. 1842.** Description de quatre coquilles nouvelles. Annales des Sciences naturelles (Zoologie), série 2, 18: 188–181.
- Montfort, D. de. 1810.** Conchyliologie systématique, et classification méthodique des coquilles; offrant leurs figures, leur arrangement générique, leurs descriptions caractéristiques, leurs noms; ainsi

que leur synonymie en plusieurs langues. Ouvrage destiné à faciliter l'étude des Coquilles, ainsi que leur disposition dans les cabinets d'histoire naturelle. Coquilles univalves, non cloisonnées. Tome second. [3] + 676 pp. F. Schoell. Paris.

- Moquin-Tandon, A. 1855.** Histoire naturelle des mollusques terrestres et fluviatiles de la France contenant des études générales sur leur anatomie et leur physiologie et la description particulière des genres, des espèces et des variétés. vol. 1: viii + 416 pp. (vol. 1), 646 pp. (vol. 2), iv + 92 pp., 54 pls. (vol. 3). J.-B. Baillière. Paris.
- Moragues, F. 1886.** Descripciones de moluscos de Mallorca. Anales de la Sociedad Española de Historia Natural, 15: 233–235.
- Müller, O. F. 1774.** Vermivm terrestrium et fluviatilium, seu animalium infusoriorum, helminthicorum, et testaceorum, non marinorum, succincta historia. Volumen alterum. xxxvi + 214 + [10] pp. Heineck et Faber. Havnia [Copenhague] and Lipsia [Leipzig].
- Neiber, M. T., Checa, L. J., Caro, A., Teixeira, D., Schlegel, K. A., Gómez-Moliner, B., Walter, F., Glaubrecht, M. & Hausdorf, B. 2021.** Incorporating palaeogeography into ancestral area estimation can explain the disjunct distribution of land snails in Macaronesia and the Balearic Islands (Helicidae: Allognathini). Molecular Phylogenetics and Evolution, 162, 107196.
- Nordsieck, H. 1986.** Das System der tertiären Helicoidea Mittel- und Westeuropas (Gastropoda: Stylommatophora). Helda, 1 (4): 109–120, Taf. 15–17.
- Ortiz de Zárate, A. 1946.** Observaciones anatómicas y posición sistemática de varios helicidos españoles. Boletín de la Sociedad Española de Historia Natural, 44: 337–356.
- Ortiz de Zárate, A. 1991.** Descripción de los moluscos del valle del Najerilla. 400 pp. Consejería de Educación, Cultura y Deportes. Logroño.
- Österreich-Toskana, L. S. 1871.** Die Balearen in Wort und Bild geschildert. Leipzig: Brockhaus. Band II. Die eigentlichen Balearen. I. Allgemeiner Teil. 665 pp. L. Woerl. Würzburg and Leipzig.
- Paetel, F. 1889.** Catalog der Conchylien-Sammlung von Fr. Paetel. Vierte Neubearbeitung. Mit Hinzufügung der bis jetzt publicirten recenten Arten, sowie der ermittelten Synonyma. Zweite Abtheilung: Land- und Süßwasser-Gastropoden. 505 pp. Paetel. Berlin.
- Paul, C. R. C. 1982a.** Pleistocene non-marine molluscs from Cala Salada, Ibiza. Geology Journal, 17: 161–184.
- Paul, C. R. C. 1982b.** An annotated check-list of the non-marine mollusks of the Pityuse Islands. Journal of Conchology, 31: 79–86.
- Paul, C. R. C. 1985.** Pleistocene non-marine molluscs from Cova de Ca Na Reia, Eivissa. Bolletí de la Societat d'Història Natural de Balears, 28 [1984]: 95–114.
- Paul, C. R. C. & Altaba, C. R. 1992.** Els mol·luscs terrestres fòssils de les Illes Pitiüses. Bolletí de la Societat d'Història Natural de les Balears, 34: 141–170.
- Paulucci, M. 1879.** Étude critique sur l'*Helix Balmei*, Potiez & Michaud. Journal de Conchyliologie, 27: 6–15.
- Pechaud, J. 1883.** Excursions malacologiques dans le Nord de l'Afrique. De la Calle à Alger, d'Alger à Tanger. N° 1. 112 pp. J. Tremblay. Paris.
- Pennant, T. 1777.** British zoology. Vol. IV. Crustacea. Mollusca. Testacea. viii + [1–10], 1–154, [1–2], pls. I–XCIII. B. White. London.
- Pfeiffer, 1842.** Symbolae ad Historiam heliceorum. Sectio altera. 147 pp. T. Fischer. Cassellum [Kassel].
- Pfeiffer, L. 1846.** Symbolae ad historiam heliceorum. Sectio tertia. 100 pp. T. Fischer, Cassellum [Kassel].
- Pfeiffer, L. 1848.** Monographia heliceorum viventium. Sistens descriptiones systematicas et criticas omnium huius familiae generum et specierum hodie cognitarum. Volumen primum. xxxii + 484 pp. F.A. Brockhaus. Lipsia [Leipzig].
- Pons, G. X. & Damians, J. 1992.** Fauna malacològica d'algunes cavitats de l'illa de Mallorca. Endins, 17–18: 67–71.
- Pons, G. X. & Palmer, M. 1996.** Fauna endèmica de les Illes Balears. 307 pp. Institut d'Estudis Baleàrics, Direcció General de Medi Ambient i Societat d'Història Natural de les Balears. Palma de Mallorca.
- Potiez, V.-L. -V. & Michaud, A.-L. -G. 1835–1838.** Galerie des Mollusques, ou catalogue méthodique, descriptif et raisonné des Mollusques et Coquilles du Muséum de Douai. Tome Premier. xxxvi + 560 + [4] pp., 56 pp. + 37 pls. (Atlas). J.-B. Baillière. Paris.
- Puente Martínez, A. I. 1994.** Estudio taxonómico y biogeográfico de la superfamilia Helicoidea Rafinesque, 1815 (Gastropoda: Pulmonata: Stylommatophora) de la Península Ibérica e islas Baleares. 979 pp., láms. 159–190. Tesis doctoral. Universidad del País Vasco / Euskal Herriko Unibertsitatea.
- Quintana, J. 1996.** Fauna malacològica associada a *Cheirogaster gymnesica* (Bate, 1914). Implicaciones biogeográficas. Bolletí de la Societat d'Història Natural de les Balears, 38 [1994]: 95–119.
- Quintana, J. 2009.** Estudi sobre la variabilitat conquiològica i del sistema genital d'*Iberellus pyrenaicus* (Rossmassler 1839) (= *I. minoricensis* (Mittre 1842)) (Gastropoda Pulmonata: Helicidae) a l'illa de Menorca (Illes Balears, Mediterrània occidental). Comparació amb *Iberellus balearicus* (Zielgler 1853) i *Iberellus tanitianus* Forés & Vilella 1993. Bolletí de la Societat d'Història Natural de les Balears, 50 [2007]: 27–44.
- Reeve, L. & Sowerby, G. B. 1851–1854.** Conchologia iconica: or, illustrations of the shells of molluscous animals. Vol. VII containing a monograph of the genus *Helix*. 20 pp. + pls. I–CLV. L. Reeve. London.
- Richardson, L. 1980.** Helicidae: Catalog of species. Miscellaneous Publications of the Department of Malacology of the Academy of Natural Sciences of Philadelphia, 3: i–iii, 1–697.
- Rosals, J. 1913.** Notes sobre la malacologia catalana. Butlletí de la Ins-

- titució Catalana d'Història Natural, 10: 82–90.
- Rosals, J. 1914.** Impresions d'una excursió científica. Butlletí de la Institució Catalana d'Història Natural, 11: 150–158.
- Rossmässler, E. A. 1838-1844.** Iconographie der Land- und Süßwassermollusken, mit vorzüglicher Berücksichtigung der europäischen noch nicht abgebildeten Arten. (1) 2. 7/8: [1–4] + 1–44, 9/10: [1–4] + 1–66, 11: [1–4] + 1–15, 12: [1–4] + 1–37, Taf. 31–60. Arnoldische. Dresden and Leipzig.
- Rossmässler, E. A. 1854.** Iconographie der Land- und Süßwasser-Mollusken Europa's, mit vorzüglicher Berücksichtigung kritischer und noch nicht abgebildeter Arten. III. Band. 13/14: viii + 1–39, 15/16: viii + 41–77 + [1], 17/18: viii + 81–140, Taf. 61–90. H. Costenoble. Leipzig.
- Sacchi, C. F. 1954.** Contributo alla conoscenza del popolamenti delle piccole isole mediterranee. II. Cenni biogeografici sulla malacofauna di Iviza (Pitiuse). Bollettino di Zoologia, 21: 1–40.
- Sacchi, C. F. 1955.** Fattori ecologici e fenomeni microevolutivi nei molluschi della montagna mediterranea. Bollettino Zoologico, 22: 563–652, lam. 1–3.
- Sacchi, C. F. 1957.** Lineamenti biogeografici della Spagna mediterranea su basi malacofaunistiche. Publicaciones del Instituto de Biología Aplicada, 25: 5–48.
- Sacchi, C. F. 1958a.** Les mollusques terrestres dans le cadre des relations biogéographiques entre l'Afrique du Nord et l'Italie. Vie et Milieu, 9: 11–52.
- Sacchi, C. F. 1958b.** Contributo alla conoscenza del popolamenti delle piccole isole mediterranee. VIII. Dati microsistemati di polmonati terrestri e considerazioni biogeografiche sulle Baleari orientali. Publicaciones del Instituto de Biología Aplicada, 27: 147–163.
- Schileyko, A. A. 2006.** Treatise on Recent terrestrial pulmonate molluscs. Part 13: Helicidae, Pleurodontidae, Polygyridae, Ammonitellidae, Oreohelicidae, Thysanophoridae. Ruthenica, Supplement 2 (13): 1–142.
- Schniebs, K. 1995.** Die Typen und Typoide der Molluskensammlung des Staatlichen Museums für Tierkunde Dresden (I). Die Typen der von Anton (1838) beschriebenen rezenten Mollusken: 1. Neritidae, Littorinidae, Naticidae, Vasidae. Malakologische Abhandlungen des Staatlichen Museums für Tierkunde Dresden, 17 (2): 167–172.
- Schröder, F. 1978.** Zur landschneckenfauna der Insel Formentera/Pityusen. Veröffentlichungen des Überseemuseums Bremen, A, 5: 49–56.
- Schubert, O. 1891.** Beiträge zur vergleichenden Anatomie des Genitalapparatus von *Helix* mit besonderer Berücksichtigung der Systematik. Archiv für Naturgeschichte, 58: 1–65, Taf. 1–6.
- Schumacher, C. F. 1817.** Essai d'un nouveau système des habitations des vers testacés. Avec XXII planches. [1–3], 1–287, pl. I–XXII. Schultz. Copenhague.
- Seguí, B., Bover, P., Trias, M. & Alcover, J. A. 1998.** El jaciment fòssilífer de la cova C-2 (Ciutadella de Menorca). Endins, 22: 81–97.
- Servain, G. 1880.** Étude sur les Mollusques recueillis en Espagne et au Portugal. 172 pp. D. Bardin. Paris.
- Solem, A. 1978.** Endodontid land snails from Pacific islands (Mollusca: Pulmonata; Sigmurethra). Part II Families Punctidae and Charopidae, Zoogeography. 336 pp. Field Museum of Natural History. Chicago.
- Stuardo, J. & Vega, R. 1985.** Synopsis of the Land Mollusca of Chile. With Remarks on Distribution. Studies on Neotropical Fauna and Environment, 20 (3): 125–146.
- Talaván-Serna, J. & Talaván-Gómez, J. 2019.** New *Allognathus* (*Iberellus*) (Gastropoda: Helicidae) from Ibiza, Balearic Islands (Spain). Malacologia, Mostra Mondiale, 103: 6–9.
- Thiele, J. 1931.** Handbuch der systematischen Weichtierkunde. Erste Band, Teil, 2: 377–788.
- Thomson, S. A., Pyle, R. L., Ahyong, S. T., Alonso-Zaragoza, M., Amirati, J., Araya, J. F., et al. 2018.** Taxonomy based on science is necessary for global conservation. PLoS Biol 16(3): e2005075. <https://doi.org/10.1371/journal.pbio.2005075>
- Tryon, G. W. & Pilsbry, H. A. 1888.** Manual of Conchology; structures and systematic. Second series: Pulmonata, 4. Helicidae. Vol. II. 296 pp., pls. 1–69. Tryon Jr. Philadelphia.
- Tryon G.W. & Pilsbry, H.A. 1894-1895.** Manual of Conchology; structural and systematic. Second series: Pulmonata, IX. (Helicidae, Vol. 7). Guide to the study of helices. xlviii + 366 + 126 pp., pls. 1–71. The Academy of Natural Sciences. Philadelphia.
- Valdovinos, C. 1999.** Biodiversidad de moluscos chilenos: Base de datos taxonómica y distribucional. Gayana Zoología, 63(2): 111–164.
- Vicens, D. & Gracia, F. 1991.** Nuevo yacimiento del Pleistoceno superior en la playa de "Sa Font Salada" (Balears). Bolletí de la Societat d'Història Natural de les Balears, 32 [1988]: 33–46.
- Welter-Schultes, F. W. 2012.** European non-marine molluscs, a guide for species identification. A1–A3 + 679 pp. + Q1–Q78. Planet Poster Editions. Göttingen.
- Westerlund, C. A. 1889.** Fauna der in der paläarktischen Region (Europa, Kaukasien, Sibirien, Turan, Persien, Kurdistan, Armenien, Mesopotamien, Kleinasien, Syrien, Arabien, Ägypten, Tripolis, Tunesien, Algerien und Marocco) lebenden Binnenconchylien. II. Gen. *Helix*. 473 + 31 + 8 pp. Friedländer. Berlin.
- Westerlund, C. A. 1902.** Methodus dispositionis conchyliorum extramarinorum in Regione palaeartica viventium, familias, genera, subgenera, et stirpes sistens. Rad Jugoslavenske Akademije Znanosti i Umjetnosti, Matematičko-Prirodoslovni Razred /Acta Academiae Scientiarum et Artium Slavorum Meridionalium, 151 (32): 82–139.
- Wood, B. & Collard, M. 1999.** The human genus. Science, 284: 65–71.
- Zilch, A. 1960.** Gastropoda, 2. Euthyneura. Handbuch der Paläozoologie, 6 (2–4): 1–835.