

Notes on Azorean and European *Carychium* species  
(Gastropoda, Basommatophora, Ellobiidae)

R. A. BANK

Crijnsenstraat 61 hs, 1058 XV Amsterdam

& E. GITTENBERGER

Rijksmuseum van Natuurlijke Historie, P.O. Box 9517, 2300 RA LEIDEN

1. THE AZOREAN CARYCHIUM SPECIES

The occurrence of a species of the genus *Carychium* Müller, 1774, on the Azores has been first reported by Nobre (1924: 74, 75), who mentioned *C. minimum* from the island of São Miguel. Because of subsequent changes in our views concerning the relevance of various shell characters in *Carychium*, it is uncertain now what species Nobre actually referred to. Backhuys (1975: 52-55) recorded both *Carychium tridentatum* (Risso, 1826) and *Carychium minimum minimum* Müller, 1774, from the Azores. After having studied most of the material reported upon by Backhuys (one sample is lost), we now have to conclude that three *Carychium* species are represented on the Azores.

*Carychium minimum* Müller, 1774

We have not seen any specimen of *C. minimum* from the Azores. The sample from the island of Flores, studied by Backhuys (1975: 54) has been lost. However, Backhuys (1975: pl. 22 fig. 61) published a photograph of a shell from the island of São Miguel, which appears to be most similar to *C. minimum* indeed. However, at least as long as the structure of the internal lamellae of the Azorean shells now considered to represent *C. minimum* has not been studied and described in some detail, it will remain uncertain whether they really belong to that species.

*Carychium tridentatum* (Risso, 1826), fig. 1

In a sample collected by Backhuys N. of Flamengos on the island of Faial at 280 m alt., 11 specimens of *C. tridentatum* were found together with 21 shells of another *Carychium* species (see below). This is the only record of *C. tridentatum* from the Azores which we could confirm.

The shells have a rather prominent sculpture of regular, transverse, closely spaced striae (see fig. 1). The edge of the parietal lamella is sinuous, as has been described for *C. tridentatum* by several authors (e.g., Watson & Verdcourt, 1953: 316, pl. 10 fig. 4; Kuiper, 1956: 2, fig. 1b; Kerney & Cameron, 1979: 58, fig. B). The shells are 1.6 to 1.8 mm high and 0.8 to 0.85 mm broad and thus relatively slender.

*Carychium ibazoricum* nom. nov., figs. 2-7

*Auricula gracilis* Morelet, 1845: 76, pl. 7 fig. 3 (Portugal, "environs de Coïmbre"). Non Grateloup, 1828; non Philippi, 1843.

*C. ibazoricum* is a poorly known species, represented on the Iberian peninsula and on the Azores. The following diagnosis and description apply to the Azorean material. On the Iberian peninsula the species is more variable in shape and dimensions than it is on the Azores; samples from the former area will be discussed in a paper on the *Carychium* species of the Iberian peninsula.

Diagnosis. — A rather large *Carychium* species (shell 1.8 to 2.1 mm high), with a slender, rounded conical shell, which exhibits (1) prominent, sharp, transverse riblets, (2) a distinctive, granular microsculpture on both the proto- and the teleoconch, and (3) a sinuous edge of the comparatively long internal part of the parietal lamella.

Description. — Shell rounded conical in outline, whitish or more glassy translucent (when very fresh), with  $4\frac{1}{2}$  to  $5\frac{1}{4}$  rather inflated whorls. Teleoconch with prominent, regular, transverse riblets, which are usually not very closely spaced. Both proto- and teleoconch provided with a conspicuous, granular microsculpture. Aperture oval, in front view oblique, with a broadly reflected and strongly thickened apertural lip; outer lip with a prominent denticle, inner lip showing the relatively high outer end of the parietal lamella and the less conspicuous outer end of the columellar lamella.

The height of the aperture is 0.36 to 0.40 of that of the entire shell.

The shells are 1.8 to 2.1 mm high and 0.85 to 1.1 mm broad; they are 2.0 to 2.2 times as high as broad.

The frontal part of the body-whorl should be partly removed in order to study the important internal part of both the parietal and the columellar lamella. Both lamellae have a thickened, rounded edge. The edge of the parietal lamella is distinctly sinuous, with a conspicuous, adapical curve in the second quarter of the body-whorl (counted from the penultimate whorl on). The columellar lamella is much lower than the parietal one and its edge is not clearly sinuous; only the latter lamella is still very prominent where it enters the penultimate whorl from the body-whorl.

Differentiation. — *C. ibazoricum* differs from the European species *C. minimum* Müller, 1774, *C. paganettii* Zimmermann, 1925, *C. tridentatum* (Risso, 1826), and *C. mariae* Paulucci, 1878, most clearly by its granular microsculpture and the very prominent transverse riblets. The first two species also differ from *C. ibazoricum* by their simple parietal lamella, which does not have a sinuous edge (see also part 2 of this paper).

*C. ibazoricum* is similar in shell sculpture to the American (sub)species *C. exile canadense* Clapp, 1906, and *C. clappi* Hubricht, 1959 (see Burch & Shrader van Devender, 1980: figs. 108, 110), which differ, however, by having more cylindrical and narrower shells; as far as can be concluded from the cited figures, there is no prominent, granular microsculpture in the American taxa. In *C. ibazoricum* the palatal denticle is much more prominent than it is in each of the *Carychium* species from North America discussed by Pilsbry (1948: 1051-1062) and Burch & Shrader van Devender (1980).

Systematic and zoogeographical position. — It is unclear to which *Carychium* species *C. ibazoricum* is most closely related. The species is one more Palaearctic element in the Azorean non-marine malacofauna, in which *Punctum* (*P.*) *minutissimum* (Lea, 1841) remains the only Nearctic element known (Backhuys, 1975: 117).

Distribution. — *C. ibazoricum* is known from the Iberian peninsula (Portugal) and from the following Azorean islands: São Miguel, Terceira, São Jorge, Faial, and Pico.

Derivatio nominis. — The epithet *ib-azoricum* indicates the occurrence of the species on both the Iberian peninsula and the Azores.

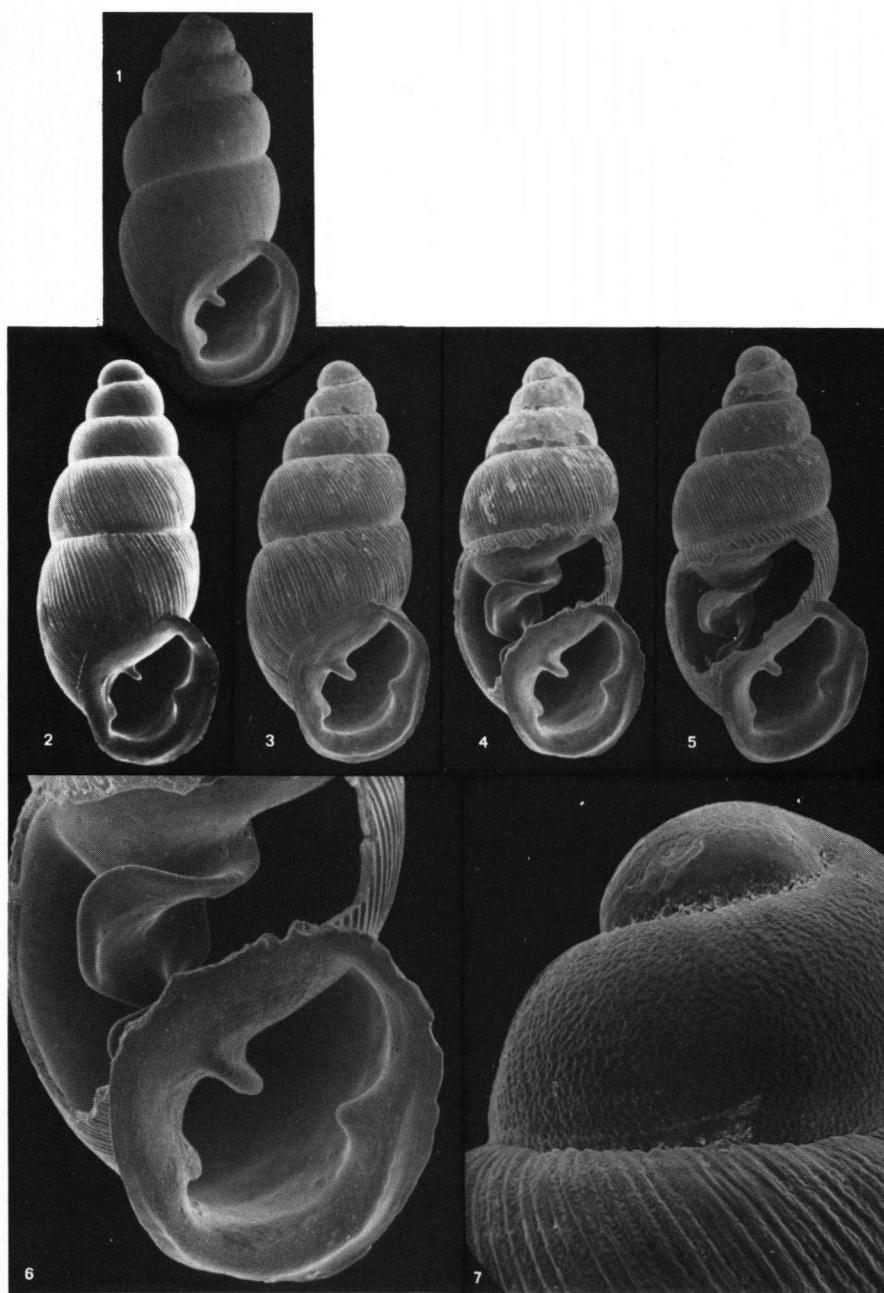


Fig. 1-7. *C. tridentatum* (Risso); Azores, Faial, N. of Flamengos, 280 m alt. (W. Backhuys leg.). Figs. 2-7. *C. ibazoricum* nom. nov. 2, Portugal, Minho, 3 km E. of Braga, Bom Jesus do Monte, 250 m alt. (H.P.M.G Menkhorst leg.); 3-7, Azores, São Miguel, Pico Grande, NE. of Ponta Delgada (W. Backhuys leg.). Figs 1-5,  $\times 30$ ; fig. 6,  $\times 70$ ; fig. 7,  $\times 200$ . Photographs J.H.W. Krom.

Material.<sup>1</sup> — Azores. São Miguel: Pedras de Galego (RMNH 55549/6); Queimada (RMNH 55551/9; WBO/2); Ribeira Quente - Furnas (RMNH 55548/2); Pico Grande, NE. of Ponta Delgada (RMNH 55553/23; WBO/11); Fayal da Terra (RMNH 55547/8; WBO/3); Lagoa das Furnas (RMNH 55544/1); Tronqueira - Feteira, 500 m alt. (RMNH 55550/1). Terceira: Angra do Heroísmo (RMNH alc./12). São Jorge: Manadas (RMNH 55543/1); Faja dos Cuberes (RMNH 55545/1); Urzelina (RMNH alc./2; WBO/1). Faial: N. of Flamengos, 280 m alt. (RMNH 55546/12; WBO/9). Pico: 1-3 km S. of San Roque (RMNH 55552/65; WBO/27).

All the Azorean material has been collected by Dr. W. Backhuys.

## 2. NOTES CONCERNING EUROPEAN TAXA IN CARYCHIUM

### The present state of our knowledge

The publication of the paper on *Carychium* by Watson & Verdcourt (1953) was a most important step towards a better understanding of European *Carychium*. The impressive earlier work of Zimmermann (1925), who had distinguished categories of shells according to their dimensions and slenderness, gained in relevance because Watson & Verdcourt (1953: 315, 316) demonstrated that the shape of the internal part of especially the parietal lamella also permits easy identification of specimens which are intermediate in slenderness between "typical", slender, *C. tridentatum* and "typical", more robust, *C. minimum*. The N. Italian *C. mariae* and the S. Italian and Sicilian *C. paganettii*, both dealt with as separate entities by Zimmermann (1925), remained poorly known. Strauch (1977) has described and figured the structure of the important internal part of both the columellar and the parietal lamella of these two species. He also suggested the occurrence of an additional recent Italian *Carychium* species (from near Naples), which he considered closely related to the Pliocene *C. sandbergeri* Handmann, 1887 (see Strauch, 1977; 167, pl. 16 fig. 39). Problematical forms of *Carychium* had been reported from SE. Europe already by Berger (1963), in an important paper, apparently overlooked by Strauch.

According to Berger (1963) there are at least two European subspecies of *C. tridentatum*, viz. *C. tridentatum* s.s. and *C. tridentatum elongatum* Villa, 1841. Both "subspecies" are reported from e.g., Poland as well as from the British Isles; for geographical races they are rather illogically distributed. We prefer to comment on this in more detail in a future paper.

Strauch (1977) has classified the recent European *Carychium* species with two subgenera, viz. *Carychium* s.s. and *Saraphia* Risso, 1826, because of the characters of the internal part of the lamellae. For various reasons we cannot follow this view as long as there are no additional arguments in favour of it. The relatively simple shape of the lamellae in *Carychium* s.s. is not fundamentally different from that in *Saraphia*; the former type might be considered the plesiomorphic character state or, equally well, an apomorphic character state. Convergent evolution, i.e. independent reduction of parts of the lamellae in separate evolutionary lineages, is a possibility which should be taken into account seriously. Berger (1963: 324) considered *C. lederi* O. Boettger, 1880, a synonym of *C. tridentatum*, whereas Strauch (1977) classified these two nominal taxa with *Carychium* s.s. and *Saraphia*, respectively. *C. schlickumi* Strauch, 1977, is also intermediate in characters between *Carychium* s.s. and *Saraphia*.

<sup>1</sup> For abbreviations see at the end of this paper.

Much more material than we have at our disposal is necessary in order to contribute substantially to a better insight in the systematics of S. European *Carychium*. We have to confine ourselves to some notes, hoping in this way to stimulate additional collecting and research.

On *C. mariae* and its sympatric occurrence with *C. tridentatum*

Zimmermann (1925: 328) characterized *C. mariae* (figs. 9-14) on shell shape, sculpture and dimensions; the shells are said to be less than twice as high as broad and not over 1.9 mm high (mean values of populations), and provided with conspicuous transverse riblets. Strauch (1977: 170, pl. 15 figs. 28-30, pl. 19 fig. 71) has described the structure of the internal part of the lamellae in *C. mariae*; the edges of the lamellae are contorted, comparable to what is seen in *C. tridentatum* (figs. 15-28) and quite different from the shape in *C. minimum* (figs. 29-30).

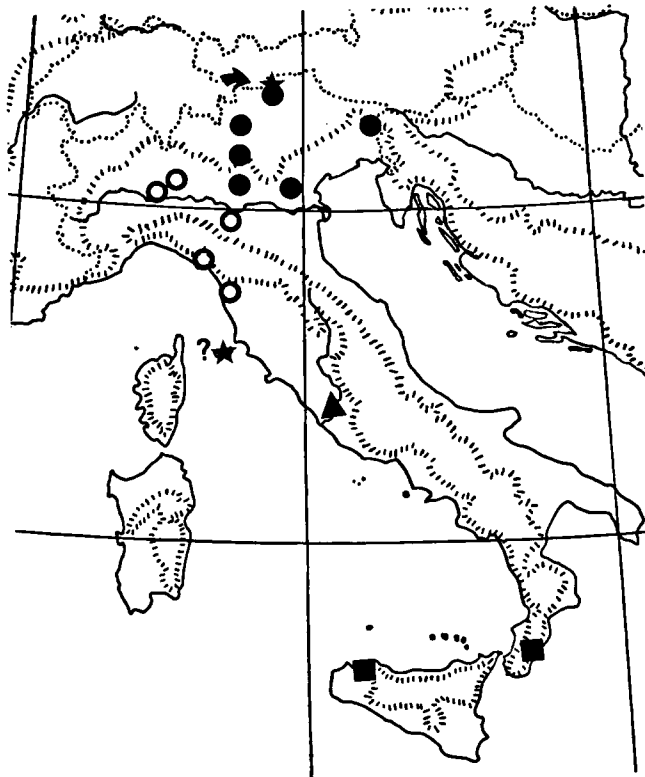


Fig. 8. Records of *C. mariae* Paulucci (dots, or circles for unprecise localities; partly after Zimmermann, 1925: 304, 342), *C. cf. sandbergeri* Hartmann (triangle; after Strauch, 1977; 167), *C. paganettii* Zimmermann (squares; after Zimmermann, 1925: 342), and *C. (cf.) minimum* (stars; partly after Giusti, 1976: 121). An arrow points to the 10 km square with both *C. mariae* and *C. minimum*.

Zimmermann (1925: 304) indicated only three exact localities for *C. mariae*, all in Italy, viz., province of Brescia, Edolo (UTM PS01), province of Mantova, Mantova (PR40), and province of Bolzano, Salten NW. of Bolzano (PS75). He mentioned (1925: 334) that he studied and identified additional material, which he only recorded on a distribution map (1925: 342), so that the localities involved cannot be determined exactly. *C. mariae* has also been collected (and recognized as such) by Mr. G. Falkner (Hörlkofen, F.R.G.) in the province of Mantova, near Castel Goffredo (UTM PR11); Mr. Falkner most kindly allowed us to study this material. Finally the two authors of the present paper collected the species in the province of Padova, Colli Euganei, 1.8 km NE. & 2.1 km NNE. of Lozzo (UTM QR01), in the province of Trento, near the Lago d'Ampola (UTM PR28), and in the province of Udine, near Cicigolis in the Valle del Natisone (UTM UM81). Summarizing we may say that *C. mariae* apparently occupies a wide range in N. Italy (fig. 8).

At all the exact localities mentioned, except Edolo and Mantova, *C. mariae* has been found sympatric with *C. tridentatum*. In these mixed populations the latter species can be easily distinguished from the former because of its (much) more slender shell (see figs. 9-13 and figs. 15-19).

There is a considerable amount of variation in shape of the internal part of especially the parietal lamella in *C. mariae*. In general we can only say that the edge of this lamella is clearly sinuous and that the lamella is still very prominent in the lower part of the penultimate whorl. The variation observed is due to individual differences in prominence and form of the undulations, as well as to differences in orientation of the parietal lamella in relation to the apertural lip of the shell. This latter kind of variation, which we consider so far insufficiently emphasized in the literature (see, however,

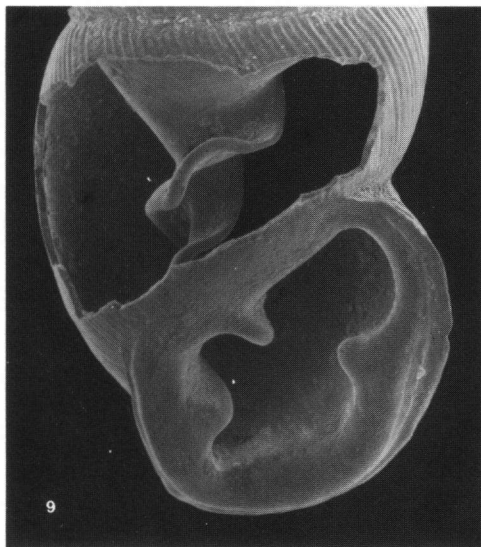


Fig. 9. *C. mariae* Paulucci, body-whorl opened in front,  $\times 70$ ; Italy, Padova, Colli Euganei, 2.1 km NNE. of Lozzo (E. Gittenberger leg.). Photograph J.H.W. Krom.

Kuiper, 1956: 4) is very important because of the practice to study the internal part of the lamellae by opening the body-whorl of the shell above the aperture; the lamellae are always figured in front view then. In the specimen figured with fig. 11 the undulations of the parietal lamella are situated less far inside the body-whorl than they are in the specimen figured with fig. 14; the shells of figs. 12 and 13 are intermediate in this respect. Our figs. 16-18 and 22-24 show similar sequences in *C. tridentatum*, whereas fig. 33 exemplifies the principle with different views of a single shell of *C. cf. schlickumi*. With our figs. 11-14, in addition to the two figures published by Strauch (1977: figs. 28, 29), it becomes possible to visualize at least partly the variation in *C. mariae* mentioned before.

In *C. mariae* the spire of the shell is somewhat less slender than it is in *C. tridentatum*, and its initial whorls are increasing more quickly in height. In our material the former species is represented by shells with 4 to 4½ whorls, whereas 4½ to 5¼ whorls are counted in material of the latter species. The shells of *C. mariae* may reach 2.0 mm in height and 1.0 mm in breadth; our smallest specimen is 1.65 × 0.85 mm.

Because *C. mariae* has been found together with *C. tridentatum* without intermediate specimens at several localities its specific identity cannot be doubted.

#### *Carychium minimum* in the southern parts of the Alps

According to Zimmermann (1925: 309, 329) *C. minimum* does not occur in the southern parts of the Alps. His view has been accepted by several later authors (e.g. Alzona, 1971: 42), who regarded earlier records from the area simply as applying to *C. mariae*.

The first author of the present paper, however, could study two samples of *C. minimum* in the collection of the late F. Schrott, kept in the Bischöfliches Seminar Johanneum at Dorf Tirol near Merano. The samples are from (1) Passeiertal (= Val Passíria), N. of Merano (UTM PS67) and (2) Flaas (= Valas), 11 km NNW. of Bolzano (UTM PS86); both localities are situated in the province of Bolzano, i.e. in the southern parts of the Alps.

As a consequence, we provisionally consider *Carychium mariae* var. *passiriensis* Schrott, 1935, described from the Val Passíria, a synonym of *C. minimum*. Unfortunately syntypes could not be found in the Schrott collection at Dorf Tirol.

Giusti (1976: 121, fig. 3 O-P) reported "*Carychium minimum* cfr. *minimum*" from the island of Elba, sympatric with *C. tridentatum* (see Giusti, 1976: 122, fig. 3 Q-T). The former taxon needs further study; maybe *C. minimum* also occurs far to the south on the Italian mainland.

#### The genus *Carychium* in Greece

There are hardly any records of *Carychium* from Greece in the literature. The few we found are discussed below. Recently collected material is still fragmentary from a geographical point of view. It nevertheless provides a base for some general notes on Greek *Carychium*. Three forms can be distinguished in our material. We provisionally consider these taxa full species.

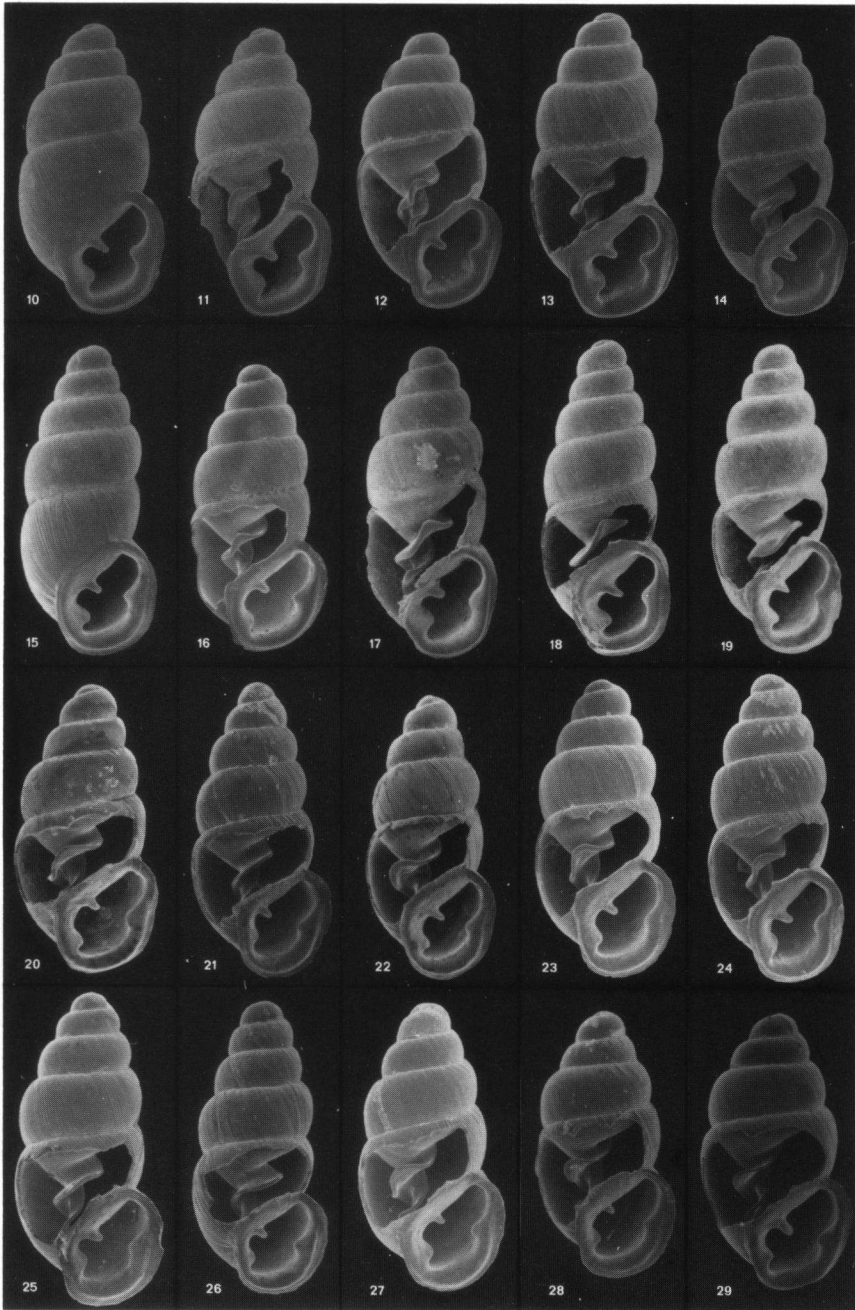






Fig. 30. *C. minimum* Müller; The Netherlands, Noord-Brabant, Biesbosch (W. Eijkman leg.);  $\times 70$ . Photograph J.H.W. Krom.

*Carychium tridentatum* (Risso, 1826), fig. 38

Much more material of Greek *C. tridentatum* should be studied to be able to judge upon the variation within the area. Klemm (1962: 219) reports the species from the province of Ípiros, Nisista (= 25 km N. of Árta), UTM EJ05; because the author refers to Watson & Verdcourt (1935), this is a reliable record. In PSA there is a specimen from the province of Thessalía, Kalabáka, EJ59. In HSD a single shell from the province of Lakonía, Yíthion, FF36, is present. Apparently both *C. tridentatum* and *C. hellenicum* (see below) occur near Yíthion. In a sample from the province of Makedhonía, Kaválla, KF93, six specimens of *C. tridentatum* were found together with numerous shells of the species dealt with next. As compared to the next species, *C. cf. schlickumi*, the shells of *C. tridentatum* have a more slender spire, their transverse sculpture is less prominent, and the parietal lamella is different, reaching beyond the body-whorl into the penultimate whorl and having a clearly sinuous edge. One of the

Figs. 10-29. *C. mariae* Paulucci 10, 11, Italy, Padova, Colli Euganei, 1.8 km NE. of Lozzo; 12, 14, Italy, Udine, Valle del Natisono, near Cicigolis (R.A. Bank leg.); 13, Italy, Padova, Colli Euganei, 2.1 km NNE. of Lozzo. Figs. 15-28. *C. tridentatum* (Risso). 15-18, Italy, Padova, Colli Euganei, 1.8 km NE. of Lozzo; 19, Italy, Udine, Valle del Natisono, near Cicigolis (R.A. Bank leg.); 20, France, Alpes-Maritimes, Gorges du Paillon, 2.5 km SE. of l'Escarène; 21, France, Isère, Gorges du Guiers Mort, SE. of St. Laurent-du-Pont; 22-24, Austria, Salzburg, March Graben NW. of Abtenau; 25, 26, Switzerland, Bern, Kaltbrunnental near Grellingen; 27, 28, Sweden, Malmöhus, N. of Lake Rinsjön, Skare (H. Lohmander leg.). Fig. 29. *C. minimum* Müller; Spain, Barcelona, Font (= spring) Guidart, 20 km W. of Barcelona (C. Altimira leg.). E. Gittenberger leg., if not indicated otherwise. All figs.,  $\times 20$ . Photographs J.H.W. Krom.

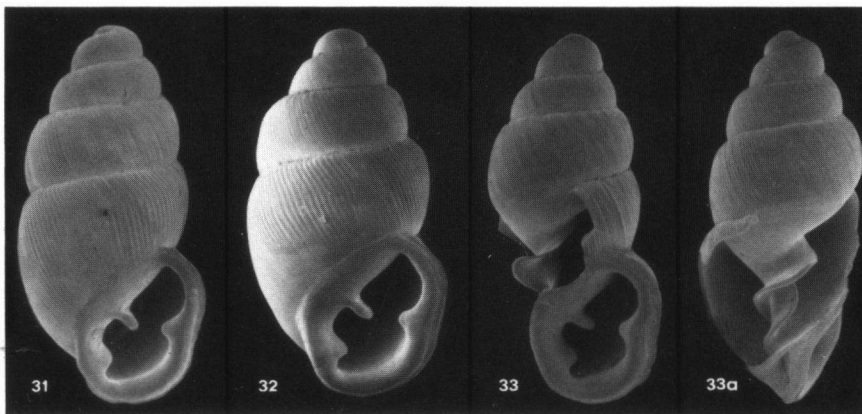
six shells is damaged and another shell is somewhat deformed; the remaining four specimens have  $4\frac{1}{2}$  to 5 whorls, whereas their height and breadth are 1.8 to 1.9 mm and 0.8 to 0.85 mm, respectively.

*Carychium* cf. *schlickumi* Strauch, 1977, figs. 31-33, 38

In the sample from Kaválla (UTM KF93) far over 100 shells are present, which are extremely variable in shape, varying between slender ovoid-conical and very short ovoid. They are uniformly sculptured with prominent, but obtuse, transverse riblets. The structure of the internal part of the lamellae is quite similar to what has been described by Strauch (1977: 169, fig. 2, pl. 19 figs. 68-70) for *C. schlickumi*. The parietal lamella is only slightly sinuous; it has no distinct curve downward. Apart from that, the parietal lamella is relatively short, as in e.g. *C. minimum*, entering the penultimate whorl from the body-whorl as only a low lamella.

Strauch (1977) has described two subspecies of *C. schlickumi*, from Pliocene deposits and from deposits near the transition from Pliocene to Pleistocene. The fossil species is recorded from a wide range between the Caucasus and France. The recent material from Kaválla contains specimens which cannot be separated from *C. schlickumi montagnyense* Strauch, 1977, not only not in the structure of the lamellae, but also not in general shape, dimensions and sculpture. Specimens with an additional parietal denticle in the aperture, next to the parietal lamella, have not been found in the recent material; such a denticle is said to occur sometimes in *C. s. schlickumi*, which is described as very variable in general shape. The recent material too, is very variable in shape.

We prefer to deal with the taxa involved once more as soon as more recent material is available for study.



Figs. 31-33. *C. cf. schlickumi* Strauch; Greece, Makedhonía, Kaválla (H. Schütt leg.);  $\times 30$ . Photographs J.H.W. Krom.

***Carychium hellenicum* spec. nov., figs. 34-38**

? *Carychium minimum* — O. Boettger, 1883: 338. Non Müller, 1774.

? *Carychium minimum* var. *inflatum* — Von Martens, 1889: 232. Non Bourguignat, 1857.

**Diagnosis.** — A rather small to medium-sized *Carychium* species (shell 1.5 to 2.0 mm high), with a more or (usually) less slender ovoid shell, which exhibits (1) only a relatively vague transverse sculpture, (2) a strongly contorted internal part of the parietal lamella, with a dominating, very prominent curve upward, and nevertheless (3) an abrupt decline of the parietal lamella already in the body-whorl.

**Description.** — Shell more or (usually) less slender ovoid in outline, whitish or glassy translucent (when fresh), with 4 to 4½ whorls; initial whorls rather inflated, the body-whorl often somewhat flattened. Teleoconch with a vague transverse sculpture of growth-lines, only rarely faint regular riblets are seen, which are confined to the body-whorl. There is a microsculpture of puncta on both the protoconch (fig. 34 a) and the initial teleoconch whorls (fig. 34 b), which is somewhat similar to that described for the American *C. nannodes* Clapp, 1905, by Burch & Shrader van Devender (1978). Aperture more or less oval, in front view oblique, with a broadly reflected and strongly thickened apertural lip; outer lip with a prominent denticle, inner lip showing the relatively high outer end of the parietal lamella and the less conspicuous outer end of the columellar lamella.

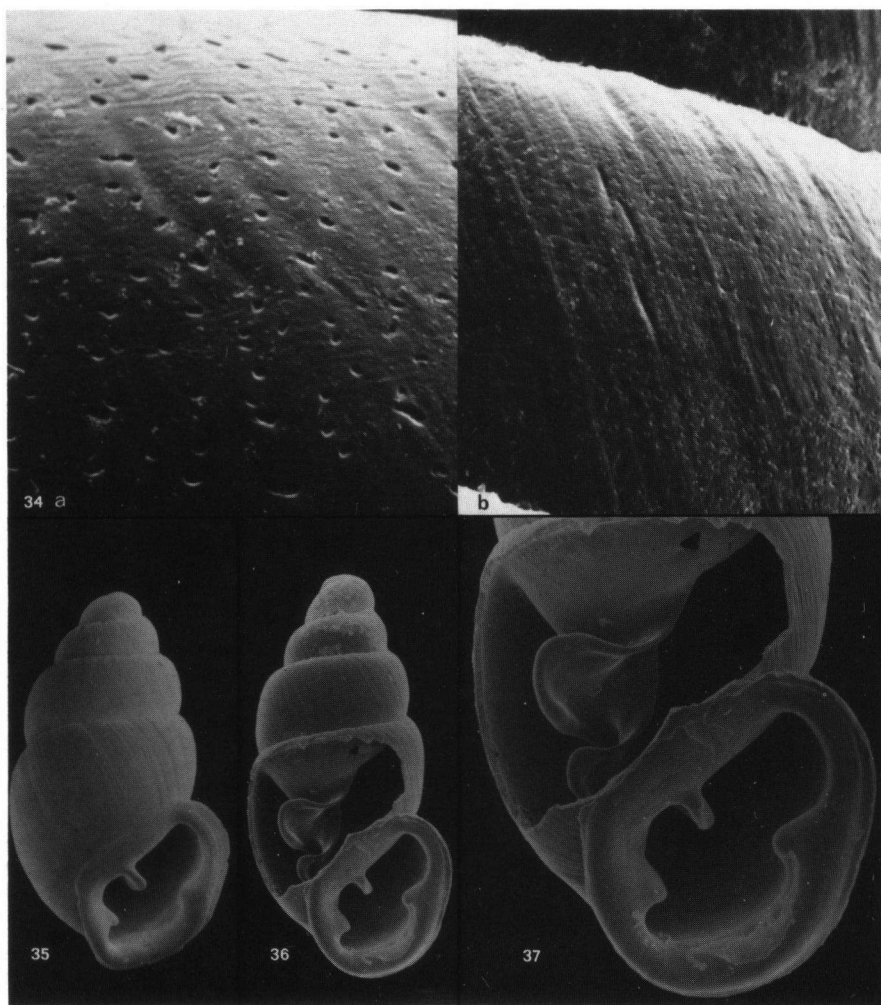
The height of the aperture is 0.42 to 0.50 of that of the entire shell. The shells are 1.6 to 2.0 times as high as broad. Shell height 1.5 to 2.0 mm; shell breadth 0.8 to 1.1 mm.

In fresh specimens the important internal part of both the parietal and the columellar lamellae can be studied without opening the body-whorl. Both lamellae have a thickened, rounded edge. The edge of the parietal lamella is distinctly sinuous, with a very prominent adapical curve shortly before the third quarter of the body-whorl, i.e. at the left side of the columella in the usual front view. The columellar lamella is also clearly sinuous; there is a distinct adapical curve located half-way in the body-whorl. Both the parietal lamella and the, much lower, columellar lamella strongly decrease in height in the upper quarter of the body-whorl, i.e. after the prominent adapical curves mentioned; consequently, they enter the penultimate whorl as relatively low lamellae.

**Differentiation.** — *C. hellenicum* resembles *C. minimum*, *C. mariae*, and *C. cf. schlickumi* in general shape. The last two species have a more regular, more prominent, transverse sculpture. Both *C. minimum* and *C. cf. schlickumi* have a relatively short, high, internal part of the parietal lamella, quite similar to what we see in *C. hellenicum*. In the first two species, however, the high part of the parietal lamella is not, or only slightly, sinuous. In *C. mariae* the high part of the parietal lamella reaches beyond the body-whorl into the penultimate whorl. In *C. tridentatum*, which usually has a (much) more slender shell than *C. hellenicum*, the lamellae are most similar to those in *C. mariae*; only rarely specimens of *C. tridentatum* were found with rather short lamellae, somewhat similar to those of *C. hellenicum* (see fig. 28).

**Notes.** — There are two records of a *Carychium* species in the literature which might apply to *C. hellenicum*. Both authors (O. Boettger, 1883: 338; Von Martens, 1889: 232) indicate a rather short, inflated shell. Without the original material at hand, nothing more can be said.

It might be worth mentioning here that *Auricella inflata* Hartmann, 1841, is a nomen nudum. Hartmann (1841: 48) mentions only two localities; it is said that the species is intermediate between two other species, but a description is not given. The earliest description in combination with "*Carychium minimum* .. Var. *C. Auricella inflata*, de



Figs. 34-37. *C. hellenicum* spec. nov. 34, holotype (RMNH 55850), Greece, Kérkyra, near spring at Kardáki (= 2 km S. of Kérkyra town). 34a, sculpture at the beginning of the second protoconch whorl ( $\times 750$ ); 34b, sculpture on the first teleoconch whorl ( $\times 260$ ). 35, Greece, Kýchira, near spring S. of Mitata (= 6 km SE. of Potamós). 36, 37, Greece, Kérkyra, Aghios Spiridon (= 6 km WNW. of Kassiópi). Figs. 35, 36,  $\times 30$ ; fig. 37,  $\times 70$ . All specimens: E. Gittenberger leg. Photographs J.H.W. Krom.

Hartmann" has been published by Bourguignat (1857: 211, 213, 214); we here restrict the type locality of this nominal taxon to Switzerland ("Suisse").

Systematic relations. — It is unclear to which *Carychium* species *C. hellenicum* is most closely related. Maybe this new taxon should be given subspecific status; a combination with *C. minimum* or *C. cf. schlickumi* might be possible. *C. hellenicum* is still separated by large geographical gaps from these two taxa, however, and intermediate

forms are not known. Near Yíthion both *C. hellenicum* and *C. tridentatum* have been found, indicating that these two taxa cannot be considered to belong to a single species.

Distribution (fig. 38). — *C. hellenicum* is known from (1) the Ionian islands Kérkyra, Kephallinía, Lefkás, Zákynthos, and Kýthira, (2) the province of Ípiros, (3) the Pelopónnisos, province of Lakonía, and (4) W. Crete.



Fig. 38. Records of *Carychium* species in Greece: *C. hellenicum* spec. nov. (dots), *C. cf. schlickumi* Strauch (open square), and *C. tridentatum* (Risso) (stars). Arrows point to 10 km squares with two species represented.

Material. — Holotype: Kérkyra, near spring at Kardáki (= 2 km S. of Kérkyra town), UTM DJ0784 (RMNH 55850).

Paratypes. — Kérkyra: Plátonas (= 4 km W. of Epískepsis), CK9402 (RMNH 55563/2); Sfakará, CK9503 (HSD/3); Dassia, DJ0092 (RMNH 55558/4); 1.5 km WSW. of Aghios Mattheos, DJ0271 (RMNH 55561/9, 55564/6); near Gardiki castle (= 3 km SE. of Aghios Mattheos), DJ0470 (RMNH 55560/2); 1 km W. of Benitses, DJ0678 (RMNH 55566/3); W. of Pérama (= 4 km SSW. of Kérkyra town), DJ0682 (RMNH 55559/5); 1 km W. of Messonghi, DJ0769 (RBA 3414/3; RMNH 55562/15; SMF/3); near spring at Kardáki (= 2 km S. of Kérkyra town), DJ0784 (RBA 3415/4; RMNH 55851/47; SMF/4); Aghios Spiridon (= 6 km WNW. of Kassiópi), DK0207 (RMNH 55856/32). Kephallínia: 0.5 km SE. of Pástra near brooklet, DH7915 (RMNH 55556/19); Ákoli spring (= 6 km SE. of Sámi), DH7228 (RMNH 55557/3). Lefkás: spring Megali Vrysi near Kaligóni (= 2 km S. of Lefkás town), DH7597 (PSA/2 & 1; RMNH 55565/4). Zákynthos: freshwater and pitch spring along Limni Keriou (= 2.5 km NNE. of Kerf), DG8571 (RBA 3416/10; RMNH 55852/150; SMF/10). Kýthira: spring S. of Mitata (= 6 km SE. of Potamós), FF7912 (RBA 3417/6; RMNH 55853/40); waterfall at Mylopotamos, FF7612 (RMNH 55854/15). Province of Ípiros: Igoumenítsa, DJ37 (PSA/3). Pelopónnisos, province of Lakonía: 5 km SW. of Yíthion, FF36 (RMNH 55857/5); 2 km SE. of Neápolis, FF84 (RMNH 55855/15). Crete: flood rubbish of the river Tiflos, GE43 (PSA/5).

P. Subai has collected *C. hellenicum* near Igoumenítsa, on Crete and on Lefkás; H. Schütt found it on Kérkyra. The material in RMNH has been collected by the second author of the present paper.

#### ABBREVIATIONS

The following abbreviations are used for collections: HSD, H. Schütt (Düsseldorf-Benrath, F.R.G.); PSA, P. Subai (Aachen, F.R.G.); RBA, R.A. Bank (Amsterdam, The Netherlands); RMNH, Rijksmuseum van Natuurlijke Historie (Leiden, The Netherlands); SMF, Senckenberg Museum (Frankfurt am Main, F.R.G.); WBO, W. Backhuys, Oegstgeest, The Netherlands).

#### ACKNOWLEDGEMENTS

We would like to thank the various colleagues who most kindly allowed us to study their material.

#### SUMMARY

Various notes on Azorean and European *Carychium* species are given. Our present knowledge of the Azorean species is summarized: three species can be recognized, one of which is given a new name, viz. *C. ibazoricum* nom. nov. (known from both the Iberian peninsula and the Azores). *C. minimum* and *C. tridentatum* are both uncommon on the Azores; the occurrence of the former species is still somewhat uncertain.

Our present knowledge concerning European *Carychium* species is shortly indicated. New data are given for *C. mariae*. *C. mariae* var. *passiriensis* Schrott, 1935, is considered a junior synonym of *C. minimum*. Two S. Alpine records of *C. minimum* are given. A first summary of our knowledge of the occurrence of *Carychium* species in Greece is given. Three species can be recognized in the area, viz. *C. tridentatum*, *C. cf. schlickumi* (described originally as a fossil species), and *C. hellenicum* spec. nov. The type locality of *C. minimum inflata* Bourguignat, 1857, is restricted to "Suisse" (Switzerland).

#### REFERENCES

- ALZONA, C., 1971. Malacofauna Italica. — Atti Soc. ital. Sci. nat. 111: 1-435.  
 BACKHUYS, W., 1975. Zoogeography and taxonomy of the land and freshwater molluscs of the Azores: i-xii, 1-350. Amsterdam.  
 BERGER, L., 1963. Polish species of the genus *Carychium* Müller (Gastropoda, Ellobiidae). — Acta zool. cracov. 8: 311-326.  
 BOETTGER, O., 1883. Aufzählung der von den Herren E. Reitter und E. Brenske 1883 in Griechenland und auf den Jonischen Inseln gesammelten Binnenmollusken. — Jb. dt. malakozool. Ges. 10: 312-344.

- BOURGUIGNAT, J.R., 1857. Aménités malacologiques LXIV. — *Revue Mag. Zool.* (2) 9: 209-232.
- BURCH, J.B., & A. SHRADER VAN DEVENDER, 1978. The shell surface sculpture of *Carychium nannodes*. — *Malac. Rev.* 11: 59-60.
- , 1980. Identification of eastern North American land snails. — *Walkerana* 1: 33-80.
- GIUSTI, F., 1976. Notulae malacologicae XXIII. I molluschi terrestri, salmastri e di acqua dolce dell'Elba, Giannutri e scogli minori dell'arcipelago Toscano. — *Lav. Soc. ital. Biogeogr. (N.S.)* 5: 97-355.
- HARTMANN, J.D.W., 1841. Erd- und Süßwasser-Gasteropoden der Schweiz. Mit Zugabe einiger merkwürdigen exotischen Arten 3: 37-60. St. Gallen.
- KERNEY, M.P., & R.A.D. CAMERON, 1979. A field guide to the land snails of Britain and North-west Europe: 1-288. London.
- KLEMM, W., 1962. Zoologische Studien in West-Griechenland. X. Die Gehäuseschnecken. — *Sber. öst. Akad. Wiss. (Math. naturw. Kl., I)* 171: 203-258.
- KUIPER, J.G.J., 1956. Over het voorkomen van *Carychium minimum* Müller en *Carychium tridentatum* (Risso) in Nederland. — *Basteria* 20: 1-11.
- MARTENS, E. VON, 1889. Griechische Mollusken. Gesammelt von Eberh. von Örtzen. — *Arch. Naturgesch.* (1889) 1: 169-240.
- MORELET, A., 1845. Description des mollusques terrestres et fluviatiles du Portugal: i-vii, 1-116. Paris.
- NOBRE, A., 1924. Contribuições para a fauna dos Açores. — *Anais Inst. zool. Univ. Porto* 1: 41-90.
- PILSBRY, H.A., 1948. Land Mollusca of North America (North of Mexico). — *Monogr. Acad. nat. Sci. Philad.* 3 (2): i-xlvii, 521-1113.
- STRAUCH, F., 1977. Die Entwicklung der europäischen Vertreter der Gattung *Carychium* O.F. Müller seit dem Miozän (Mollusca: Basommatophora). — *Arch. Molluskenk.* 107: 149-193.
- WATSON, H., & B. VERDCOURT, 1953. The two British species of *Carychium*. — *J. Conch. Lond.* 23: 306-324.
- ZIMMERMANN, F., 1925. Untersuchungen über die Variabilität einiger Arten des Genus *Carychium* Müller. — *Z. induct. Abstamm. u. VererbLehre* 37: 291-342.

## SAMENVATTING

(1) Op de Azoren blijken drie *Carychium*-soorten vertegenwoordigd te zijn: *C. minimum*, *C. tridentatum* en een eveneens in Europa (Iberisch schiereiland) voorkomende, weinig bekende soort, die in verband met homonymie een nieuwe naam moet krijgen, *C. ibazoricum*. Alleen de laatstgenoemde soort, die een opvallende microsculptuur bezit, komt op de Azoren algemeen voor.

(2) De ontdekking dat de vorm en positie van vooral de pariëtale lamel binnenin het huisje bij *Carychium* een belangrijk determinatiekenmerk is (Watson & Verdcourt, 1953; zie ook Kuiper, 1956), heeft het onderscheiden van *C. tridentatum* en *C. minimum* aanzienlijk vergemakkelijkt. Diverse vormen uit Zuid-Europa bleven evenwel problematisch. Enkele van deze vormen worden behandeld. *C. mariae* uit Noord-Italië bleek een goede soort te zijn, die vaak samen met *C. tridentatum* gevonden wordt, zonder overgangen. *C. minimum* blijkt ook in de Zuid-Alpen voor te komen en daar te raken aan het verspreidingsgebied van *C. mariae*. In Griekenland vinden we tenminste drie soorten *Carychium*. Naast *C. tridentatum* komt er een soort voor die met enige aarzeling *C. schlickumi* genoemd wordt; *C. schlickumi* was uitsluitend als fossiel bekend (Pliocen tot de overgang naar het Pleistoceen). De derde *Carychium*-soort uit Griekenland bleek nog onbeschreven te zijn en werd *C. hellenicum* genoemd. Hoe gering onze kennis betreffende de Griekse *Carychium*-soorten nog is, moge blijken uit het feit dat laatstgenoemde soort vrijwel uitsluitend bekend is van de Ionische eilanden, waar de tweede auteur van dit artikel veldwerk verrichtte, en havenplaatsen vanwaar de veerboten naar die eilanden vertrekken. Onderzoek in andere delen van Griekenland zal ongetwijfeld nog veel belangrijke nieuwe gegevens kunnen opleveren.