

The Assimineidae of the Atlantic-Mediterranean seashores

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A study of the Atlantic – and Mediterranean marine species of the genera *Assimineia* and *Paludinella* revealed several new species. The species *Assimineia gittenbergeri* spec. nov. is established in the Mediterranean. *Assimineia avilai* spec. nov. and *Assimineia rolani* spec. nov. have been found in Terceira, Azores and in Madeira respectively. A species from the Atlantic coast of France, cited as *Assimineia eliae* Paladilhe, 1875 by Thiele, is described as *Paludinella glaubrechtii* spec. nov. *A. eliae* cannot be identified today as no type material is known. The name, however, is used for several different species as documented herein. *Assimineia ostiorum* (Bavay, 1920) is here considered a species in its own right. *Paludinella sicana* (Brugnone, 1876), until now considered an exclusively Mediterranean species, has been detected along the Atlantic coast at Laredo (Spain) in the north as well as at Agadir (Morocco) in the south.

Keywords: Gastropoda, Caenogastropoda, Assimineidae, Assimineia, Paludinella, systematics, Atlantic Ocean east coast, Mediterranean.

INTRODUCTION

The Assimineidae H. & A. Adams, 1856 are a group of mollusks living worldwide in brackish water, in freshwater as well as terrestrial habitats. In Europe there are only a few species known. They live in usually more or less brackish conditions high in the tidal zone, frequently along tidal mudflats. The two genera recognized to date are *Paludinella* Pfeiffer, 1841 with *Paludinella littorina* (Delle Chiaje, 1828) and *Paludinella sicana* (Brugnone, 1876) and the type-genus *Assimineia* Leach in Fleming, 1828, with the type-species *Assimineia grayana* (Fleming, 1828) as well as *Assimineia eliae* Paladilhe, 1875. Several other species have been described from the Atlantic-Mediterranean area but most are unrecognizable or belong to other genera which have no relation to the Assimineidae (see CLEMAM).

Assimineia grayana is an Atlantic species with doubtful occurrence in the Mediterranean. The other *Assimineia* species viz. *Assimineia eliae* was described from Atlantic localities only. Both *Paludinella* species occur in the Mediterranean whereas *Paludinella littorina* is also known from the Atlantic. During study of the different Atlantic and Mediterranean *Assimineia* species it became apparent that there are two different types of protoconchs. This is true for many gastropod genera and is known to be caused by a different life history of the juveniles. Some species possess planktotrophic larvae resulting in relatively small protoconch whorls whereas lecithotrophic larvae result in bigger protoconch whorls. In order to quantify these differences in the genus *Rissoa*, Verduin (1976: 25 fig. 1) proposed a method which is used here too. The radula is also significant. A description of the radula of *Assimineia grayana* is given by Thiele (1927: 115 textfig. 1) as well as by Bandel (1984: 25, 26 fig. 39). Both Thiele (1927: 114) and Bandel (l.c.) stress the importance of the basal denticles on the central, rachidean, tooth. An example is here given in figs 12, 13. Thiele (1927: 126) used a "Sectio" [*Eussoia* Preston, 1912] for species of *Assimineia*

where the basal denticles are absent altogether.

Species of the genus *Paludinella* do not show such denticles either according to this author (1927: 126). Fukuda & Ponder (2003: 2014 – 2032) also use the presence or absence of the basal denticles to discriminate between groups (subfamilies) in the Assimineidae: Group 1 with basal cusps and group 2 without them. Group 1 is equivalent to Assimineinae H. & A. Adams, 1856, whereas group 2 contains the genus *Paludinella* where basal cusps are absent. Fukuda & Ponder do not name this group although they suggest several subfamily names. They doubt whether Paludinellidae Habe, 1976 is available, but mention Ekadantinae Thiele, 1929 and Cyclotropidae Iredale, 1941 as possibilities.

Unfortunately some species here described as new have not been found alive and so radulae were not always available for study.

In this paper a critical evaluation of the known species is given and several new species are described.

Abbreviations. – RMNH = National Museum of Natural History Naturalis, Leiden, The Netherlands.

NMR = Natuurhistorisch Museum Rotterdam, Rotterdam, The Netherlands

MNHN = Museum National de Histoire Naturelle, Paris, France.

USNM = United States National Museum, Washington, USA.

ZMB = Zoologisches Museum der Humboldt-Universität, Berlin, Germany.

AD = collection J.J. van Aartsen, Dieren, The Netherlands.

BO = collection W. Backhuys, Oegstgeest, The Netherlands.

FW = collection of the late Mrs. M. Fehr-de Wal, presently incorporated in AD.

JT = collection J. Trausel, Dordrecht, The Netherlands.

MK = collection H. Menkhorst, Krimpen a/d IJssel, The Netherlands.

RV = collection E. Rolan, Vigo, Spain.

SA = collection W. Segers, Aartselaar, Belgium.

d = diameter of initial swelling of the protoconch.

D = diameter of the first half whorl of the protoconch.

rl = real length of shell

SYSTEMATIC PART

Assiminea Leach in Fleming, 1828.

Assiminea grayana Fleming, 1828 figs 1, 2

Assiminea grayana, Fleming, 1828: 275.

Assiminea grayana, Forbes & Hanley, 1850: 70, pl. 71 figs 3, 4.

Assiminea grayana, Jeffreys, 1869: 99, pl. 97 fig. 5.

Assiminea grayana, Monterosato, 1906: 128.

Assiminea grayana, Thiele, 1929: 169 fig. 147.

Assiminea grayana, Marchand, 1972: 55 figs 11,12.

Assiminea grayana, Fretter & Graham, 1978: 146 fig. 128.

Assiminea grayana, Bandel, 1984: 25, 26 fig. 39.

Assiminea grayana, Poppe & Goto, 1991: 95, pl. 10 fig. 25.

Assiminea grayana, Gittenberger et al., 1998: 104 fig. 170.

Not: *Assiminea* sp., Cesari, 1988: 18, 21, pl. 1 figs 3a-d, pl. 2 figs 2a-c.

Not: *Assiminea* cfr. *grayana*, Giannuzzi-Savelli et al., 1997: 120, 121 figs 517, 518.

Material studied. – AD 11282/1, FW 416/5, FW 485/3, FW 2019/1, FW 4863/20, all from The Netherlands.

Original description. – “Dr. Leach sent me, several years ago, a shell, from Greenwich marshes, constituting “a new fresh water genus”, under the title *Assimineea grayana*. The lip is thickened on the pillar, and reflected over the cavity, but is destitute of the oblique fold; and the lip does not extend over the body-whorl. The colour is brown; the whorls six in number, conical, regularly increasing in size, glossy, with minute lines of growth. Length about 0.2 of an inch.”

Diagnosis. – Shell forming a straight sided cone with nearly flat whorls. No umbilicus present. Colour brown to yellowish, sometimes a little transparent. The breadth is about sixty percent of the length but the slenderness is somewhat variable, young specimens are broader than full-grown ones. The last whorl occupies just over seventy percent of the total length. The mouth is holostome and occupies less than fifty percent of the length. The average dimensions are four to five mm., reaching up to seven mm. in exceptional cases. The embryonic whorls are characterized by $d = 100\mu$, $D = 180\mu$ (see fig. 2).

Discussion. – This species is the type of the genus *Assimineea* s.s. The radula has been sketched by Thiele (1927: 115; 1929: 169) and by Bandel (1984: 26 fig. 39). A SEM photograph is given by Marchand (1972: 55 figs 11, 12). A summary of these authors texts and figures result in the following description. The central tooth has a cutting edge with five teeth; the outer ones small and the three middle ones not very different in size. There are three basal denticles on each side. The lateral tooth has five teeth, the inner marginal four whereas the outer marginal shows eleven teeth. In comparing this description with the radulae of other *Assimineea* species it should be realized that some of the outer teeth are very small indeed and therefore can be missed easily.

Fretter & Graham (1978: 147) describe the veliger larvae as “with a simple, hardly spiral, smooth shell about 160-170 μ across”. This corresponds well with the diameter of the first half whorl D. The length of the free life of the larvae is not known according to these authors (l.c.) but is here assumed to be of the planktotrophic type. It should be noted that the same authors (l.c.: 146) mention “there are about twelve spiral lines on the larval whorl” whereas the veliger shell is described as smooth. SEM photographs did show about ten spirals. These spirals were not very conspicuous in our material and were only detected at the end of the embryonic whorls.

The species is known along the Atlantic coasts of Europe from Arcachon in the south to Denmark in the north, including Great Britain. The specimen mentioned by Cadée (1968: 113) does not belong to *Assimineea grayana* according to Falkner et al. (2002: 92 note 97). See *Paludinella sicana*.

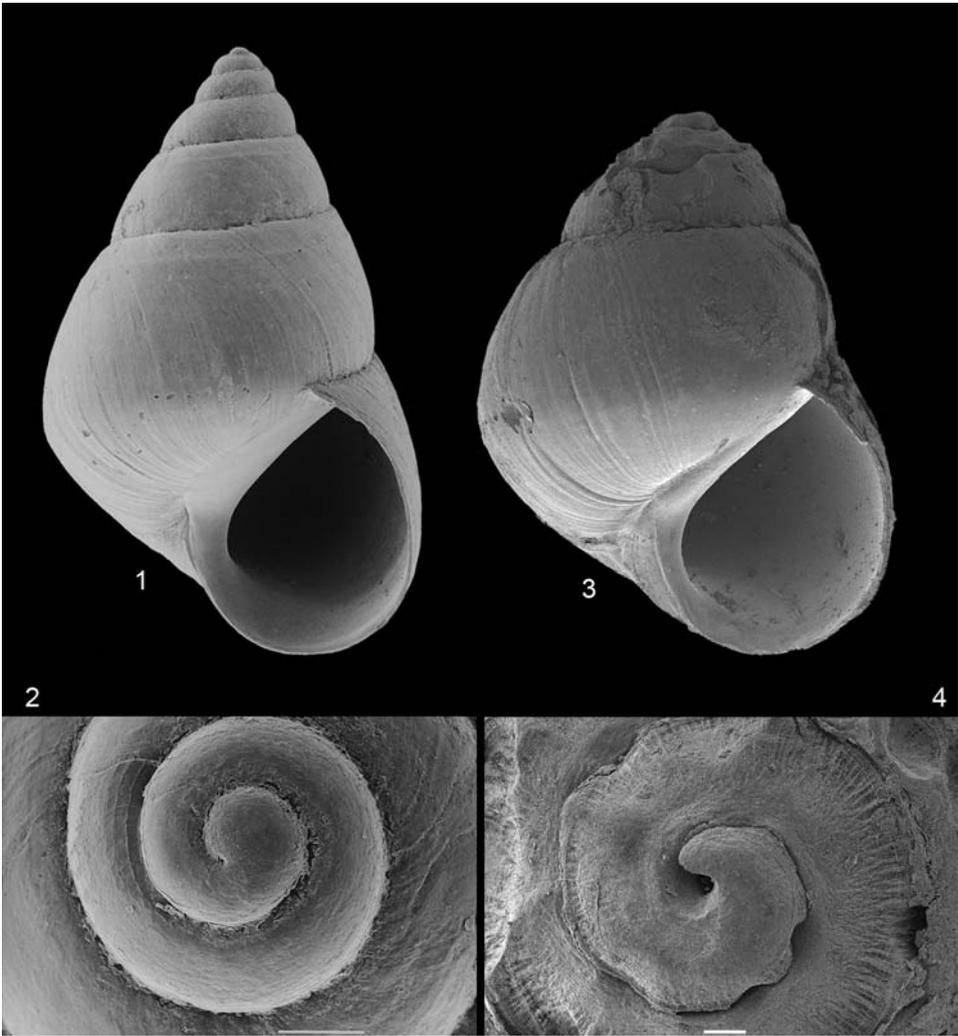
Assimineea ostiorum (Bavay, 1920) figs 3, 4

Assemania ostiorum Bavay, 1920: 161, 162 figs in text.

?*Assimineea* sp. Amanieu, 1969: 525.

Material studied. – six syntypes from Andernos, Bassin d’Arcachon, France, MNHN 20895. One of the syntypes is here chosen as lectotype of the species *Assemania ostiorum* (see fig. 3) with dimensions 4.5 x 3.5 mm.

Original description. – “Coquille petite de couleur de corne brune, non perforée, de forme courtement conique; six tours de spire, dont l’inférieur dilaté mesurant à lui seul les 4/5 de la hauteur de la coquille. La spire qui le surmonte est fort court et non aiguë.



Figs 1-4. *Assimineea* spec. Figs 1,2. *Assimineea grayana*, Numansdorp, The Netherlands.1, specimen H = 3.8 mm; 2, topwhorls much enlarged. Figs 3, 4. *Assimineea ostiorum*, Anderos, Bassin d'Arcachon, France. 3, Lectotype. H = 4.5 mm; 4, topwhorls much enlarged.

Ouverture ovale, aiguë au sommet, à bord droit tranchant, à bord gauche appliqué sur le dernier tour où son email s'épaissit sur la région ombilical. Opercula corné, demi-circulaire, mince et pellucide."'. Length 5 mm; Breadth 3mm at maximum.

Type-locality: Bassin d'Arcachon.

Discussion. – Although this species has been synonymised with the well-known *A. grayana*, study of the syntypes raised much doubt about this synonymy. The shells are much broader at the same length and more stumpy altogether. From the figures this can readily be appreciated. Unfortunately the topwhorls are corroded in all the syntypes (see

fig. 4) and so d nor D values can be measured to be compared with *A. grayana*. The material found at the bay of Arcachon and commented upon by Amanieu (1969: 525) may have been this species but this can not be proofed. *A. ostiorum* is certainly not synonymous with *Assimineae elae* as suggested by Amanieu. For the moment this species should be considered as a species in its own right, not a form of *A. grayana*. Although Bavay found this species to be "abondante" it has apparently not been mentioned in the last ninety years.

Assimineae gittenbergeri spec. nov. figs 5, 6, 7, 8

Assimineae spec., Cesari, 1988: 18, 21 fig. 3, pl. 1 figs 3a-d, pl.2 figs 2a-c.

Assimineae cfr. *grayana*, Giannuzzi-Savelli et al., 1997: 120, 121 figs 517, 518.

Material studied. – Holotype: RMNH 110499. Paratypes: RMNH 110500/10, AD 26260/17, AD 25340/1; > 25 spec. in MK from the type locality. AD 29521/4, AD 29508/3+4 fragm. from Grado (El Bosco), Italy; SA 1 spec. from Ravenna, Italy, SA 3 spec. from Trieste, Italy.

Description. – The shell forms an almost straight sided cone and the whorls are nearly flat. The colour is light yellowish to brownish, the surface being rather shiny and a little transparent. The embryonic whorls are characterized by $d = 130\mu$ and $D = 250\mu$ (see fig. 7). The top is rather blunt. The breadth of the shell is just over sixty percent of the total length, the last whorl occupies about seventy percent and the mouth is a bit less than fifty percent of the total length. The mouth is holostome without interruption on the body-whorl and the growthlines are strongly prosocline. The average dimensions are around three mm. at about four whorls, not counting the embryonic ones.

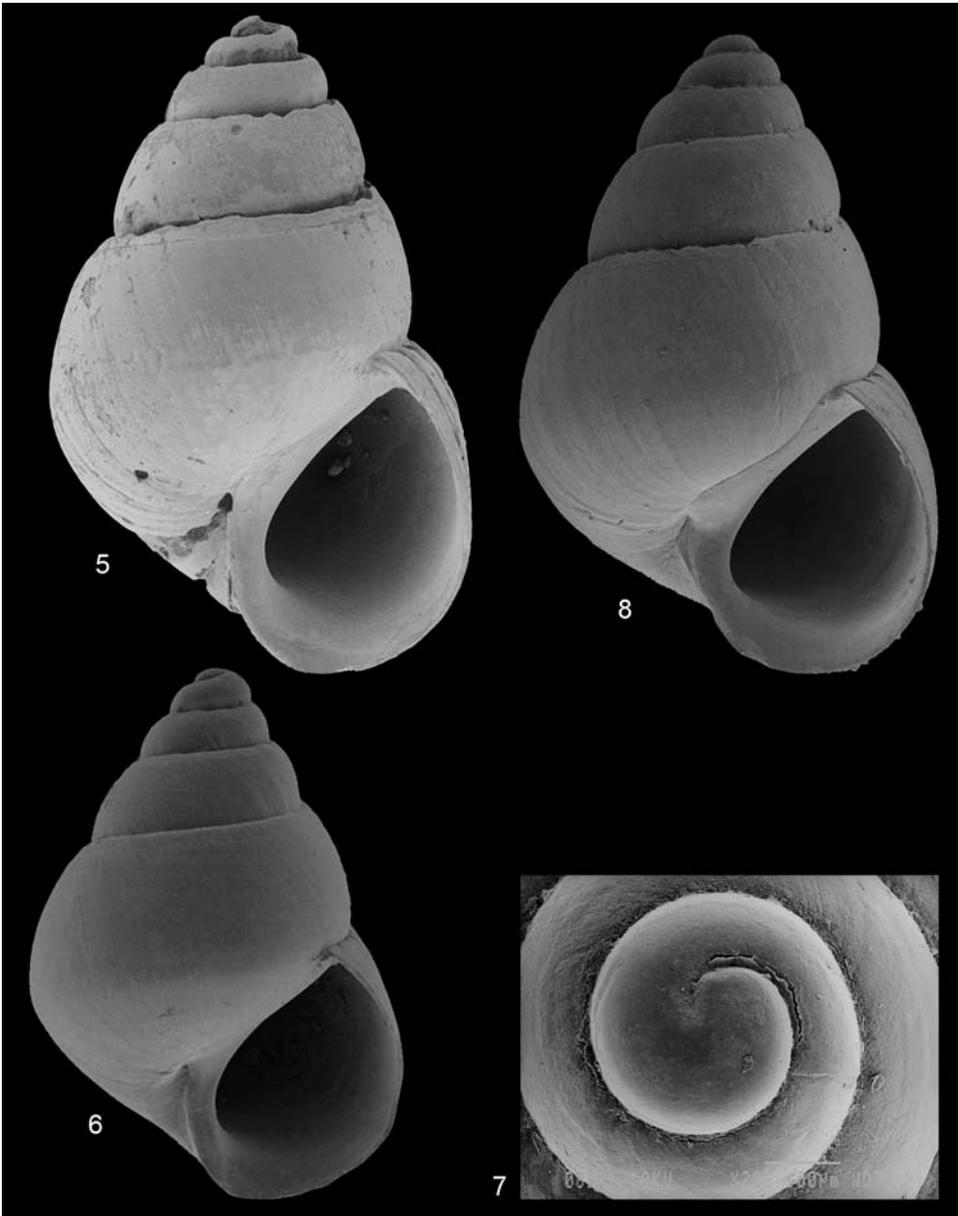
Holotype: 3.1 x 2.0 mm.

Type-locality: Sfax, Tunisia.

Etymology. – This species is named after prof. dr. E. Gittenberger, well-known malacologist and friend, at the occasion of his retirement from active duty at Naturalis as well as at the Leiden University.

Discussion. – This species differs from the well-known *Assimineae grayana* by the more blunt protoconch and its bigger embryonic whorls with dimensions of $d = 130\mu$ and $D = 250\mu$ (see fig. 7). The dimensions of the shells are smaller and the radula of the animal differs too, according to Cesari (l.c.), as cited below.

The specimens studied by Cesari are not available anymore. Fortunately Cesari (l.c.) gives a good description of his material and therefore there is no doubt that the specimens from Tunisia (Sfax) and those from the Northern Adriatic belong to one species only. The shells from Grado (El Bosco), Ravenna and Trieste are identical with those from Sfax also regarding the d and D values of their protoconchs. Cesari (1988: 18) describes the radula of the specimens from the North Adriatic as follows: "La radula è di tipo tenioglosso (7 denti per un numero elevate di fila) con formula 2-1-1-1-2. Il dente centrale ha corpo largo con parte apicale a forma di sarchello; presenta 5 dentelli apicali, di cui i due laterali deboli ed esuigui, e otto cuspidi basale (4 per lato); i laterali hanno 7 dentelli di cui il medio evidentemente pronunciato (pl. 2 fig. 2b) un paio di piccolo relieve lateralia appaiono irregolarmente e hanno consistenza trascurabile; i primi marginali sono più larghi e sono dotati di 9 dentelli apicali; i secondi marginali sono piu larghi ed hanno 15 dentelli apicali". This radula differs from the one of *A. grayana* in the number of basal denticles of the central tooth (four instead of three on each side), the marginal teeth have different numbers of denticles too, viz. five and fifteen respectively compared with four and eleven in *A. grayana*.



Figs 5-8. *Assimineea gittenbergeri* spec. nov., 5-7, Sfax, Tunisia. 5, Holotype H = 3.1 mm; 6, Paratype H = 2.4 mm; 7, topwhorls much enlarged; 8, Trieste, Italy, Paratype H = 3.1 mm.

Assiminea eliae Paladilhe, 1875

Assiminea eliae Paladilhe, 1875: 6, pl. 21 figs 15-17.

Assiminea eliae, Paladilhe, 1877: 15, pl. 10 figs 5-7.

Assiminia eliae, Monterosato, 1906: 128.

Assiminia eliae, Dollfus, 1912: 186.

Assiminea eliae, Falkner et al., 2002: 32, 92 (?in part).

Not: *Assiminea eliae*, Thiele, 1927: 118, 122.

Not: *Assiminea eliae*, Backhuys, 1975: 50, 51.

Not: *Assiminea eliae*, Avila et al., 1998: 498.

Not: *Assiminea eliae*, Avila, 2000: 121.

Original description. – “Coquille imperforée, conoïdale, de consistance cornée, couleur d’ambre un peu rougeâtre, assez transparente, lisse, luisante, à peine marquée, chez les échantillons très-adultes, de quelques stries d’accroissement irrégulières et seulement appréciables dans le voisinage de l’ouverture. Spire conique à sommet petit et aigu. 6-7 tours peu convexes, presque plats sur les côtés, à accroissement très-rapide à partir surtout du quatrième, séparés par une suture assez profonde, bien marquée, submarginée. Dernier tour très-grand, égalant, vu par derrière, les deux cinquièmes de la hauteur totale de la coquille, convexe-arrondi, remontant un peu vers l’ouverture, à bord libre oblique de haut en bas et de dedans en dehors, presque concave. Ouverture arrondie, légèrement ovale, subpiriforme, un peu anguleuse vers le haut; péristome interrompu, simple, droit, tranchant; bord externe arrondie, un peu projeté en dehors, faiblement anguleux à sa réunion avec l’extrémité inférieure de la columelle; bord columellaire mince, tranchant, droit, à peine un peu élargi et épaissi à son insertion supérieure.

Opercule mince, présentant des stries subspirales d’accroissement irrégulières, mais assez bien marquées et représentant à peu près deux tours. Hauteur, 3 millim. $\frac{1}{4}$; diamètre, 2 millim.” Found at La Rochelle and Bayonne (France), Golfe de Gascogne (Spain), and Coimbra (Portugal). Paladilhe later (1877: 17) gives the dimensions as 3.5 x 2.0 mm.

Discussion. — This species has always been rather obscure. Both Monterosato (l.c.) and Dollfus (l.c.) consider it to be either “vicina o identica, guidicando da buoni tipi” (Monterosato) or “ne nous paraissent que des variétés peu éloignées du type” (Dollfus) compared with *Assiminea grayana*. In view of the description and figures given by Paladilhe these authors could well be right. Unfortunately there are no types known and so the species *Assiminea eliae* Paladilhe must remain unrecognizable. The specimens mentioned by Thiele (l.c.) have been studied. They belong to a different species (see *A. glaubrechtii* spec. nov.). The same is true for the specimens mentioned by Backhuys (1975: 50,51) which belong to the new species *A. avilai* spec. nov.

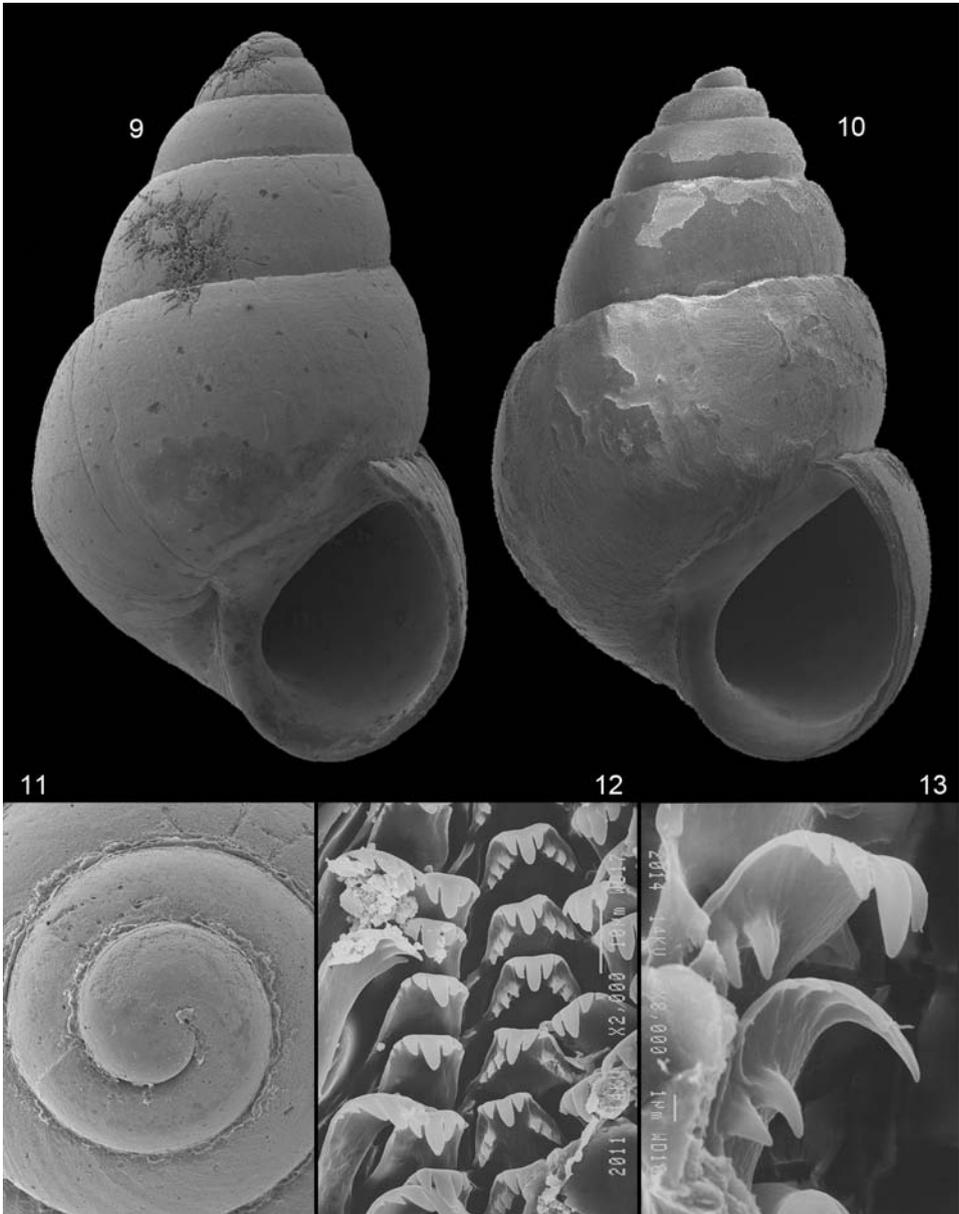
Avila et al. (1998: 498) and Avila (2000: 121), at least in part, use the name *A. eliae* for *Paludinella littorina*.

Recently Falkner et al. (l.c.: 32) give *A. eliae* as belonging to the “mollusques continentaux de France”. However the specimen mentioned (l.c.: 92 note 97) has been studied and belongs to *Paludinella sicana*.

Assiminea avilai spec. nov. figs 9, 10, 11, 12, 13

Assiminea eliae, Backhuys, 1975: 50, 51.

Material studied. – Holotype: RMNH 110501. Paratypes: RMNH 110502/6, >25 spec. in coll. S. Avila, AD 30900/17 and SA 3 spec., all from the type- locality. Also from Terceira Isl. but from different locali-



Figs 9-13. *Assimineia avilai* spec. nov., Terceira, Azores, Portugal. 9, Holotype H = 3.2 mm; 10, Paratype H = 3.2 mm; 11, topwhorls much enlarged; 12-13, radula.

ties: NMR 038764/1 Porto Martins, NMR 038766/5 Porto Judeu and NMR 038765/15 Ponta des Cavales, Farol, all ex JT and one specimen from Baia da Silveira in BO.

Description. – The shells form a slender cone which is slightly pupoid. The young specimens are therefore less slender than the full-grown ones. The four to five whorls are somewhat convex and of a yellow-brown colour. The last whorl occupies seventy percent of the total height whereas the mouth is less than fifty percent of the total height. The embryonic whorls are characterized by $d = 120\mu$ and $D = 240\mu$ (see fig. 11) The breadth is variable and depends on age, forming sixty-five percent in full-grown specimens to more than seventy-five percent of the total length. Dimensions range from 2.5 to 3.5 mm.

The radula is of the *Assimineea* type and shows three basal denticles on each side of the central tooth. The laterals show seven teeth which are very different in size, the inner marginals have seven teeth too whereas the outer marginals show more than ten teeth of approximately the same size (see figs 12, 13).

Holotype: 3.2 x 2.0 mm.

Type-locality: Azores, Terceira Island, Predeira do Cabo.

Etymology. – This species is named after dr. S. P. Avila, from the Universidade dos Açores who found the species and presented it to the author.

Discussion. – *Assimineea avilai* differs from both *A. gittenbergeri* as well as from *A. grayana* by the dimensions of the protoconch being bigger than those of *A. grayana* but smaller than those of *A. gittenbergeri*. The whorls are somewhat more convex too compared with both these species. The radula differs in the much more incised teeth, in the number of teeth on the inner marginals and in the number of basal denticles of the central tooth, which is four in *A. gittenbergeri* compared with three in *A. grayana* as well as in *A. avilai*. The teeth on the cutting edge however are much more different in size in *A. avilai* than they are in *A. grayana*. The species *A. avilai* seems to be restricted to the island Terceira of the Azores but is found there in different localities.

Assimineea rolani spec. nov. figs 14, 15, 16.

Assimineea cf. *grayana*, Rolan & Templado, 2000: 82, 83, 81 figs 2-8.

Material studied. – Holotype: RMNH 110503. Paratypes: RMNH 110504/11, AD31067/7, 2 spec. in SA and >25 in RV.

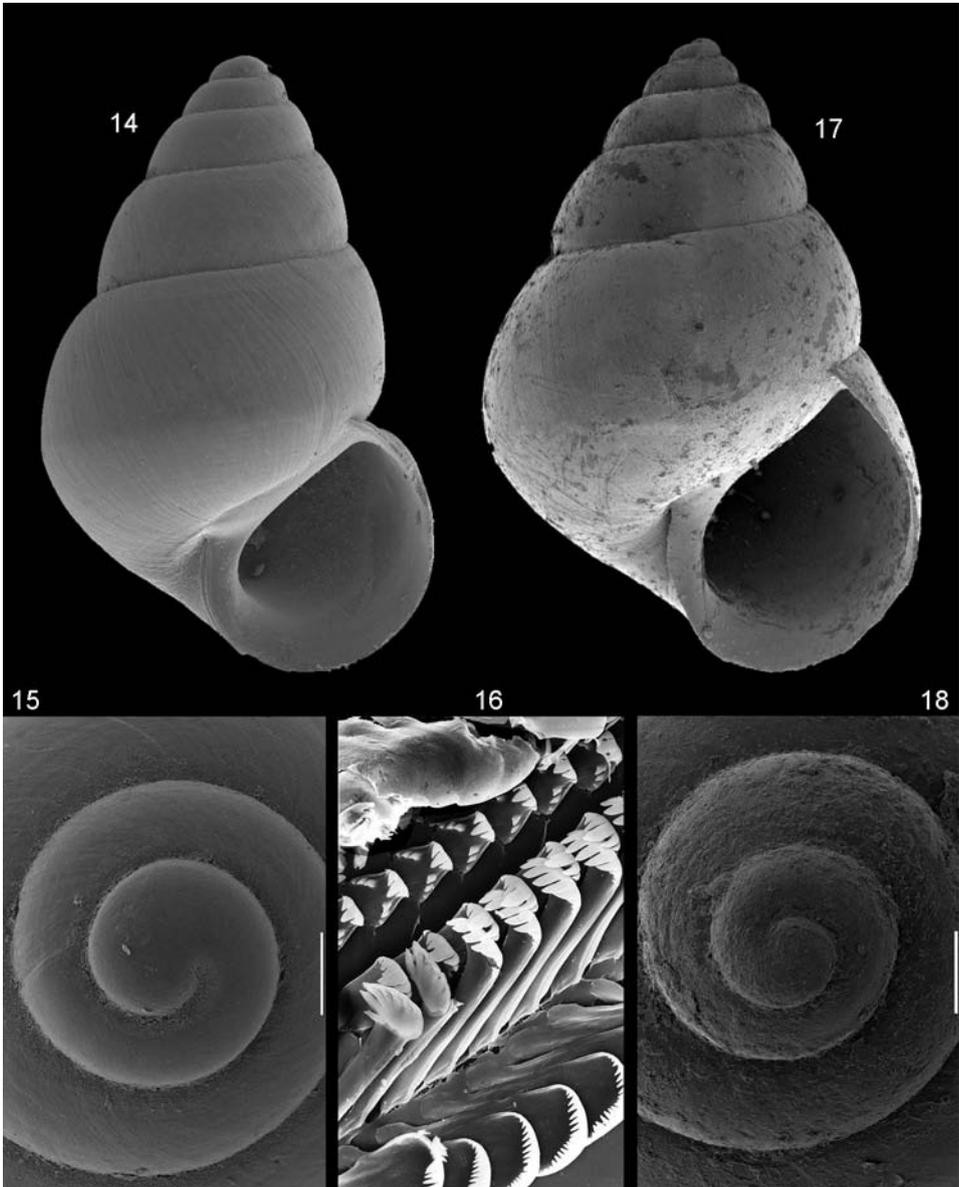
Description. – Shell forming a straight-sided cone with somewhat obtuse top. The four to five whorls only slightly convex. Growth lines strongly prosocline. No clearly developed spiral sculpture except for an occasional spiral groove below the upper suture. The breadth is variable, forming about seventy percent of the total length. The mouth occupies less than fifty percent. The top-whorls are characterised by $d = 130\mu$ and $D = 250\mu$ (see fig. 15).

Holotype: 2.8 x 1.8 mm.

Type-locality: Funchal, Madeira, Portugal.

Etymology. – This species is named after dr. E. Rolan, well-known for his many contributions to marine malacology.

Discussion. – This species was identified with *A. grayana* at first glance. However, as already mentioned by Rolan & Templado (2000: 84), it differs from *A. grayana* by being smaller and more slender. Besides *A. grayana* shows smaller d and D values pointing to a planktotrophic embryonic state. *A. rolani* spec. nov. shows much similarity with *A. avilai* spec. nov. showing comparable d and D values. The shells are much alike too.



Figs 14-18 *Assimineina* species. 14-16. *Assimineina rolani* spec. nov., Funchal, Madeira, Portugal. 14, Holotype H = 2.8 mm; 15, topwhorls much enlarged; 16, radula. Figs 17-18. *Assimineina glaubrechtii* spec. nov., Bayonne, 2-10 m, France. 17, Holotype H = 2.6 mm; 18, topwhorls much enlarged.

The radulae, consisting of a central rachidian tooth with five teeth of rather different size along the cutting edge and two rows of three basal cusps each at the base is commonly found in all Assimineae discussed here. The form of the central tooth is different however, being more slender and pointing sideward at the cutting edge which is not the case in *A. avilai* spec. nov. (compare fig. 12 with fig. 16). The laterals as well as the inner marginals are more or less comparable but the outer marginals show about twenty teeth of the same size, compared with twelve in *A. avilai* spec. nov.

Assimineae glaubrechtii spec. nov. figs 17, 18, 19, 20

Assimineae eliae, Thiele, 1927: 118, 122.

Material studied. – Holotype in ZMB, from the Thiele (ex Paetel) collection s.n. *A. eliae* originating from Bayonne, 2-10 m. (France). Paratypes: five in ZMB from the type-locality; RMNH 110505/10, >25 in RV, AD31066/ from Vegadeo, Northern Spain.

Description. – The shell forms a rather broad cone. The whorls are convex and evenly rounded. The height of the last whorl and the breadth are about equal and form seventy percent of the total length. The mouth occupies forty-five percent of the length. The embryonic whorls are characterized by $d = 90\mu$ and $D = 170\mu$ (see fig. 18, 20). The surface is shiny but the colour has faded from the specimens available. According to Thiele (l.c.) the central tooth of the radula does not show any basal denticles. The dimensions are about 2.4 – 2.7 mm. at four to five whorls.

Holotype: 2.6 x 1.9 mm.

Type locality: Bayonne, France, 2-10 m.

Etymology. – This species is named after dr. M. Glaubrecht, curator of Mollusca at the ZMH in Berlin.

Discussion. – Although the shells in ZMB were labelled *Assimineae eliae* they do not at all correspond with the original description of that species, nor with the figure given [see under *Assimineae eliae* Paladilhe, 1875]. It is clear that these six specimens belong to a new species which differs from *Assimineae grayana*, *Assimineae gittenbergeri* and *Assimineae avilai* by the convex whorls as well as the relatively broad shell. Thiele (1927: 118) compares the radula with that of *Assimineae grayana* and writes “..die Platten sind nicht so groß und dichtgedrängt, der Mittelplatte fehlen die Hinterzacken, ihre Schneide hat ebenso wie die Zwischenplatte 7, die innere Seitenplatte 8 und die äußere 14 Zähne”.

The material from Vegadeo, Spain, consists of many somewhat smaller shells, an example is figured here as fig. 19. Its embryonic whorls are represented in fig. 20, note the spiral lines at the end of the protoconch.

As already mentioned the absence of basal denticles on the central tooth is considered a basic difference between the groups 1 and 2 by Fukuda & Ponder (l.c.). Thus *A. glaubrechtii* should be classified in group 2.

Paludinella Pfeiffer, 1841

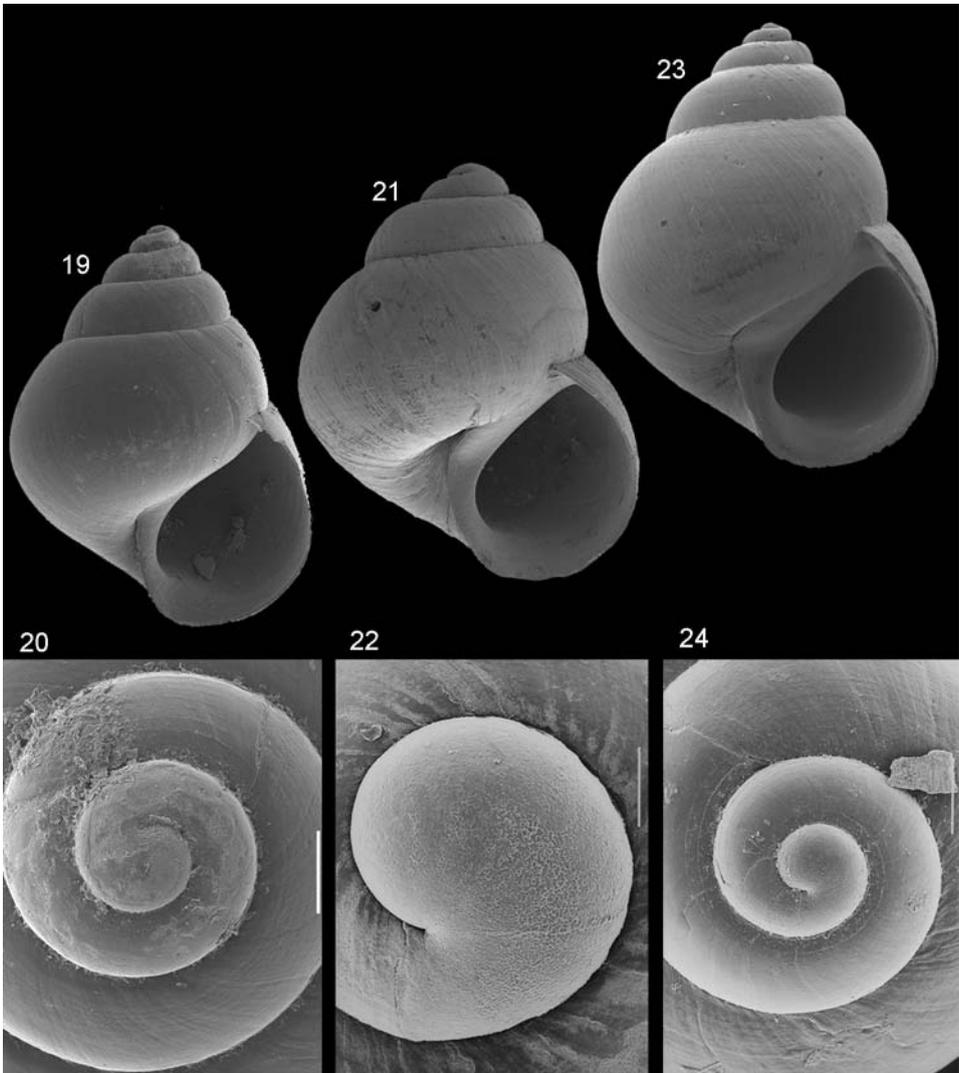
Paludinella littorina (Delle Chiaje, 1828) Figs 21, 22

Helix littorina Delle Chiaje, 1828: 225, pl. 49 figs 36-38.

Truncatella littorina, Philippi, 1841: 53, pl. 5 fig. 7.

Truncatella littorina, Philippi, 1844: 133, 301, pl. 24 fig. 2.

Rissoa(?) littorea, Forbes & Hanley, 1850: 132, pl. 81 figs 6, 7.



Figs 19-24. Figs. 19-20. *Assimineea glaubrechtii* spec. nov., Vegadeo, Northern Spain. 19, Paratype H = 1.8 mm; 20, topwhorls much enlarged. Figs 21-22. *Paludinella littorina* (Delle Chiaje, 1828), Sfax, Tunisia. 21, H = 2.1 mm; 22, topwhorls much enlarged. Figs 23-24. *Paludinella sicana* (Brugnone, 1876), Mercin, Turkey. 23, H = 2.2 mm; 24, topwhorls much enlarged.

Assimineea littorina, Jeffreys, 1869: 101, pl. 97 fig. 6.

?*Assimineea littorina*, Buquoy, Dautzenberg & Dollfus, 1884: 317, pl. 36 figs 27-30.

Assiminella littorina, Monterosato, 1906: 129.

Paludinella littorina, Priolo, 1955: 60.

Paludinella littorina, Fretter & Graham, 1978: 148 fig. 129.

Paludinella littorina, van Aartsen et al., 1984: 14, 107 fig. 53.

Paludinella cfr. *littorea* (Forbes & Hanley, 1866[sic!]) Cesari, 1988: 20, 21 fig. 4, pl. 1 figs 1a-d, pl 2 figs 1a-c.

Not pl. 1 figs 2a, 2b.

Paludinella littorina, Poppe & Goto, 1991: 95, pl. 10 fig. 26.

Paludinella littorina, Giannuzzi-Savelli et al., 1998: 120, 121 fig. 520.

Paludinella littorina, Rolan & Templado, 2000: 84, 83 figs 9-12.

Material studied. – Atlantic: Great Britain: Weymouth USNM 67956, USNM 185086 (var. *pallida*), The Fleet (Dorset) AD 22675; France: Hendaye; Portugal: Martinhal, Lagos; Spain: Laredo, Ria de Arosa; Gran Canary, Las Canteras AD 27436; Madeira AD 28189; Azores: Terceira, Pico AD 30198, AD 30199. Mediterranean: 36 samples in AD from all over the Mediterranean, as well as one figured specimen ex BDD from Paulliles in MNHN. Not (yet) known from the Israeli coast.

Original description. – “Testa minima succinea, spirae anfractus quatuor”.

Discussion. — As can be seen from the material studied this species has a rather wide distribution throughout the Mediterranean, the Atlantic coast of mainland Europe as far as Great Britain and the Atlantic Islands. The Atlantic specimens are entirely identical with the Mediterranean ones and so the opinion of Jeffreys (1869:101), Monterosato (1906:129) and van Aartsen et al. (1984: 15) is again confirmed. The four specimens in USNM 185086 (Jeffreys collection) are somewhat smaller and lighter in colour but otherwise identical and therefore a var. *pallida* seems superfluous. Surprisingly the specimen ex BDD mentioned above turned out to belong to *Paludinella sicana*. Whether BDD also had material belonging to *Paludinella littorina* can not be ascertained. Cesari (1988: pl. 2 figs 1a, 1b) gives a photograph of the radula of this species from which it is clear that basal denticles are absent. The species therefore belongs to group 2 as defined by Fukuda & Ponder (2003: 2017). Figure 1c represents the protoconch whorls, from which we calculate $D = 400\mu$ well in accord with our own measurements which are $d = 290\mu$ and $D = 420\mu$ (see fig 22).

Paludinella sicana (Brugnone, 1876) figs 23, 24

Assimineia littorina var. *sicana* Brugnone, 1876: 13, fig. 15.

Assimineia sicana, Buquoy, Dautzenberg & Dollfus, 1884: 318, pl. 36 figs 31, 32.

Assimineia sicana, Monterosato, 1906: 129.

Assimineia sicana, Pallary, 1912: 123, pl. 16 fig. 21.

Assemania sicana, Pallary, 1920: 53.

?*Assimineia coeni* Coen, 1933: 161 no. 75, pl. 2 fig. 23 ex Mtrs. ms.

Paludinella sicana, Priolo, 1955: 60.

Paludinella sicana, D'Angelo & Gargiullo, 1978: 105, figured.

Paludinella littorina, Cesari, 1988: 22, pl. 1 figs 2a, 2b.

Paludinella sicana, Gaglioli, 1991: 3, 4, 16 figured.

Paludinella sicana, Giannuzzi-Savelli et al., 1997: 120, figs 519a, 519b.

Assimineia eliae Paladilhe, 1875, in: Falkner, 2002: 32, 92 (in part).

Material studied. – Atlantic: Spain: Laredo AD 17406/4, SA/3, Ria de Arosa NNM/1; Morocco: Agadir AD 23293/1.

Mediterranean: 30 samples from all over the Mediterranean: Spain, France, Italy, Yugoslavia, Greece, Turkey, Israel and Algeria, all in AD.

Original description. – “A. testa mm. 3 alta, mm. 2¼ lata, orato-conoidea, solidula,

laevis, nitida, fulva: anfractus 5 convexi, suturis parum profundis distincti: aperture ovata, superne angulata, tota longitudine duplo et dimidio minor: peristoma continuum: fissura umbilicaris obsoleta, callo quodam peristomatis obsecta.

Discrimina inter utramque formam non sunt profecto parvi ponderis, attamen, ob dubia nonnulla utriusque specimina, statuere non audeo, utrum altera bonam speciem suique juris constituat."

Discussion. — The differentiation between *Paludinella littorina* and *Paludinella sicana* on the basis of the very different dimensions of the protoconch as indicated by Gaglini (1991: 4) is here confirmed. However, Gaglini misinterpreted the protoconchs as far as dimensions are concerned. Figures 22 and 24 show the protoconchs of *Paludinella littorina* and of *Paludinella sicana* with dimensions $D = 420\mu$ and $D = 150\mu$ respectively. The photographs in Cesari (1988: pl. 1 figs 2a, 2b) corroborate the identification of this material as *P. sicana* instead of *P. littorina*. Other differences e.g. dimensions of the shell, slenderness, colour as well as convexity of the whorls, mentioned by authors in the past, turn out to be variable and of no value in differentiation between both species. In particular the slenderness is rather variable. As both species frequently occur together the locality is of no use either.

The species *Assiminea coeni* Coen, 1933 may be this species too, but cannot be recognized as the holotype does not exist anymore in the Coen collection in Jerusalem. Although CLEMAM, Chreson 28657, gives the names *Assiminea lhotellerii* and *Assiminea letourneuxi*, both ex Bourguignat in Monterosato, 1906 as synonyms of *Paludinella sicana* there is no evidence for this synonymy without study of the types, which are not available. The specimen mentioned by Falkner et al. (2002: 92 s.n. *Assiminea eliae*, in NNM) has been studied and should be considered to belong to *Paludinella sicana*.

Some remarks about species described as *Assiminea*, from Europe.

Assiminea recta Mousson, 1874

Assiminea recta Mousson, 1874: 100, pl. 5 fig. 4.

Peringia recta, Pallary, 1920: 53, pl. 1 figs 34-36.

Original Description. — "Diese kleine Brackwasserschnecke hat die grösste Aehnlichkeit mit *Assiminea gallica* Paladilhe, 1867 aus den Salzquellen der Jura...". Dimensions given as 4.2 x 1.1 mm.

The original figure depicts a very slender shell (Eulimidae?). The figure by Pallary (l.c.) clearly shows a slender *Hydrobia* species. CLEMAM (X = 13281) suggests identity with *Hydrobia ulvae* (Pennant, 1777) a suggestion which is here endorsed. Falkner et al. (2002: 92) consider the possibility that *Assiminea recta* is an older synonym of *Assiminea eliae* but this seems improbable in view of the dimensions given by Mousson.

Assiminea adriatica Clessin, 1878

Assiminea adriatica Clessin, 1878: 119, pl. 4 fig. 6.

Pseudoamnicola clessini Brusina, 1885: 52.

Original Description. — "Gehäuse: klein, geritzt, kegelig mit spitzem Wirbel, fein gestreift, von bräunlich-violetter Farbe, etwas durchscheinend, ziemlich festschalig; Umgänge 6-7, ziemlich rasch und regelmässig zunehmend; wenig, fast gar nicht gewölbt,

durch eine seichte Naht getrennt; der letzte nimmt 1/3 der Gehäuse-Höhe ein; Mündung eiförmig, oben spitz gewinkelt; mit einfachen, scharfen, zusammenhängenden Rändern, Spindelrand wenig angedrückt. - Deckel: hörnig, dünn, eingesenkt, aus wenigen Windungen bestehend. Alt. 5 mm; diam. 3,5 mm. Hab. Görz".

Clessin described this species as one of his "Neue Süßwasser-Rissoiden". This fact as well as the locality strongly suggest that this species should not be considered as a (new) *Assiminea*. Brusina (1885: 52) has renamed this species *Pseudoamnicola clessini* and enumerates it among the terrestrial mollusca ("Dem Festland eigenthümlichen Mollusken-Arten."). In the Check-list for the Iberian Peninsula [see: www.naturamediterraneo.com] this species is given as a synonym of *Paludinella sicana*. In view of the dimensions this synonymy is erroneous.

Assiminea species described by Paladilhe, 1875 and 1877.

Paladilhe described a number of species which he placed in *Assiminea* viz. *A. blanci*, *A. elegans* and *A. siciliensis* all of which were described in 1877 whereas he described *A. cardonae* and *A. eliae* in 1875. All these species lack individuality and can not be recognised as long as there are no types available. As it is not known whether types are still existent it can only be suggested that the three first mentioned species probably belong to *Paludinella* but it cannot be made out whether they belong to *P. littorina* or to *P. sicana* as long as the protoconchs cannot be studied. The species *A. cardonae* is described from the island of Minorca (Spain) as possessing a non-continuous peristome, sometimes reddish in colour and living near the mouth of a small stream. Monterosato (1906: 129) did not see any material as he did with *A. eliae*, but merely says "seems rather to belong to *Assiminea* s.s.". From the figure this species should not be included in *Paludinella* but may well belong to an other genus (?freshwater). In the recent Check-list for the Iberian Peninsula [see above] all five species are considered synonyms of *P. sicana* which does not seem correct.

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