

On the type species of *Aubignyna* and a description of *A. hamblensis*, a new microforaminifer from temperate shallow waters

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ABSTRACT - The genus *Aubignyna* Margerel, 1970 (type *A. mariei*) was originally described from the upper Pliocene of NW France. Examination and re-illustration of topotypes of *A. mariei* Margerel, 1970, the holotype of *Buccella planidorso* Atkinson, 1969 (from the Recent of Cardigan Bay, Wales) and syntypes of *Rotalia perlucida* Heron-Allen and Earland, 1913 (from the Clare Island Survey, western Ireland) shows them to be conspecific. Consequently, the type-species of *Aubignyna* becomes *R. perlucida*, for which a lectotype is chosen. A new species of microforaminifera formally described here is assigned to *Aubignyna* and shown to occur in a wide range of intertidal - shallow subtidal, brackish - normal marine estuaries and lagoons in Europe and North America.

INTRODUCTION

During preliminary ecological studies of the intertidal zone of an estuary in England (Alve & Murray, 1994) and detailed studies of the shallow subtidal zone of Scandinavian coasts (Alve & Murray, 1999), an undescribed species of microforaminifera (adult diameter <130µm) was discovered. Since it was not abundant it was not named, but in a time-series study of the intertidal zone of the Hamble estuary the new species was consistently present and sufficiently abundant to warrant further investigation (Alve and Murray, in prep.).

The second author had independently carried out a study of *Aubignyna perlucida* (Heron-Allen & Earland, 1913) and considered the possibility that the non-described species might consist of juveniles of that species. However, it immediately became clear that this could not be the case because of the major morphological differences as described in this paper. A careful search of the extensive collections in The Natural History Museum, London (BMNH), not only from the type area of western Ireland, but also from British localities (both Recent and Pleistocene) and from northern France, demonstrated that juveniles of *A. perlucida* (diameter 250-300 µm), half the size of adults, retain its specific characteristics. In *A. perlucida* the umbilicus is star-shaped and the sutures are curved and swept back, compared with the almost straight sutures of the new species. Granular matter is more abundant and concentrated along the umbilical sutures in *A. perlucida*. When viewed from the umbilical side, *A. perlucida* is almost indistinguishable from (the planispiral) *Haynesina germanica* (Ehrenberg), with which it has been much confused in historical collections.

Aubignyna was described by Margerel (1970) from upper Pliocene deposits (“marnes à *Nassa*”) at Bosq d’Aubigny in NW France; hence the name. Further study by the authors has established that the type species, *A. mariei* Margerel, 1970, is a junior synonym of *A. perlucida* (Heron-Allen & Earland, 1913). Also, our studies show that the holotype of *Buccella planidorso* Atkinson, 1969 is identical with *A. perlucida*. Hence, *A.*

perlucida has priority over both and is the type of the genus. We follow Loeblich & Tappan (1987) in placing *Aubignyna* in the Trichohyalidae, closely related to *Buccella* Andersen, 1952. Like the latter genus it has umbilical sutural fissures obscured by granules, which sometimes have been misinterpreted as secondary apertures. Otherwise, for the moment, it is not possible to make a fuller comparison of *Aubignyna* with *Buccella*, as that would require a thorough revision of the latter, especially of its type species *B. hannai* (Phleger & Parker, 1951).

The new species has most of the attributes of the genus *Aubignyna* although it is considerably smaller than previously described species. We have compared it with other micro-genera (on the advice of J. Pawlowski) such as *Microglabratella* Pawlowski & Lee, 1991, *Crumia* McCulloch, 1977, *Sabinia* McCulloch, 1977, *Sabinina* McCulloch, 1981, all of which Loeblich & Tappan, 1987, place in synonymy with *Glabratellina* Seiglie & Bermúdez, 1965. These genera have striae rather than sutures on the umbilical side and an open umbilicus. *Donsissonia* McCulloch, 1977 has an open umbilicus and lacks granular material.

Before describing *Aubignyna hamblensis* sp. nov., a lectotype is formally designated for *A. perlucida* (Heron-Allen & Earland). All the specimens figured in this paper are deposited in the Micropalaeontology collections of the Department of Palaeontology, The Natural History Museum, London (BMNH), the registered numbers being prefixed by PF (fossil) or ZF (Recent).

SYSTEMATIC DESCRIPTION

Suborder **Rotaliina** Delage & Hérouard, 1896

Superfamily **Chilostomellacea** Brady, 1881

Family **Trichohyalidae** Saidova, 1981

Genus *Aubignyna* Margerel, 1970

Type species: *Aubignyna mariei* Margerel, 1970 (= *Rotalia perlucida* Heron-Allen & Earland, 1913)

Aubignyna perlucida (Heron-Allen & Earland, 1913)

(Plate 1, figs. 1-14; Fig. 1d)

1913 *Rotalia perlucida* sp. nov. Heron-Allen & Earland: 139, pl. 13, figs 7-9.

1969 *Buccella planidorso* sp. nov. Atkinson: 535, fig. 6.3a-c.

1970 *Aubignyna mariei* sp. nov. Margerel: 60-64, pl. 1, figs 1-8, pl. 2, figs 1-10, text-fig. 2.

Diagnosis. Adult test of 300-400 μm diameter, trochospiral, periphery rounded; spiral side quite variable in shape (flattened to dome-shaped), with chambers consequently flat to slightly inflated, with sutures, respectively nearly flush to depressed; umbilical side flattened to slightly concave with 6 and 8 chambers, umbilicus star-shaped, together with the curved umbilical (often incised) sutures being filled with granular material.

Lectotype. BMNH no. ZF 5117, from Clare Island Survey station 15, Inishgowla Harbour (among the islands), Clew Bay, Co. Mayo, western Ireland, depth 4 fathoms (7.3m). Ex Heron-Allen & Earland "Type-slide" 87, The Natural History Museum, London. Figured in Pl. 1, figs 1-3, 5.

Material. *Rotalia perlucida*: syntypes from eight stations in Clew Bay (13, 19, 20, 23, 24, 25, 34 and 35) and one station (32) from Killary Bay, collected during the Clare Island Survey by the S.S. *Helga* or by Heron-Allen & Earland themselves are found in the Heron-Allen & Earland "Type-slide" Collection, in The Natural History Museum, London (a map of the stations is shown on the pull-out chart facing p. 1 of Heron-Allen & Earland, 1913); three are figured here, one as lectotype (see above) and two (BMNH nos. ZF 5117, ZF 5118; Pl. 1, figs 4, 8-10) as paralectotypes. Many specimens, including

small juveniles, from the Kirmington Formation, Lincolnshire, eastern England (oxygen isotope stages 9 or 11 (*vide* Bowen, 1999), Hoxnian, Pleistocene) occur in the Brady Collection, The Natural History Museum, London (listed as *Nonionina depressula* by Brady (*in* Reid, 1885); a small juvenile (BMNH no. PF 66950) is figured in Pl. 1, fig. 6. *Buccella planidorso*: the holotype (BMNH no. 1968.5.16.2) from station CB416B, Cardigan Bay, west Wales, depth 11½ fathoms (21m), is in The Natural History Museum, London; refigured here in Pl. 1, figs 13, 14.

Aubignyna mariei: topotypes kindly provided by J.P. Margerel from Bosq d'Aubigny, NW France (Upper Pliocene), in The Natural History Museum, London (BMNH nos. PF 66951, PF 66952); two are figured in Pl. 1, figs 7, 11, 12.

Description. Test free, trochospiral; spiral side flattened and comprising no more than 1½ whorls with 7 chambers in the final whorl, proloculus large (40 µm in diameter), sutures curved, oblique and slightly depressed, chamber wall smooth; periphery rounded with more-or-less parallel sides; umbilical side with 7 chambers, sutures curved and swept back and incised towards the umbilical end; umbilicus star-shaped with granular matter extending back along the sutures, chamber wall otherwise smooth; aperture an interiomarginal slit obscured by granules which extends from the umbilicus almost onto the spiral side; wall hyaline, perforate.

Dimensions. Lectotype: Greatest diameter 315 µm, shortest diameter 255 µm, thickness 130 µm. **Paralectotypes:** (ZF 5118) greatest diameter 335 µm, shortest diameter 285 µm; (ZF 5119) greatest diameter 365 µm, shortest diameter 345 µm, thickness 180 µm.

Remarks. The identity of Heron-Allen & Earland's species is rather poorly known mainly because of the misleading original illustrations. Particularly misleading is the view of the umbilical side, where the granular infilling of the swept-back sutures is not shown, although the authors refer to the sutures as....“being studded with fine tuberculate outgrowths”.

Heron-Allen & Earland also state that the species is rather variable in spiral

convexity, even within a population....“the superior [i.e. spiral] surface in some specimens rising in a comparatively high dome, whereas in others the shell is so flat as to be with difficulty distinguished at first sight from *Nonionina depressula* [= *Haynesina germanica*]”. These more spirally flattened forms constitute *Buccella planidorso* Atkinson (hence the name) and *A. mariei* Margerel; otherwise they are identical.

Distribution. A southern European (Lusitanian) shallow marine and estuarine species whose northernmost occurrence at the present day appears to be NW France, SW England (Devon and Cornwall) and western Ireland. Consequently, its occurrence in UK Pleistocene sediments (e.g. Kirmington Formation of eastern England) would signify warmer interglacial conditions than those prevalent today. It is also known from the late Pliocene of NW France (Margerel, 1970) and the coeval St. Erth Beds of Cornwall (Margerel *in* Mitchell, 1973).

Aubignyna hamblensis sp.nov.

(Plate 2, figs. 1-16; Fig. 1a-c, e)

Derivation of name. From the Hamble estuary, Hampshire, southern England.

Diagnosis. Test very small (adults <130 µm diameter), trochospiral, periphery rounded; umbilical side flattened and usually with 7 chambers, spiral side convex; umbilical sutures almost straight, radial, with granular material in the umbilicus and along the umbilical regions of the sutures.

Holotype. BMNH no. ZF 5120, Micropalaeontology collections, Department of Palaeontology, The Natural History Museum, London.

Material. Hundreds of specimens from intertidal to shallow subtidal areas in numerous localities from Scandinavia to southern England and Buzzards Bay, USA.

Locality of holotype and paratypes. Lower intertidal mudflats, Hamble estuary,

Warsash, Hampshire, southern England (= station W5 of Alve & Murray, 1994).

Description. Test free, trochospiral; spiral side convex comprising $2\frac{1}{4}$ whorls with 7 chambers in the final whorl, sutures slightly curved, oblique, slightly depressed in the penultimate few chambers, chamber wall smooth; periphery rounded, concavo-convex in edge view with rather produced initial coil; umbilical side with 7 chambers, sutures almost straight, radial, incised around the depressed umbilicus; inner parts of sutures and umbilicus lined with granular material, chamber wall smooth; aperture a small interiomarginal, extraumbilical slit, obscured by granules; wall hyaline, optically radial, perforate (pore diameter $<1\ \mu\text{m}$), pores sometimes arranged in groups of two or three.

Dimensions. Holotype: Greatest diameter $120\ \mu\text{m}$, shortest diameter $104\ \mu\text{m}$, thickness $60\ \mu\text{m}$. **Paratypes:** 13 paratypes are formally designated, their dimensions being given in Table 1.

Variation. The number of whorls in individuals $>63\ \mu\text{m}$ varies from $1\frac{1}{2}$ - $2\frac{1}{2}$; there are 6-7 chambers in the final whorl; in some individuals the umbilical portions of the chambers lack wall pores. Microspheric forms generally have a higher spiral side with more chambers overall. The ratio between largest diameter and height is ≥ 2 for megalospheric and 1.5-1.8 for microspheric forms. Microsphere and megalosphere diameters are approximately 12 and $20\ \mu\text{m}$ respectively.

Remarks. In transmitted light with crossed polars, the wall gives an extinction cross indicating an optically radial structure. Individual crystallites are $\sim 3\ \mu\text{m}$ in diameter with sutured boundaries (revealed by gentle acid-etching), and each pore is in a separate crystallite (Fig. 1e). The pores are grouped (see Fig. 1a), the pores of *A. perlucida* being shown (Fig. 1d, $<2\ \mu\text{m}$) for comparison. The aperture is obscured by granular material and it is not clear whether there are secondary apertures hidden in the umbilicus. A specimen lacking the final chamber shows the internal primary aperture as a slit (Fig. 1b); the normal external appearance of the aperture in edge view is shown in Fig. 1c.

Aubignyna hamblensis differs from *A. perlucida* in being much smaller (adults

generally <130 µm greatest diameter, compared with >300 µm in the latter). Its umbilical sutures, moreover, are almost straight rather than being curved and swept back as in *A. perlucida* (which character even small juveniles retain; see Pl. 1, fig. 6). The granular matter is more abundant and concentrated along the umbilical sutures in *A. perlucida*. It has been suggested that the function of such granules might be to break apart diatom frustules or to separate chloroplasts from plant cells (Alexander & Banner, 1984; Bernhard & Bowser, 1999) or to aid in burrowing (Langer *et al.*, 1989). The microspheric forms of *A. hamblensis* have a very high spiral side (e.g. Pl. 2, fig 7), whereas the microspheric *A. perlucida* (e.g. Pl. 1, figs 8-10) is more rounded in lateral view with a looser coil.

Aubignyna hamblensis is superficially similar in morphology and size to *Buccella frigida* (Cushman, 1922). It differs, most noticeably on the umbilical side: the latter does not have deeply incised inner parts of the sutures or a depressed umbilicus and the granules occur densely both along and around the sutures so that much of the umbilical side is granulated.

Distribution. This species is widely distributed in muddy sand, in sheltered brackish to normal marine estuarine or lagoonal environments, from northern Spain to southern Norway (Table 2) and in Buzzards Bay, USA. This species has not been listed by any name in any of the cited publications. We have checked the collections and the more detailed distribution is as follows: Oslofjord, Skagerrak and Kattegat, <6m (Alve & Murray collections), rare, living and dead; England: Hamble estuary, lower intertidal zone, living individuals common in surface 0.25 cm and present down to 4 cm; Poole Harbour, shallow subtidal, rare (Alve & Murray collections); Exe estuary, lower intertidal zone, rare, living; Christchurch Harbour, shallow subtidal, rare, living (Murray collections); NW France: Golfe de Morbihan, rare, dead (Debenay pers. comm.); northern Spain: Orío, Plentzia, Santoña, and San Vicente estuaries, intertidal, rare, living and dead (Cearreta collections, University of Bilbao); Buzzards Bay, Cape Cod, USA,

12m, rare, dead (Murray collection). Previously it has been ignored (because of low abundance), overlooked, or misidentified (perhaps as juvenile *Ammonia* species, especially of the more 'simple' forms such as *Ammonia limnetes* (Todd and Brönnimann, 1957), or even as *Buccella frigida*) because of its small size. However, in the case of the latter, *B. frigida* is a northern species while *A. hamblensis* occurs in more southerly habitats so there is a limited zone where the two distributions overlap. The abundant living taxa commonly associated with *Aubignyna hamblensis* are the *Ammonia beccarii* gr., the *Elphidium excavatum* gr., *E. williamsoni*, and/or *Haynesina germanica*. We have not observed *A. hamblensis* in Pleistocene sediments so all known records are Recent.

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	Number	L. diam.	S. diam.	Height	L:S	L:H	
Holotype	ZF 5120	120	104	60	1.2	2.0	meg.
Paratype	ZF 5121	121	100	55	1.2	2.2	meg.
Paratype	ZF 5122	142	112	88	1.3	1.6	micro.
Paratype	ZF 5123	114	89	53	1.3	2.2	meg.
Paratype	ZF 5124	150	129	69	1.2	2.2	meg.
Paratype	ZF 5125	135	108	68	1.3	2.0	meg.
Paratype	ZF 5126	133	113	90	1.2	1.5	micro.
Paratype	ZF 5127	140	119	87	1.2	1.6	micro.
Paratype	ZF 5128	131	110	63	1.2	2.1	meg.
Paratype	ZF 5129	131	98	71	1.3	1.8	micro.
Paratype	ZF 5130	131	112	60	1.2	2.2	meg.
Paratype	ZF 5131	132	113	67	1.2	2.0	meg.
Paratype	ZF 5132	125	96	58	1.3	2.2	meg.
Paratype	ZF 5133	135	121	73	1.1	1.8	micro.

Table 1. Size measurements of the holotype and 13 paratypes of *Aubignyna hamblensis* sp. nov. L = longest, S = smallest; diam. = diameter; Height = height of coil/thickness; L:S = ratio of longest to smallest diameter; L:H = ratio of longest diameter to height of coil/thickness; meg. = megalospheric, micro. = microspheric test. (Measurements are in μm). ZF numbers refer to registration numbers in the collections of The Natural History Museum, London [BMNH].

AREA	S (‰)	T (°C)	SEDIMENT	REFERENCE
Lyngør, Norway	26-29*	14-18**	muddy sand	Alve & Murray, 1999
Horten, Norway	16-20*	20-25**	muddy sand	Alve & Murray, 1999
Borre, Norway	19-22*		muddy sand	Alve & Murray, 1999
Hafstensfjord, Sweden	21-25*	19-21**	muddy sand	Alve & Murray, 1999
Vejle Fjord, Denmark	19-24*	17-19**	muddy sand	Alve & Murray, 1999
Hamble estuary, UK	25-35	4-23	muddy sand	Alve & Murray, in prep.
Christchurch Harbour, UK	20-33	4-20	muddy sand	Murray, 1966, 1968a
Exe estuary, UK	19-35	5-20	muddy sand	Murray, 1983
Golfe de Morbihan, France	27-35	6-22	muddy sand	Debenay (pers.comm.)
Santoña estuary, Spain	31-42	9-30	muddy sand	Cearreta, 1988
San Vicente estuary, Spain	33-43	13-33	sandy mud	Cearreta, 1989
Buzzards Bay, USA	30-33*	17*	muddy sand	Murray, 1968b

Table 2. Environmental data for occurrences of *Aubignyna hamblensis* sp. nov. (The references are the source of the environmental data, not published occurrences of the new species). S = salinity, T = temperature. * = measured only at the time of sampling (summer for Scandinavian localities; autumn for Buzzards Bay). ** = winter temperatures go down to 0°C.

Explanation of Plate 1

figs 1-14, *Aubignyna perlucida* (Heron-Allen & Earland, 1913): **figs 1-3, 5**, Lectotype, BMNH no. ZF 5117, spiral, edge, umbilical and oblique-umbilical views, from Heron-Allen & Earland “Type-slide” 87, Clare Island Survey station 13, Inishgowla Harbour, Clew Bay, Co. Mayo, W Ireland, depth 4 fathoms (7.3m); **fig. 4**, Paralectotype, BMNH no. ZF 5118, umbilical view, from Heron-Allen & Earland “Type-slide” 106, Clare Island Survey station 34, near Inishgowla, Clew Bay, depth 8-10 fathoms (14.6-18.3m); **fig. 6**, BMNH no. PF 66950, umbilical view of small juvenile, Kirmington Formation (Pleistocene), Lincolnshire, H.B. Brady Collection; **fig. 8-10**, Paralectotype, BMNH no. ZF 5119, spiral, edge and umbilical view of microspheric specimen, from Heron-Allen & Earland “Type-slide” 87, Clare Island Survey station 13, Inishgowla Harbour, Clew Bay, depth 4 fathoms (7.3m); **figs 7, 11**, Topotype of *Aubignyna mariei* Margerel, 1970, BMNH no. PF 66951, oblique-umbilical and umbilical view, from Bosq d’Aubigny (Upper Pliocene), NW France; **fig. 12**, Topotype of *Aubignyna mariei* Margerel, 1970, BMNH no. PF 66952, from Bosq d’Aubigny (late Pliocene); **13, 14**, Holotype of *Buccella planidorso* Atkinson, 1969, BMNH no. 1968.5.16.2, umbilical and edge views, from station CB416B, Cardigan Bay, west Wales, depth 11½ fathoms (21m). All x140.

Explanation of Plate 2

figs 1-16, *Aubignyna hamblensis* sp. nov.: **figs 1-4**, Holotype, BMNH no. ZF 5120, spiral, edge, umbilical and oblique-umbilical views; **fig. 5**, Paratype, BMNH no. ZF 5132, umbilical view; **figs 6-8**, Paratype, BMNH no. ZF 5126, spiral, edge and umbilical views of a microspheric specimen; **figs 9-12**, Paratype, BMNH no. ZF 5130, spiral, edge, umbilical and oblique-umbilical views; **figs 13-16**, Paratype, BMNH no. ZF 5133, spiral, edge, umbilical and oblique-umbilical views. All from lower intertidal mudflats at Warsash, Hamble Estuary, Hampshire, southern England (station W5 of Alve & Murray, 1994). All x320.

Fig. 1a-c, e. *Aubignyna hamblensis* sp. nov. **1a**, pores on spiral surface, showing distinctive grouping (Paratype, BMNH no. ZF 5128), x1280. **1b**, edge view of microspheric form with final chamber broken away to reveal internal slit-like aperture (Paratype, BMNH no. ZF 5127), x355. **1c**, edge view, showing close-up of aperture obscured by granules (paratype, BMNH no. ZF 5133), x990. **1e**, close-up of surface showing individual crystallites with sutured boundaries (revealed by acid-etching), each pore being in a different crystallite, approx. x2500. All specimens from intertidal mudflats at Warsash, Hamble Estuary, Hampshire, southern England (station W5 of Alve & Murray, 1994).

Fig. 1d, *Aubignyna perlucida* (Heron-Allen & Earland, 1913). Pores on spiral surface, for comparison (Paralectotype, BMNH no. ZF 5119), x585. From Heron-Allen & Earland "Type-slide" 87, Clare Island Survey station 13, Inishgowla Harbour, Clew Bay, Co. Mayo, western Ireland, depth 4 fathoms (7.3m).