

**Note on the occurrence of *Hydrobia acuta* (Draparnaud, 1805)
(Gastropoda, Prosobranchia: Hydrobiidae) in western Europe, with
special reference to a record from S. Brittany, France**

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In August 1992 samples of living *Hydrobia acuta* (Draparnaud, 1805) have been collected in the Baie de Quiberon (Morbihan, France). The identification is elucidated. Giusti & Pezzoli (1984) and Giusti, Manganeli & Schembri (1995) suggested that *Hydrobia minoricensis* (Paladilhe, 1875) and *Hydrobia neglecta* Muus, 1963, are junior synonyms of *H. acuta*. The features of the material from Quiberon support these suggestions: it will be demonstrated that *H. minoricensis* and *H. neglecta* fit completely in the conception of *H. acuta*. *H. acuta*, well known from the Mediterranean, appears to be also widely distributed in western and northwestern Europe.

Key words: Gastropoda, Prosobranchia, Hydrobiidae, *Hydrobia acuta*, distribution, France, Europe.

INTRODUCTION

In favoured localities hydrobiid species are very abundant, often occurring in dense populations. Some species prefer fresh water, others brackish or sea-water habitats. Although salinity preferences play a part in determining the distribution of each species, most species show a broad tolerance as regards the degree of salinity. Frequently one hydrobiid species may live in the same habitat with another. Some hydrobiid species are often dealt with in publications on marine species as well in those on non-marine species (e.g. Cachia et al., 1996, and Giusti et al., 1995). Many hydrobiid species are widely distributed, but often in genetically isolated populations; probably due to different ecological circumstances the species may show a considerable variability, especially as to the dimensions and the shape of the shell and to the pigmentation of the body. Identification may often be made on the shell alone, but for many individuals a certain identification is only possible by study of the soft parts (genitalia, radula, colour pattern) (Fretter & Graham, 1978: 122-133).

Many authors, dealing with hydrobiid species, introduced new names and most species names have a considerable list of synonyms. It is clear that a thorough revision of the European hydrobiids is necessary, but that is beyond the aim of this paper.

In April 1992 Mr. G.J. Geuze showed me a remarkable sample of beached, but fresh, *Hydrobia* shells from the Plage des Sables Blancs (NE. of Penthièvre, Quiberon peninsula, Morbihan, France; fig. 1). The shells were small, slender and flat-sided. Coincidentally the next month Mr. J.E. Phorson sent to me a sample of the same hydrobiid from the same site. The samples had been collected in August and September 1991 respectively.

At first identification seemed simple. The shells were clearly identical with those shown and described by Boeters (1980: 61-62) and Van Aartsen, Menkhorst & Gittenberger (1984: 13, 107, fig. 50) under the name *Hydrobia glyca* (Sylvain, 1880), a species known from S. Spain. A few years later Boeters (1988: 191-193, 254-255, figs. 8-9)

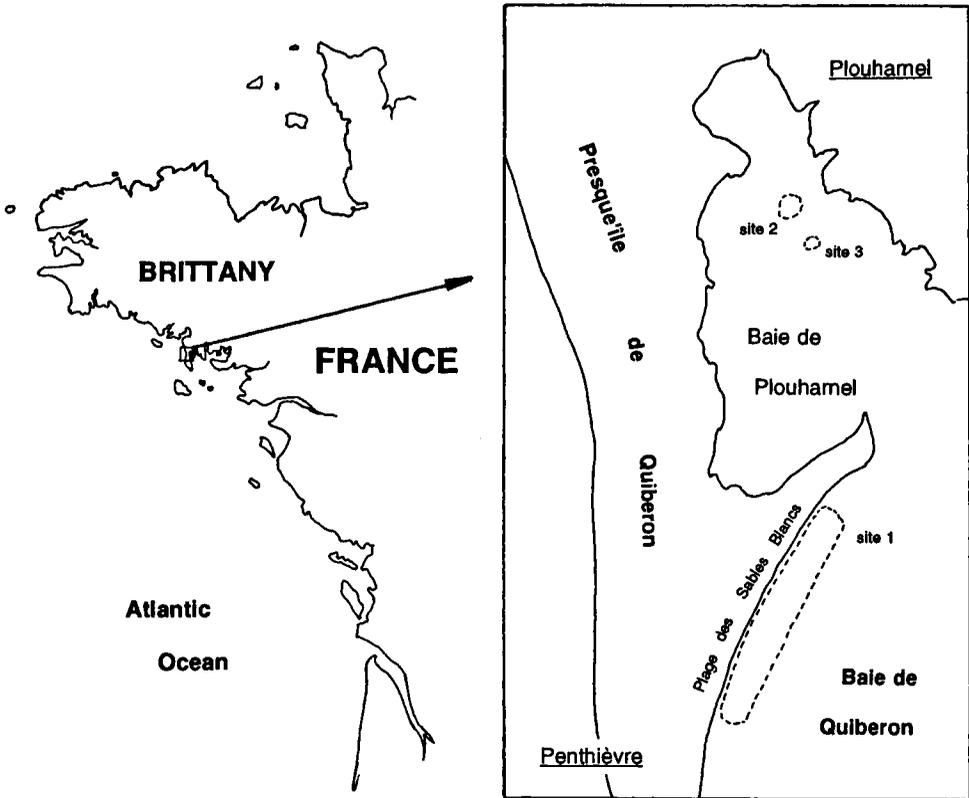


Fig. 1. Two areas in which *Hydrobia acuta* has been found: the sand banks parallel to the Plage des Sables Blancs (site 1) and some sand banks in the centre of the Baie de Plouharnel (sites 2 & 3).

showed *H. glyca* to be identical to *Hydrobia minoricensis* (Paladilhe, 1875), a species which has been described from the Balears. Rolán Mosquera (1983: 117; 1991: 124; 1993: 107-108, 165) and Rolán Mosquera, Otero Schmitt & Rolán Alvarez (1990: 17) reported the presence of this hydrobiid in NW. Spain; they originally (1983) used the name *Hydrobia neglecta* Muus, 1963, but, following Boeters, they successively called the species *H. glyca* (1990) and *H. minoricensis* (1991, 1993).

Giusti et al. (1984, 1995), however, showed that also the taxon *Hydrobia acuta* (Draparnaud, 1805) should be taken into consideration. *H. acuta* has been described from S. France and is widely distributed in the Mediterranean.

In August 1992 the author succeeded in collecting living specimens at two areas in the Baie de Quiberon.

The present paper aims at demonstrating that this slender, flat-sided hydrobiid belongs to *H. acuta*. The description and figure of Draparnaud (1805: 40, pl. 1, fig. 23) are very poor. The author associates himself with the clear redefinition of *H. acuta* by Giusti & Pezzoli (1984: 124-127) and Giusti, Manganelli & Schembri (1995: 116-121, 123),

which implicates a rejection of the unfortunate interpretation of *H. acuta* by Boeters (Boeters, 1984; 1988: 189-190, 194-195; Giusti et al. 1984: 124; 1995: 119-120).¹

According to Giusti et al. (1984, 1995) *H. minoricensis* and *H. neglecta* are probably junior synonyms of *H. acuta*. The features of the specimens from Quiberon support these suggestions. The second aim of this paper is to demonstrate that *H. minoricensis* and *H. neglecta* fit completely in the redefined conception of *H. acuta* mentioned above, confirming the synonymy of these taxa.

MATERIAL AND METHODS

In the Baie de Quiberon *H. acuta* appeared to be living in two areas (fig. 1), hiding in the upper centimeter of the bare sand banks, co-existing with *Hydrobia ulvae* (Pennant, 1777). Three samples have been collected, each by taking 2000 cm² sand, about 1.5 cm deep. The sand has been sieved through 1 mm² mesh, which means that the youngest specimens have not been collected. The specimens of *H. acuta* and *H. ulvae* generally could be separated by differences in shape and always by differences in apical dimensions. Moreover, specimens of *H. acuta* often distinguished themselves by carrying grains of sand and threads of algae on their shells.

Sample 1 has been taken from site 1, the sand banks parallel to the Plage des Sables Blancs, at a distance between c. 50 and 200 m from the beach. Date: 12 August 1992. Contents: c. 400 living specimens of *H. acuta* and 10,000 do. of *H. ulvae*; the ratio between numbers of adults and juveniles of *H. acuta* was 5:1, while almost all specimens of *H. ulvae* were juvenile.

Samples 2 and 3 have been taken from the second area, some sand banks in the centre of the Baie de Plouharnel. Date: 18 August 1992. At site 2, with loose sand, c. 2,500 living specimens of *H. acuta* have been collected, ratio adults/juveniles again 5:1, while only c. 250 specimens of *H. ulvae* were present, mainly adults.

At site 3 the sand grains somewhat stuck together, probably because of a thin, invisible layer of detritus. This sample also contained c. 2,500 living specimens of *H.*

¹ Boeters (1984: 4, pl. 1a, fig. 1; 1988: 254-255, fig. 5), very unfortunately, selected as the lectotype for *H. acuta* a shell clearly showing distinguishing characters of *Hydrobia ventrosa* (Montagu, 1803): convex whorls, deep sutures and a wide umbilicus. The lectotype can be related to a convex whorled hydrobiid occurring in the étangs near Montpellier, Hérault, S. France, the region enclosing the supposed type locality of *H. acuta* (Boeters, 1984: 4). This hydrobiid exhibits "einen pfriemförmigen Penis mit kleinem seitlichen Anhang, eine hammerförmige Bursa und eine tiefere Gehäusenaht" (Boeters, 1984: 4), confirming the unfortunate choice of a specimen of *H. ventrosa* as the lectotype for *H. acuta*.

In the type material of Draparnaud another specimen could have been chosen as the lectotype, showing more flattened whorls, shallow sutures and an almost closed umbilicus (Boeters, 1984: 4, pl. 1a, fig. 2). This second specimen can be related to a second species from the étangs near Montpellier, exhibiting "einen distal verbreiterten Penis, eine sackförmige Bursa und eine flachere Gehäusenaht" (Boeters, 1984: 4). Radoman (1977) identified this species as *H. acuta* (cf. Boeters, 1984: 4).

If the lectotype and the interpretation of Boeters (1984) are accepted, *H. acuta* (Draparnaud, 1805) becomes a junior synonym of *H. ventrosa* (Montagu, 1803) and a new name will have to be found for *H. acuta* sensu Radoman (1977) and Giusti et al. (1984, 1995).

In this paper, following Haase (1993) and Giusti et al. (1995: 124-125), *Ventrosia* Radoman, 1977, is considered a junior synonym of *Hydrobia* Hartmann, 1821.

acuta, but now with a ratio adults/juveniles 1:5, while c. 800 specimens of *H. ulvae* were collected, also mainly juveniles.

H. acuta could only be traced at the three sites indicated in fig. 1. On (and in) the mudflats surrounding sites 2 & 3 *H. ulvae* was very abundant. Other living molluscs in the samples are: juv. *Cerastoderma edule* (L., 1758), sites 1-2-3; juv. *Abra tenuis* (Montagu, 1803), sites 2-3; *Retusa obtusa* (Montagu, 1803), site 3, 70 specimens. After observation all specimens of *H. acuta* have been preserved in 90% alcohol.

For preparing the photographs the radula was extracted from the buccal bulb; radulae, opercula and shells were washed in 75% ethanol; the juvenile shell showing the microstructure of the protoconch has been washed with a soap solution and a very soft brush. After that, the objects were mounted on copper blocks with electronconductive glue, sputter coated with gold and photographed using a Philips 505 SEM. The anatomical drawings have been made using a stereoloupe with drawing-mirror.

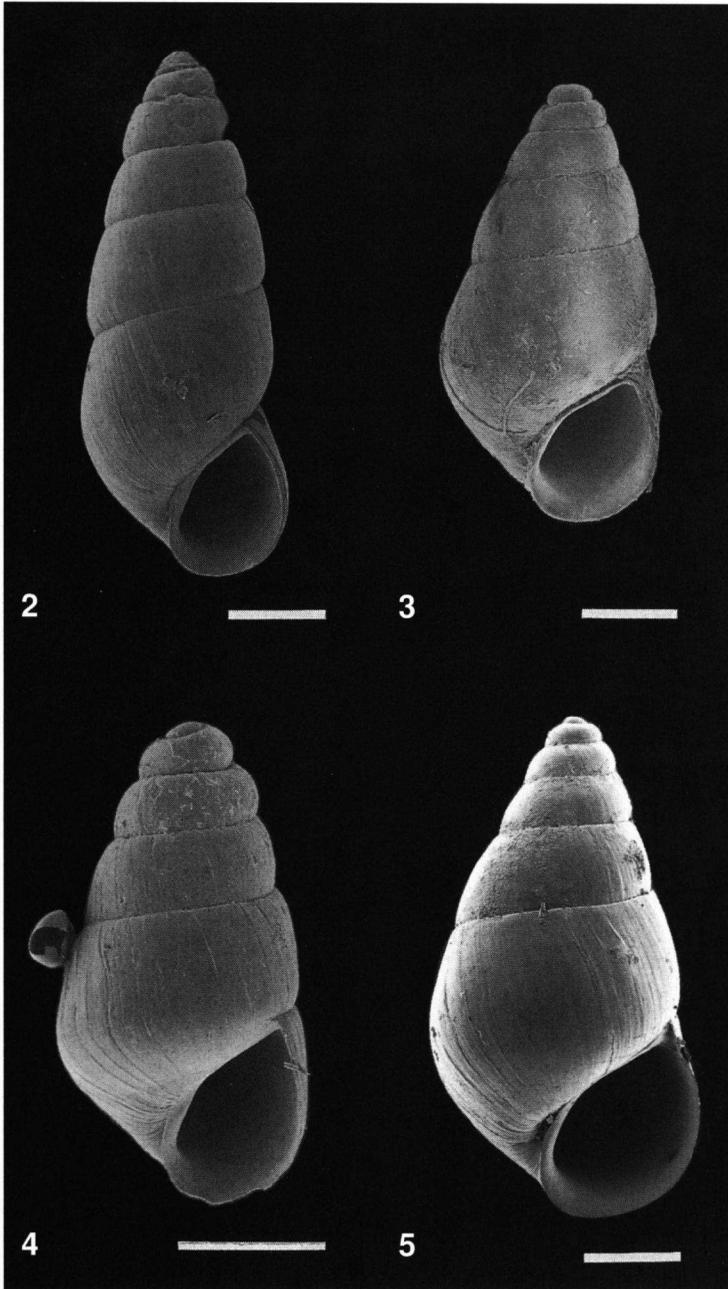
ADDITIONAL MATERIAL

In addition to the three samples mentioned above, the following samples have been studied.

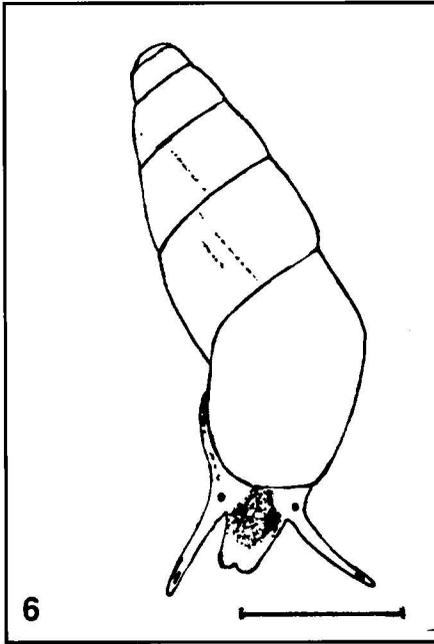
Abbreviations: B = coll. R.A. Bank, Hoofddorp; D = ex-coll. J. van Dalsum, Middelburg (now coll. Hoeksema); GE = coll. G.J. Geuze, Oost-Souburg; GU = coll. G.J. Gulden, Mijnsheerenland; H = coll. D.F. Hoeksema, Middelburg; K = coll. Mrs. T. Keukelaar-van den Berge, Wilhelminadorp; N = coll. F.A.D. van Nieulande, Nieuwen St. Joosland; O = coll. R. van Outryve, Oostende; P = coll. J.E. Phorson, Durham; RGD = coll. Rijks Geologische Dienst, Haarlem; SE = coll. W. Segers, Aartselaar; SI = coll. G.F. Simons, Middelburg; UDS = coll. Universita' di Siena.

DENMARK: s.n. *H. neglecta*, NE. of Vestern Havn, Laesø, GU, H; s.n. *H. neglecta*, Sundby, Limfjorden, SE; s.n. *H. neglecta*, Hadsund, Ajstrup Bugt, B. ENGLAND: s.n. *H. neglecta*, lagoons Dunwich-Walberswick, Suffolk, H. THE NETHERLANDS: s.n. *H. neglecta*, pool behind Hondsbosse Zeewering (Holocene), (Meijer, 1979), RGD; s.n. *H. neglecta*, Sluiswaard, near Alkmaar (Holocene), RGD; s.n. *H. neglecta*, tunnel pit near Velsen (Holocene), (Meijer, 1979), D; s.n. *H. neglecta*, Sloterdijk, near Amsterdam (Eemian), (Meijer, 1979), RGD. W. FRANCE: *H. acuta*, building sand, Sables-d'Orles-Pins, Côtes-du-Nord, H, K; s.n. *H. neglecta*, Anse Lostrouc'h, mouth Aber Vrac'h, Finistère, (Barnes, 1992, 1993), H; *H. acuta*, Plage des Sables Blancs, Quiberon, Morbihan, GE, H, K, N, P, SI; *H. acuta*, SW. Ile de Noirmoutier, Vendée, H. S. PORTUGAL: *H. acuta*, lagoon Cacula-Velha, H, N, SI. S. SPAIN: s.n. *H. minoricensis*, Rio Jara, NW. of Tarifa, (Boeters, 1980: 61-62; 1988: 192-193), H, SE. NE. SPAIN: *H. acuta*, Rosas, SE. S. FRANCE: *H. acuta*, étang near Pinet, Hérault, D; *H. acuta*, Ile Damiano, Etang de Biguglia, NE. Corsica, UDS; *H. acuta*, Etang d'Urbino, E. Corsica, SE. W. ITALY: *H. acuta*, Bay of Talamone, S. Toscana, GE, K; *H. acuta*, Saline di Tarquinia, Lazio, UDS; *H. acuta*, Lago di Monaci, near Latina, Lazio, UDS. MALTA: *H. acuta*, Salina Bay, SE; *H. acuta*, Marsaxlokk Bay, SE. TUNISIA: *H. acuta*, El Mahdia, SE; *H. acuta*, Hount Souk, Djerba, K, SE. W. CROATIA: *H. acuta*, Poreč, SE; *H. acuta*, Umag, SI. GREECE: *H. acuta*, Bay of Hanoni, Corfu, SE.

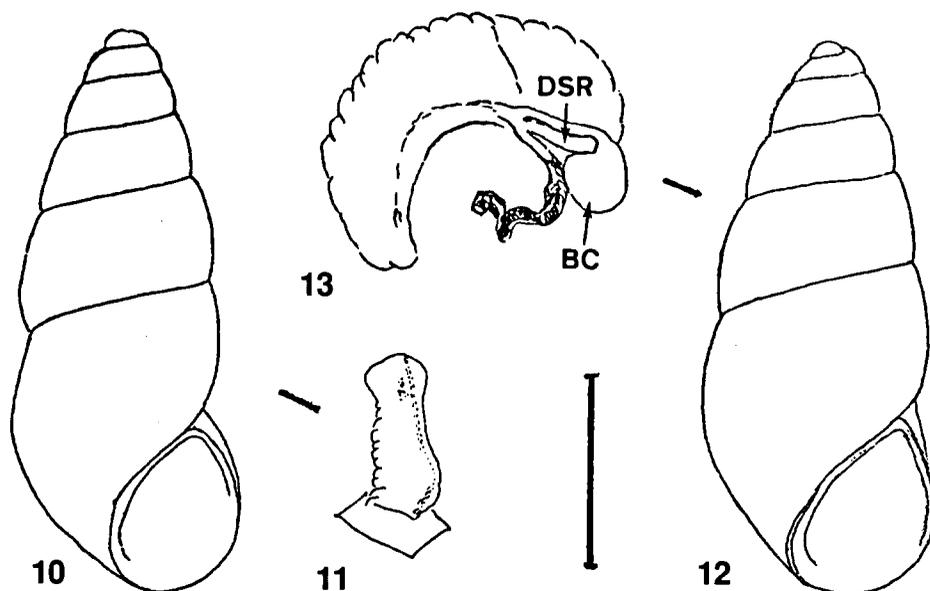
For comparison a few other samples have been studied. THE NETHERLANDS: *H. ulvae*, mudflats near Fort Rammekens, Ritthem, D; *H. ventrosa*, creek near Veere, D. N. SPAIN: *H. joossei*, Playa de Salvé, Laredo, H, O; *H. joossei*, Playa de Berria, Santoña, O; *H. acuta*/*H. joossei*, Playa de Nerón, San Vicente de la Barquera, O. S. PORTUGAL: *H. joossei*, Alvor, H; *H. acuta*/*H. joossei*, Praia da Rocha, H.



Figs. 2-5. Shells of *H. acuta* (figs. 2-4) and *H. ulvae* (fig. 5), Baie de Plouharnel (sites 2 & 3), 18-VIII-1992. Scale bars 0.5 mm. 2: Adult, first whorls corroded; 3: adult, relatively conical, diameter nucleus 0.12 mm; 4: juvenile, bearing an empty egg capsule (according to size probably of *H. ulvae*), diameter nucleus 0.12 mm; 5: small adult of *H. ulvae*, distinguishable from *H. acuta* (fig. 3) by its smaller apical dimensions, diameter nucleus 0.07 mm.



Figs. 6-9. *H. acuta*, Baie de Plouharnel, 18-VIII-1992. Scale bars 1.0 mm (fig. 6), 0.20 mm (fig. 7), 0.10 mm (figs. 8-9). 6: Living specimen; 7: operculum, showing external surface; 8: protoconch of juvenile specimen, showing hatching line (arrowed) and dense reticulate surface pattern; 9: detail of teleoconch, showing traces of spiral microsculpture.



Figs. 10-13. *H. acuta*, Plage des Sables Blancs, 12-VIII-1992. Scale bar 1.0 mm (figs. 10, 12), 2.0 mm (figs. 11, 13). 10, 11: Shell and penis of male specimen; 12, 13: shell and genitalia of female specimen; BC = bursa copulatrix, DSR = distal seminal receptacle.

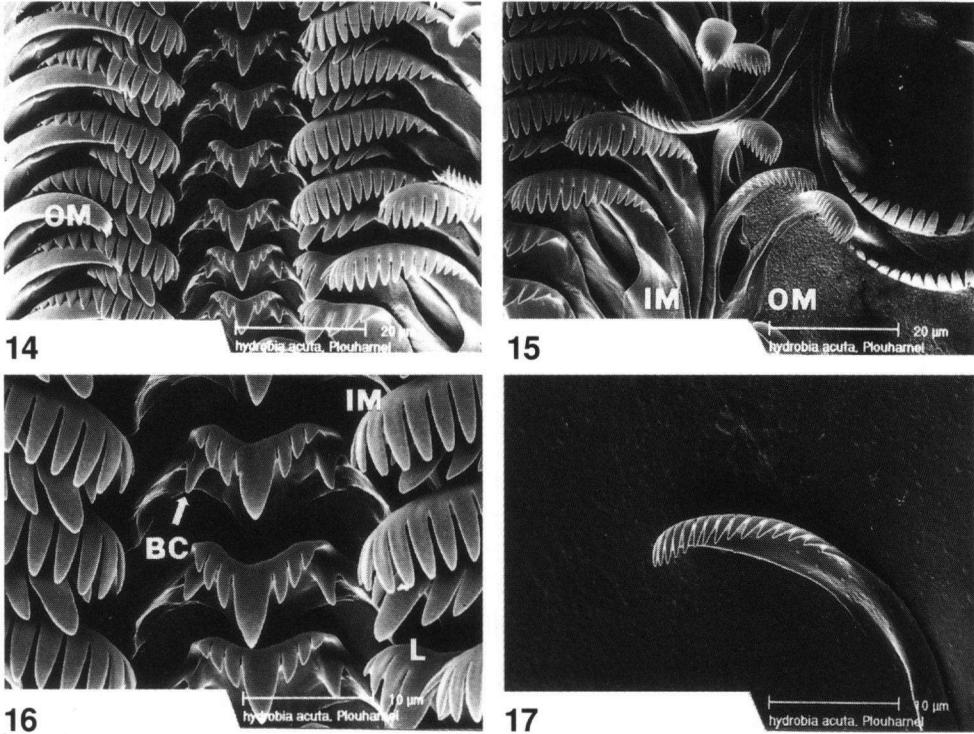
DESCRIPTION OF THE SPECIMENS FROM QUIBERON

Shell. - Figs. 2-4, 6, 8-10, 12. Dextral, cyrtocoid, slender, shallow sutures, whorls nearly flat-sided and curved most strongly just above the sutures (fig. 2); sometimes less slender, more conical, making the shell look like *H. ulvae* (fig. 3); apex blunt, the first whorls in the shape of a small turban (fig. 4) but those of adults often corroded (fig. 2), last whorl of adults irregular, giving the shell a more or less fusiform appearance. Protoconch paucispiral, 3/4-1 whorl, teleoconch about 5 whorls, protoconch and teleoconch clearly separated by the hatching line (fig. 8). Protoconch has dense reticulate surface pattern (fig. 8). Growth lines on teleoconch thin, prosocline, very clear on juvenile shells (fig. 4); traces of spiral microsculpture on the surface (fig. 9). Aperture oblique pyriform, angled above; peristome continuous, not thickened, slightly reflected at lower and columellar margins, in juvenile shells not continuous and thin. Umbilicus closed or slightly open. Colour whitish or yellowish light-brown, with animal: dark-green, often with a light coloured strip below the sutures. Surface subtransparent, moderately glossy.

Dimensions. - Height: to 3.3 mm. Width: to 1.25 mm. Diameter nucleus: 0.10-0.17 mm (fig. 18).

Operculum. - Fig. 7. Corneous, pear-shaped, thin, paucispiral, nucleus eccentric; external surface with thin, sinuous growth lines; internal surface very little thickened in correspondence with nucleus.

Radula. - Figs. 14-17. Taenioglossate. Each central tooth butterfly-shaped, the apex



Figs. 14-17. Radula of *H. acuta*, Baie de Plouharnel, 18-VIII-1992. BC = basal cusp of central tooth, IM = inner marginal tooth, L = lateral tooth, OM = outer marginal tooth. 14: Central part of the radula; 15: marginal part of the radula, with outer marginal teeth bent sideways; 16: enlargement of fig. 14, showing central, lateral and inner marginal teeth and basal cusps of central teeth; 17: outer marginal tooth, showing posterior denticles.

V-shaped, with long lateral wings and plough-shaped basal projection; cutting edge with 7-9 denticles, central longer than lateral; internal side of base of each lateral wing with long, pointed cusp (trace of second smaller cusp sometimes evident). Each lateral tooth with widened apex; cutting edge with 7-9 denticles, central longest. Each inner marginal tooth rake-shaped, apex elongate with long row of denticles (16-18) at the anterior side. Each outer marginal tooth looking like inner marginal tooth, but apex smaller, spoon-shaped, with long row of small denticles (16-18) at the posterior side.

Genitalia. - Figs. 11, 13. Male: penis stout; tip rounded, often bent with the axis of the penis making the tip look like a rounded vane. Female: bursa copulatrix sack-shaped, not hammer-shaped.

Pigmentation. - Fig. 6. Head: transparent, greyish white, with round black eyes; locally variably dense black pigmentation and internal yellow granules; rarely internally somewhat reddish. Proboscis: dorsally more or less dense symmetrical black pigmentation, sometimes bordered by a black transverse band along the front side of the snout, but always leaving the frontal region unpigmented; sometimes in the frontal region, left

and right, a small internal concentration of yellow granules. Tentacles: transparent; sometimes without pigmentation, but mostly each with an oblong black spot situated not far from the tip; less common with black spots at the outer sides and in front of the eyes; internally often yellow granules present, sometimes arranged in strings. Foot: underside greyish white, locally with small internal concentrations of yellow granules, sometimes some black pigmentation along the edges.

Ecology. - The species occurs in an intertidal, open, but sheltered, marine environment. At low tide the specimens can be found among the sand-grains of the upper part of bare sand banks, co-existing with *H. ulvae*.

DISCUSSION

The hydrobiid from Quiberon fits completely in the conception of *H. acuta* by Giusti & Pezzoli (1984: 124-127) and Giusti, Manganelli & Schembri (1995: 116-121, 123), except, seemingly, for the shape of the shell. 'Typical' *H. acuta* has a more conical shell with slightly convex whorls (Draparnaud, 1805: pl. 1, fig. 23; Giusti et al., 1984: 125; 1995: 117, figs. 39-42). But *H. acuta*, like other hydrobiids, is very variable and samples of *H. acuta* from the Mediterranean often contain conical as well as slender specimens, the latter looking very similar to the specimens of Quiberon. The author found slender specimens in samples from Rosas (NE. Spain), the étang near Pinet (S. France), Etang d' Urbino (E. Corsica), the Bay of Talamone (S. Toscane, Italy), El Mahdia and Hount Souk, Djerba (Tunisia), Poreč and Umag (W. Croatia) and the Bay of Hanoni (Corfu, Greece). See also Giusti et al. (1984: 125, last fig.) and Cesari (1994: 47, figs. 3e-f).

The original description and figures of *H. minoricensis* (Paladilhe, 1875: 14-15, pl. 21, figs. 27-29) are not very clear. Boeters (1980: 61-64, s.n. *H. glyca*; 1988: 191-195, 254-255, figs. 8-9) elucidated this taxon. The description and drawings of Boeters show that *H. minoricensis* is a junior synonym of *H. acuta*. Boeters himself could not draw that conclusion because of his different opinion on the taxon *H. acuta*, which has already been indicated in the introduction above.

Giusti & Pezzoli (1984: 126-127, 145) already pointed out the striking resemblance between *H. neglecta* and *H. acuta*, as well as for the shell form as for the similarity of the body. They suggested that *H. neglecta* is probably a junior synonym of *H. acuta*. The specimens from Quiberon support this suggestion:

- the radula of *H. acuta* shows central teeth with one basal cusp on each side, but sometimes a trace of a second basal cusp on each side is evident (fig. 16; Giusti et al., 1984: 145, fig. 7B); Muus (1963: 132; 1967: 142-143) uses the presence of two basal cusps on each side of the central teeth as one of the distinguishing characters of *H. neglecta*, although he adds the remark (1963: 132) that "In a row of central teeth the number of basal cusps may vary from one to three." (see also Giusti et al., 1984: 145, fig. 7A);

- according to Muus (1967: 142) "an absolutely reliable specific character is found in the structure of the male copulatory organs"; his figure 68 (1967: 144), showing the variability of the penis of *H. neglecta*, matches the penis of *H. acuta* (fig. 11; Giusti et al., 1984: 126-127, figs. 1e, h-i; 1995: 123, figs. 51-52);

- the protoconch of *H. neglecta* (described and figured by Fish & Fish, 1981: 91, 93, fig. 3) can be considered identical to that of *H. acuta* (fig. 8), as well as for its dimensions as for its dense reticulate surface pattern; the diameter of the nucleus of *H. neglecta* is not significantly different from that of *H. acuta* (fig. 18);

- like *H. acuta* from the Mediterranean, samples of *H. neglecta* from NW. Europe often contain slender specimens which are strikingly similar to *H. acuta* from Quiberon (see Fretter & Graham, 1978: 127; Graham, 1988: 193; Meijer, 1974: pl. 19, fig. 34; 1975: 105, fig. 6; 1979: bijl. 3; Geene & Bank, 1989: 17, fig. 36);

- recently Barnes (1992, 1993) reported *H. neglecta* from NW. Brittany, also from a fully marine, intertidal environment and also living together with *H. ulvae*;

- the snails of *H. neglecta* from NW. Brittany "possessed elongate, tightly spiral shells of up to seven whorls" (Barnes, 1992: 60, 1993: 76, fig. 1); in samples of *H. acuta* from Sables-d'Or-les-Pins (building sand; Côtes-du-Nord, France), Cacula-Velha (S. Portugal) and Rosas (NE. Spain) I found elongate specimens like those found by Barnes, but smaller.

H. neglecta appears to fit in the conception of *H. acuta*. Therefore *H. neglecta* too is considered a junior synonym of *H. acuta*.

DISTRIBUTION

This paper is not the first record of *H. acuta* from W. France. Although many old records are not reliable, some of them probably are.

In 1865 P. Fischer (p. 74) reported *H. acuta* (as *Paludestrina acuta*) from the mouth of the Gironde: from le Verdon, Gironde, and Royan, Charente-Maritime. Fischer had compared his specimens of *H. acuta* with typical specimens of *H. acuta* from Montpellier. His enumeration of the differences between the shells of his Atlantic *H. acuta* and those of *H. ulvae* (s.n. *P. muriatica* Lamarck) from the same sites, is rather convincing.

In 1867 Taslé (pp. 35-36) listed *H. ventrosa* (as *Paludestrina ventrosa*), *H. ulvae* (as *P. ulvae* and ? *P. subumbilicata*) and *H. acuta* (as *P. acuta*) from "the bras de mer de la Chênaie", near Vannes, Morbihan. The specimens of *H. acuta* probably have been identified by P. Fischer (Taslé, 1867: ii).

Dautzenberg & P.H. Fischer (1925: 70), discussing records of *H. acuta* from the surroundings of Brest, Finistère (from "la rive droite de la Penfeld, près de la digue, ainsiqu'à Kervallon") by Daniel in 1883, stated that this identification possibly was not correct as "*H. acuta* est méditerranéen et son existence dans l'océan Atlantique n'a pas été confirmée".

Mrs. Keukelaar had collected shells of *H. acuta* from building sand at Sables-d'Or-les-Pins, Côtes-du-Nord, in July 1975. In 1989 Dr. Barnes (1992) discovered this species (as *H. neglecta*) in the Anse Lostrouc'h, Finistère. Mr. Phorson (in litt., 1992) already had found *H. acuta* at the Plage des Sables Blancs, Quiberon peninsula, in 1979 and 1983; this site has been visited again by Messrs. Geuze and Phorson in August and September 1991; the present paper deals with samples collected near the Plage des Sables Blancs and in the Baie de Plouharnel in August 1992. In 1993 the author sieved some fresh empty shells of this species from sand banks SW. of the Ile de Noirmoutier, Vendée.

Apparently the records of *H. acuta* from the western coasts of France fill up a gap between the known distributions of *H. acuta* in S. Europe (known as *H. acuta* in the Mediterranean and *H. minoricensis* in Spain and Portugal) and NW. Europe (known as *H. neglecta*). The Atlantic *H. acuta* is usually slender, while the specimens from the Mediterranean and NW. Europe usually exhibit a more conical appearance. But most samples show the variability of the species and contain also specimens of the less common form.

REMARKS

The diameter of the nucleus appears to be useful as an additional tool to separate shells of different hydrobiid species. Measuring of at random taken samples procured the information presented in fig. 18.

Applying Student's *t*-test it is justified to consider the samples 1 and 2 significantly different, mutually and from the other samples. Sample 1 is even totally separable from the samples 3-8. Samples 3-8 are not considered significantly different. The information from literature sources (Fish & Fish, 1977: 499, plate 1a; 1981: 92-93, figs. 2A, 3A; Meijer, 1979: bijl. 1, figs. 1-3) fits in fig. 18, except for Meijer's fig. 3 (1979: bijl. 1) that indicates a diameter of 0.050 mm for the nucleus of a specimen of *H. ventrosa*.

Fig. 18 supports the synonymy of *H. neglecta* and *H. acuta* and draws attention to the taxon *Hydrobia joossei* Van Aartsen, Menkhorst & Gittenberger, 1984.

Hydrobia joossei has been introduced on conchological characters only (Van Aartsen et al., 1984: 13-14, 107, fig. 51; Boeters, 1988: 191-193, 254-255, fig. 7). Although it is not difficult to recognize typical specimens of *H. joossei*, the author did not succeed in entirely splitting up samples with both *H. acuta* and *H. joossei*. Therefore *H. joossei* is considered a poorly defined taxon, awaiting the publication of anatomical characters.

The paucispiral protoconch with 3/4-1 whorl indicates a non-planktotrophic larval development of the *H. acuta* specimens of Quiberon. Fish & Fish (1981) described this development (for "*H. neglecta*"). Each egg capsule of "*H. neglecta*" contains a single egg and the egg capsule size is larger than that of *H. ventrosa* (cf. Fish & Fish, 1981). According to Mars (1966: 239-240) the same is true for capsules of Mediterranean *H. acuta*: "... La plupart (capsules ovigères) étaient vidées de leur contenu, et montraient

| sample | species | location | number of specimens | range in mm | mean in mm | standard dev. in mm |
|-------------|------------------------|-----------------|---------------------|-------------|------------|---------------------|
| 1 | <i>H. ulvae</i> | Riithem, NL | 25 | 0.06 - 0.10 | 0.079 | 0.011 |
| 2 | <i>H. ventrosa</i> | Veere, NL | 25 | 0.09 - 0.14 | 0.114 | 0.014 |
| 3 | " <i>H. neglecta</i> " | Dunw.-Walb., UK | 9 | 0.12 - 0.15 | 0.139 | 0.012 |
| 4, Holocene | " <i>H. neglecta</i> " | Velsen, NL | 25 | 0.12 - 0.17 | 0.145 | 0.013 |
| 5 | <i>H. acuta</i> | Plouhamel, F | 25 | 0.10 - 0.17 | 0.135 | 0.016 |
| 6 | <i>H. acuta</i> | Pinet, F | 25 | 0.12 - 0.17 | 0.140 | 0.015 |
| 7 | <i>H. acuta</i> | Tarquinia, I | 15 | 0.12 - 0.15 | 0.143 | 0.009 |
| 8 | <i>H. joossei</i> | Laredo, E | 25 | 0.11 - 0.17 | 0.138 | 0.016 |

Fig. 18. Measurements of the diameter of the nucleus in eight samples of *Hydrobia* specimens. The samples 1 and 2 are significantly different (Student's *t*-test, 1-sided, 0.5% level of probability), mutually and from the samples 3-8. The samples 3-8 are not considered significantly different (Student's *t*-test, 2-sided, 1% level of probability).

une ouverture arrondie à leur partie supérieure. Quelques autres contenaient chacune un embryon visible par transparence et ressemblant à ceux d'*H. ventrosa*, mais plus grand,

The measurements of the capsules given by Mars (1966: 239) are remarkable: "de grande taille (0.6-0.8 mm)", whereas Fish & Fish (1981: 90) indicate for the diameter of capsules: 0.300-0.362 mm. Britton (1985: 221, 226) reported unattached egg capsules, containing from one to eight individual eggs, from a lagoon in the SE. of the Camargue, S. France, and he supposed *H. acuta* to have veliger larvae (not found by himself). Britton (1985: 226, 229) evidently based his idea of veliger larvae on a paper of Chuckchin on the life cycle of *H. acuta* in the Black Sea. In that paper, published in 1976, Chuckchin had described egg cases as being attached to the shells of living snails and containing 16-30 eggs; these eggs would give rise to veliger larvae. The high number of eggs per capsule suggest that in the paper of Chuckchin another hydrobiid species may be involved. It will be clear that further investigation is necessary.

ACKNOWLEDGEMENTS

All those who contributed to this paper are gratefully acknowledged: Prof. Dr. F. Giusti (Siena) for his SEM photographs (figs. 7-9, 14-17), his many valuable remarks, the loan of material and for sending some literature sources; Dr. R.S.K. Barnes (Cambridge) for his valuable comment, the donation of material and providing some literature sources; Dr. M. Bodon (Siena) for his drawings (figs. 10-13); Mr. J. Goud (Leiden) for making SEM photographs (figs. 2-5); Mr. G.J. Geuze (Oost-Souburg) and Mr. J.E. Phorson (Durham) for having drawn my attention to this interesting hydrobiid and the donation and loan of samples; Dr. J.J. van Aartsen (Dieren), Messrs. J. van Dalsum (Middelburg) & G.J. Gulden (Mijnsheerenland) for the donation of material; Mrs. T. Keukelaar-Van den Berge (Wilhelminadorp), Messrs. T. Meijer & R. Pouwer (Rijks Geologische Dienst, Haarlem), F.A.D. van Nieulande (Nieuw-en St. Joosland), R. van Outryve (Oostende), W. Segers (Aartselaar), G.F. Simons (Middelburg) for the loan of samples; Dr. R.A. Bank (Hoofddorp) for providing literature and material; Drs. A.C. van Bruggen (Leiden) and B.W. Hoeksema (Leiden/Ujung Pandang) for providing literature and valuable remarks.

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