Beringeria
Nordbayerische geowissenschaftliche Mitteilungen
Heft 43
2013

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Erlangen 2013

Beringeria **43**: S., 4 Abb., 20 Taf., 3 Tab.; Erlangen, 1. Dezember 2013
ISSN 0937-0242

Herausgeber:
Freunde der nordbayerischen Geowissenschaften e.V.

Redaktion:
Dipl.-Geol. Christian Schulbert und Dr. Michael Heinze,
GeoZentrum Nordbayern, Fachgruppe Paläoumwelt,
Loewenichstr. 28, D-91054 Erlangen

Druck:
PrintCom, Erlangen, Tennenlohe

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Radulović, B. 2013. **Lower Jurassic bivalves of eastern Serbia**. - Beringeria **43**: 3-61, 4 text-figs., 3 tables, 20 plates; Erlangen.

Abstract. This is a detailed study of the Lower Jurassic bivalves from thirteen localities of the eastern Serbian Carpatho-Balkanides. The material consists of 326 specimens which represent 38 taxa belonging to 18 genera and twelve families. The following species are recorded from eastern Serbia for the first time: *Camptonectes* (*C.*) cf. *auritus*, *Oxytoma* (*O.*) *inequivalve*, *Harpax rapa*, *Plagiostoma punctatum*, *Eopecten velatus*, *Weyla* (*W.*) cf. *rollieri*, *Pholadomya* (*P.*) *fidicula*, and *Pleuromya uniformis*. The taxonomy, stratigraphy, autecology, and palaeobiogeography of the researched material are discussed. In addition, the foraminifera have also been identified. Most bivalve genera and subgenera are known from the Tethyan and Boreal Realm and have a cosmopolitan distribution. *Unicardium* and *Weyla* (*W.*) indicate that the bivalve fauna of eastern Serbia belongs to the Tethyan Realm. The age of the bivalve-bearing rocks is Pliensbachian, with exception of the Senokos locality which belongs to the Sinemurian and Pliensbachian.

▪ **Key words***: bivalves, taxonomy, stratigraphy, palaeoecology, palaeobiogeography, Sinemurian, Pliensbachian, eastern Serbia*

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Introduction

Lower Jurassic sedimentary rocks with abundant bivalves, brachiopods, gastropods, and some other fossils are widespread in the Carpatho-Balkanides of eastern Serbia. Bivalves are among the best represented group of fossils in these rocks.

Toula (1881) was first to mention bivalves, brachiopods, and crinoids from these rocks. Radovanović (1888, 1891), Žujović (1889, 1893), Ilić (1903), Protić (1934), Andjelković (1958, 1962), Radulović (1982), Jankičević et al. (1983), Urošević & Radulović (1990), and Živanović (1993) among other groups also reported Lower Jurassic bivalves from the Carpatho-Balkanides of eastern Serbia. However, the figures, detailed description and taxonomy given in these papers are incomplete.

The present study presents detailed descriptions and identifications as well as synonymy lists of bivalves from thirteen localities of the Serbian Carpatho-Balkanides. Lithologs are given for most of the localities. D. Ivanova identified twenty-five foraminiferal species from these localities for a precise identification of the Pliensbachian stage.

Geological and stratigraphic framework

In the present study Pliensbachian bivalves have been researched from seven sections and six localities from the eastern Serbian Carpatho-Balkanides (Text-fig. 1). The study area belongs to the western belt of the Carpatho-Balkanides, respectively to the Upper Danubian structural unit (Kräutner & Krstić 2003). The geotectonic structure of this belt has been discussed by many authors. Most of them (Sikošek & Maksimović 1965; Anđelković & Nikolić 1974, 1980; Grubić 1974, 1980; Anđelković et al. 1996; Tchoumatchenco et al. 2006a, b, 2008, 2011a, b; Vašíček et al. 2009) assumed that during the Jurassic and Cretaceous three tectonic units existed (Getic, Infragetic and Danubian) which extended from the Romanian Carpathians towards eastern Serbia and Bulgaria. There is no agreement to which of these units the investigated sections and localities belong.

Lithological characteristics of the sediments and the distribution of bivalves and foraminifers species for the following investigated sections are given in Pl. 20 and in the appendix:

Pesača section (Šomrda Mountain; 44°50'05.0"N, 20°24'52.4"E; Pl. 20, Fig. 1).

Velika Lukanja section (Stara Planina Mountain; 43°14'05.0"N, 22°39'18.9"E; Pl. 20, Fig. 2).

Bogorodica section (Stara Planina Mountain; 43°10'32.7"N, 22°49'38.2"E; Pl. 20, Figs. 3, 4).

Rosomač section (Stara Planina Mountain; 43°10'31.3"N, 22°49'37.5"E; Pl. 20, Fig. 5).

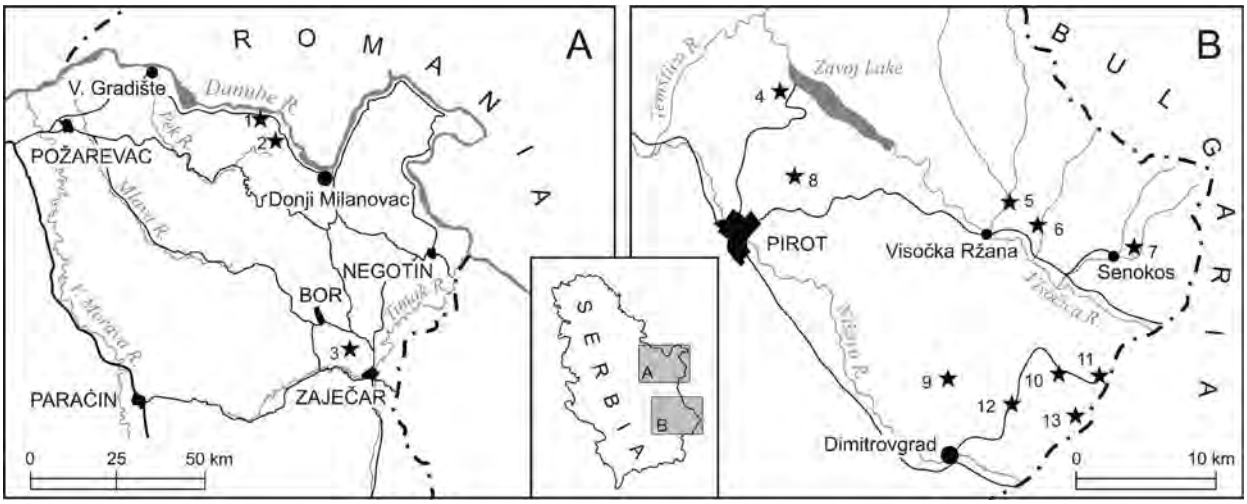
Senokos section (Stara Planina Mountain Mt; 43°8'39.9"N, 22°38'30.4"E; Pl. 20, Fig. 6).

Rgotina section (Straža Mountain; 44°01'02.7"N, 22°15'22.2"E; Pl. 20, Fig. 7).

Petrlaš section (Vidlič Mountain; 43°03'50.3"N, 22°47'24.6"E; Pl. 20, Fig. 8).

At the below mentioned localities the rocks under- and overlying the Pliensbachian strata are not exposed, so that the complete Liassic succession could not be observed:

Bosman (Sokolovac Mountain; 44°37'43.7"N, 21°59'04.8"E). - Sandy bioclastic limestones with *Pseudopecten* (*P.*) *equivalvis* and *Entolium* (*E.*) *lunare*. Also contains brachiopods, belemnites, and crinoids.



Text-fig. 1. Geographic position of the studied Liassic outcrops in eastern Serbia. 1: Bosman; 2: Pesača; 3: Rgotina; 4: Velika Lukanja; 5: Bogorodica; 6: Rosomač; 7: Senokos; 8: Mali Vrh; 9: Petrlaš; 10: Protopopinci; 11: Mazgoš; 12: Rudine; 13: Radejna.

Mali Vrh (Vidlič Mountain; 43°11'23.7"N, 22°38'30.4"E). - Sandy bioclastic limestones with *Gryphaea* (*G.*) *cymbium* and *Pseudopecten* (*P.*) *equivalvis*.

Protopopinci (Vidlič Mountain; 43°3'58.7" N, 22°52'24.1"E). - Marly sandstones with *Plagiostoma* sp. A and *Gryphaea* (*G.*) *cymbium*.

Mazgoš (Vidlič Mountain; 43°3'54.5"N, 22°54'17.2"E). - Sandy and bioclastic limestone with *Eopecten velatus.*

Rudine (Vidlič Mountain; 43°2'21.9"N, 22°53'36.4"E). - Sandy bioclastic limestone with *Limea* (*P.*) *duplicata*, *Harpax* cf. *spinosa* and *Harpax rapa*.

Radejna (Vidlič Mountain; 43°3'02.8"N, 22°49'43.4"E). - Sandstones with abundant bivalves, brachiopods, belemnites, gastropods, and rare ammonites. Bivalves include the following species: *Antiquilima* (*A.*) *succincta*, *Antiquilima* (*A.*) cf. *succincta*, *Gryphaea* (*G.*) *cymbium, Pseudopecten* (*P.*) *equivalvis*, *Chlamys* (*C.*) *textoria*, *Entolium* (*E.*) *lunare*, and *Pleuromya uniformis*.

Age of the bivalve-bearing strata

The age of the Liassic deposits containing bivalves, brachiopods, belemnites and subordinately ammonites in the Carpatho-Balkanides has been discussed by ANDJELKOVIĆ (1958, 1962) and SUČIĆ-PROTIĆ (1985) for eastern Serbia and SHOPOV (1970), and TCHOUMATCHENCO (1972a, b, 1996), SAPUNOV et. al. (1976) and SAPUNOV & TCHOUMATCHENCO (1988) for Bulgaria.

SHOPOV (1970), SAPUNOV et al. (1976), and SAPUNOV & TCHOUMATCHENCO (1988) recorded the stratigraphic distribution of the Liassic bivalve fauna of western Bulgaria. The zones they proposed are: (i) *Chlamys valoniensis* (Upper Hettangian); (ii) *Liogryphaea arcuata* (Lower Sinemurian); *Entolium lunare* (Upper Sinemurian); (iii) *E. frontalis* and *E. hehlii* (Lower Pliensbachian); (iv) *Pseudopecten aequivalvis* (Upper Pliensbachian). According to JOHNSON (1984) most of these species, have greater stratigraphic ranges, for example *Pseudopecten* (*P.*) *equivalvis* is known from the Hettangian to the ?Bajocian, *E.* (*E.*) *hehlii* and possibly *E.* (*E.*) *frontalis* are junior synonyms of the Hettangian-Toarcian *E.* (*E.*) *lunare*. The vagueness of the above zonation is the reason why it is not accepted here.

TCHOUMATCHENCO (1972a, b, 1996) and SAPUNOV & TCHOUMATCHENCO (1988) used brachiopods for the stratigraphic zonation of the adjoining west-Bulgarian terrain. Their zones are: (i) *Spiriferina walcotti* (uppermost Hettangian and Lower Sinemurian); (ii) *Tetrarhynchia dunrobiensis* (Upper Sinemurian and lower Lower Pliensbachian); (iii) *Zeilleria quadrifida* (upper Lower Pliensbachian and lower Upper Pliensbachian); (iv) *Homoeorhynchia acuta* (upper Upper Pliensbachian and Lower Toarcian); (v) *Homoeorhynchia cynocephala* (Toarcian and Lower Aalenian). This stratigraphic breakdown is also not usable, because only *Zeilleria quadrifida* is known from eastern Serbia.

IVANOVA (1999) studied an abundant and diverse assemblage of foraminifers from the same Liassic belt in Bulgaria. She identified, on the basis of foraminifers, Lower Pliensbachian (*Marginulina prima* Range Zone) and Upper Pliensbachian (*Marginulina alata-Marginulina spinata* Interval Zone).

D. IVANOVA (written comm. 2009) identified 25 foraminiferal species from most of the investigated sections (Bosman, Pesača, Rgotina, Velika Lukanja, Bogorodica, Rosomač, and Senokos). Each species had a large stratigraphic range and all are known from the Pliensbachian. The research localities of eastern Serbia and in the same Liassic belt of Bulgaria have thirteen foraminiferal species in common. The above mentioned zonal species, however, on which the Pliensbachian was differentiated in Bulgaria, were not identified.

Hence, foraminifers cannot be used in the detailed breakdown of the Pliensbachian strata containing bivalves and brachiopods (Table 1).

Most of the species described herein occur in the Pliensbachian (Table 2) and have wide stratigraphic distributions. The two exceptions are *Weyla* (*W.*) cf. *rollieri*, known only from the Pliensbachian, and *Plagiostoma* cf.

alticostum known from the uppermost Sinemurian to the Bajocian.

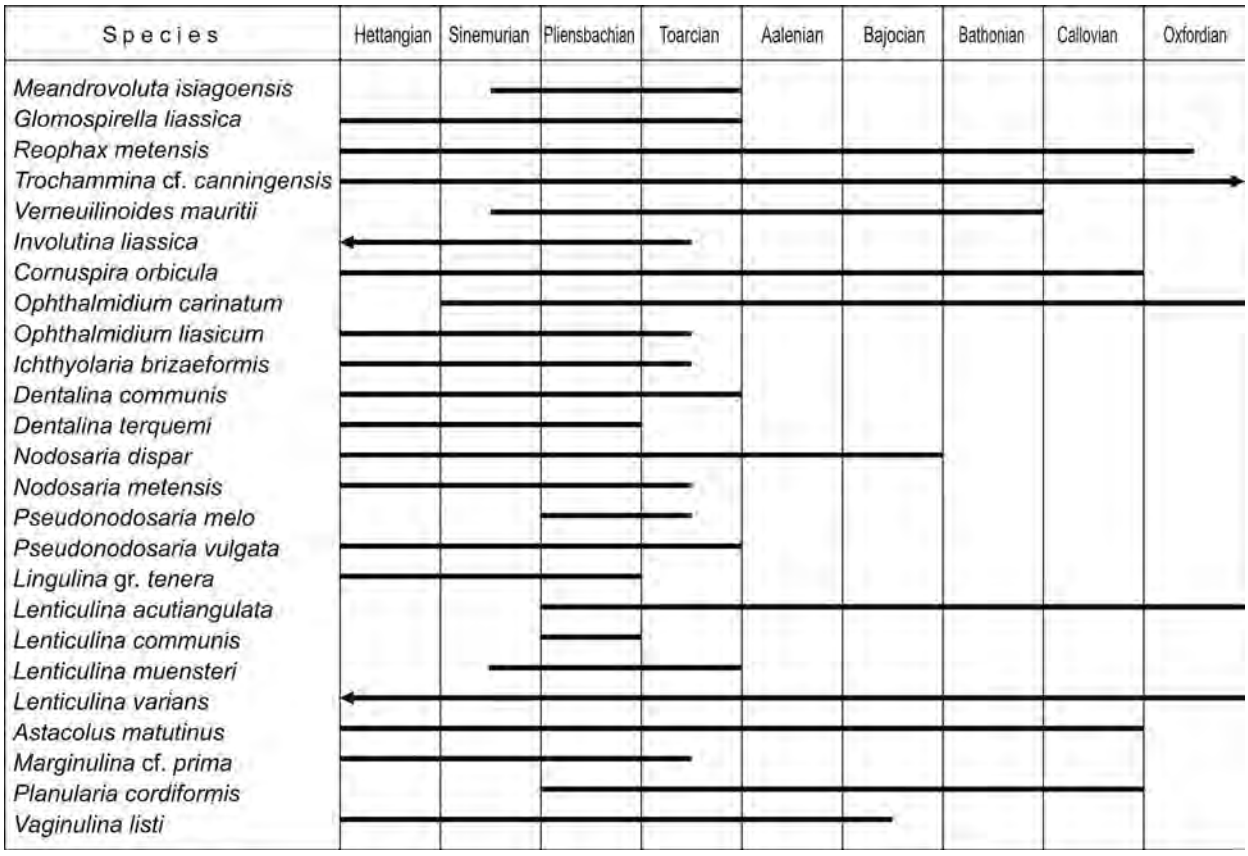
Sučić-Protić (1985) listed ammonites from Rgotina and Velika Lukanja localities. The species *Uptonia jamesoni* from the former and *Liparoceras* (*Bechieiceras*) cf. *bechi* from the latter locality clearly indicate Lower Pliensbachian (*Uptonia jamesoni, Tragophylloceras ibex*, and *Prodactylioceras davoei* zones). Andjelković (1962) also arrived at the same biostratigraphic conclusion for Stara Planina, based on ammonites. At many localities, brachiopods were found in addition to bivalves (Sučić-Protić 1969, 1971, 1985). *Cincta numismalis* and *Zeilleria quadrifida* (= *cornuta*), referred to as excellent index fossils by Ager (1990), were found in the Pliensbachian succession, the former from the Lower and the latter from the Upper Pliensbachian. The occurrence of the two species in most of the examined sections are evidence of the Pliensbachian age of the bivalves.

The bivalves are dated as Pliensbachian, because Upper Pliensbachian ("Domerian") ammonites were not found at the localities, so that it was not possible to draw a boundary between the Lower and Upper Pliensbachian. Moreover, neither a lithological nor a faunal differentiation was observed. Only at the Senokos locality, Hettangian sandstones are overlain transgressively by bioclastic limestone containing large quartz pebbles and bivalves of presumably Sinemurian age (Pl. 20, Fig. 6).

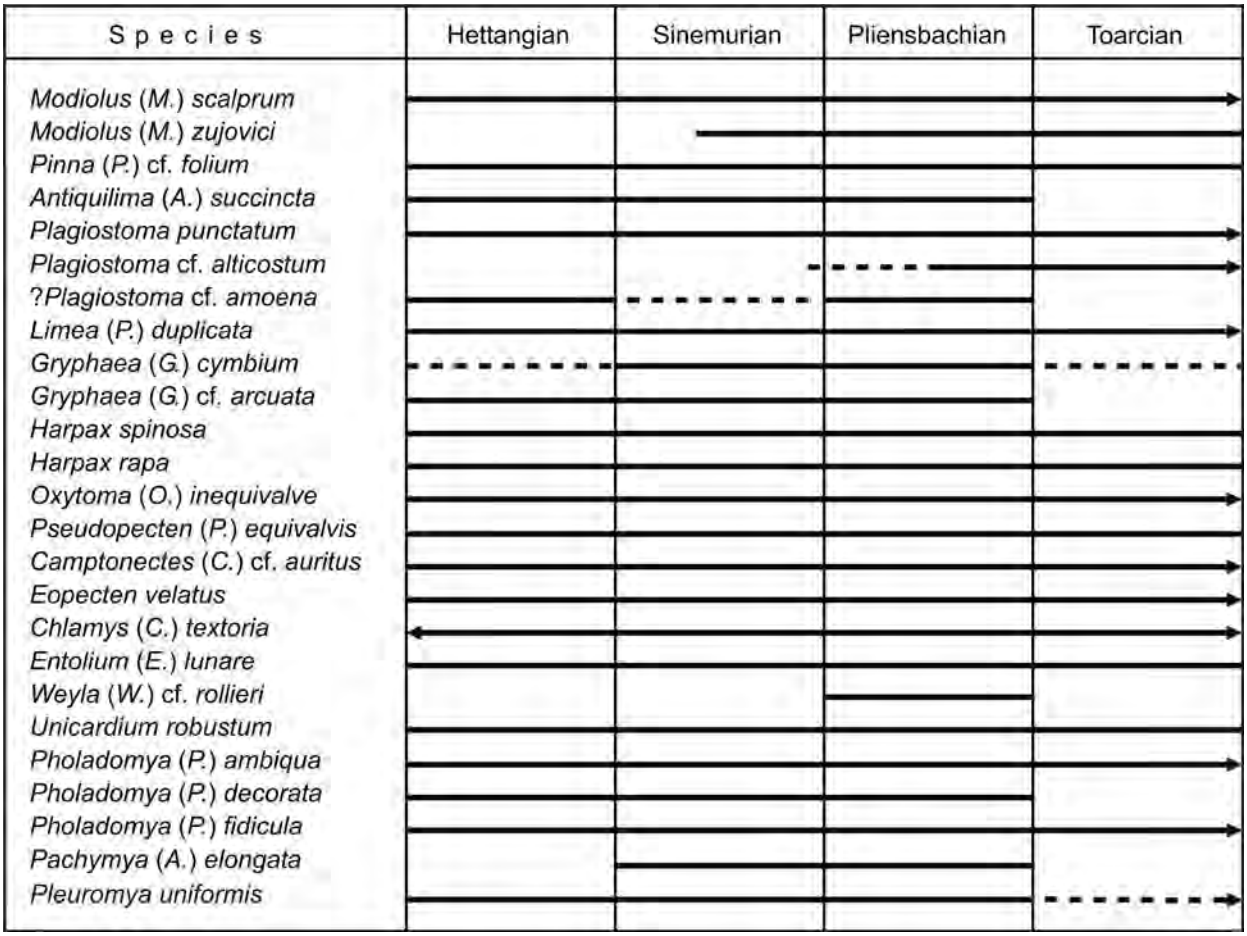
Palaeobiogeography

The first marine palaeobiogeographic classifications of the Jurassic were based mostly on ammonites, and bivalves were only occasionally mentioned to add evidence to the palaeobiogeographic pattern. Many authors (e.g. Hallam 1969, 1971; Fürsich & Sykes 1977; Doyle 1987) assumed, based on Jurassic ammonites, that Jurassic seas around the world formed the Boreal and the Tethyan faunal realms. During the last fifty years, research on the Jurassic bivalve palaeobiogeography yielded information on the boundaries of the two realms, which in some stages (Bathonian, Oxfordian, Kimmeridgian, and Tithonian) correlated well with the boundaries determined using ammonites, but not in some others (Pliensbachian and Callovian).

A detailed study of the palaeobiogeography of the Proto-Atlantic by Liu (1995) was based on Jurassic bivalves. She designated the provinces that existed through the Jurassic as (a) Boreal Bivalve Province in the north (based on Boreal bivalves and the lack of Tethyan taxa), (b) Mediterranean Bivalve Province in the south (based on Tethyan bivalves and the lack of Boreal bivalves) and (c, d) one or two transitional, intermediate provinces (Northern Transitional Province and Southern Transitional Province). According to Liu (1995) and Liu et al. (1997), the Boreal Bivalve Province and the Northern Transitional Province form the Boreal Realm and the Southern Transitional Provinces and the Mediterranean Bivalve Province constitute the Tethyan Realm. Three



Tab. 1. Stratigraphic distribution of the Liassic foraminifera from eastern Serbia.



Tab. 2. Stratigraphic distribution of the Liassic bivalve taxa from eastern Serbia.

provinces were recognized in the Pliensbachian: the Boreal Bivalve Province (Greenland, northern England and southern England), the Southern Transitional Province (Spain, Portugal, southwestern and northern France) and the Mediterranean Bivalve Province (Morocco).

For the described bivalves of eastern Serbia, the following inferences based on Pliensbachian genera/subgenera can be drawn:
(1) Fifteen genera/subgenera are cosmopolitan, found in all three provinces. These are *Modiolus* (*Modiolus*), *Pinna* (*Pinna*), *Antiquilima* (*Antiquilima*), *Plagiostoma*, *Limea* (*Pseudolimea*), *Gryphaea* (*Gryphaea*), *Plicatula* (*Plicatula*), *Pseudopecten* (*Pseudopecten*), *Camptonectes* (*Camptonectes*), *Eopecten*, *Chlamys* (*Chlamys*), *Entolium* (*Entolium*), *Pholadomya* (*Pholadomya*), *Pachymya* (*Arcomya*), and *Pleuromya*.
(2) The genera/subgenera *Unicardium* and *Weyla* (*Weyla*) are present in the Southern Transitional Province and in the Mediterranean Bivalve Province while they are absent in the Boreal Bivalve Province. These two genera, with some others, were considered by LIU (1995) to be characteristic of the two provinces.
(3) *Oxytoma* (*Oxytoma*) occurs in the Southern Transitional Province and Boreal Bivalve province, but not in the Mediterranean Province.

It follows from the above that the fossil fauna of eastern Serbia and adjoining regions (Hungary, Romania, and Bulgaria) originated from the northern Tethyan margin, the Tethyan Realm (LIU 1995), and that it may be placed by its palaeobiogeographic position into the Southern Transitional Province (Table 3).

Autecology

The life habits of the investigated bivalve genera, based on the autecological data discussed by DUFF (1978), DAMBORENEA (1987a, b, 2002b), and DELVENE (2001) are reconstructed as follows:
Modiolus: semi-infaunal byssate; prefers a sandy or muddy substrate, lives semi-infaunally, attached to large pebbles by its byssus; suspension-feeder.
Pinna: semi-infaunal byssate bivalve; lives in calcareous sandy mud and sand; high-level suspension-feeder.
Antiquilima: epifaunal byssate bivalve.
Plagiostoma: epifaunal byssate bivalve; middle-level suspension-feeder.
Limea: epifaunal bivalve, byssally attached; low-level suspension-feeder.
Gryphaea: epifaunal bivalve, living cemented by the left valve to a hard substrate in the juvenile stage, free-living in the adult stage; low-level suspension-feeder.
Harpax: epifaunal bivalve, living cemented by the right valve to another object in the juvenile stage, free-living on the sediment in the adult stage. Recent species of the genus live in the intertidal zone.
Oxytoma: epifaunal byssate bivalve; suspension-feeder.

Pseudopecten: epifaunal, byssally attached early in ontogeny, free recliner in the adult stage, able to swim; usually appearing in fully marine littoral environments; low-level suspension-feeder.
Camptonectes: epifaunal byssate bivalve; low-level suspension-feeder.
Eopecten: epifaunal byssate bivalve; low-level suspension-feeder.
Chlamys: epifaunal byssate bivalve; low-level suspension-feeder.
Weyla: semi-infaunal reclining mode of life; occupying mostly sandy bottoms or even sandy gravel, below the low-tide line down to about 100 m depth; low-level suspension-feeder.
Entolium: free-living epifaunal bivalve, able to swim; most common in fine-grained sandstones and mudstones; low-level suspension-feeder.
Unicardium: shallow-infaunal siphonate bivalve; low-level suspension-feeder.
Pholadomya: deep-infaunal bivalve with long siphons; low-level suspension-feeder.
Pachymya: deep-infaunal bivalve with long siphons; low-level suspension-feeder.
Pleuromya: deep-infaunal bivalve with long siphons; low-level suspension-feeder.

The relative abundances of the bivalve families and genera/subgenera of the studied localities are given in Text-figs. 2, 3.

Benthic organisms, such as brachiopods, gastropods, echinoids, and foraminifers are present in addition to bivalves. Nektonic organisms associated with the benthos include a few ammonites and belemnites. The recurrence of belemnites in the stratigraphic succession of most localities indicates some cyclic sedimentation pattern during the Pliensbachian.

The diversity and abundance of the bivalve species are evidence of suitable conditions for their existence. The bivalves populated littoral and sublittoral areas that had communication with the open sea, as indicated by the presence of ammonites and belemnites. The water energy was low to medium. The entire benthic fauna (bivalves, brachiopods, gastropods, and foraminifers) was stenohaline. The presence of both epifaunal and infaunal bivalves indicates that the substrate was both soft enough for the burrowing bivalves and stable enough for the epifaunal taxa.

The living conditions were also suitable for brachiopods, which were abundant and diverse. Brachiopods indicate comparatively shallow, agitated marine environments of the inner shelf.

Post-mortem transport of the specimens must have been short, because they are fairly well preserved. This conclusion is supported by the relative abundance of organisms preserved with both valves and by the lack of size sorting and preferred orientation.

The character of sedimentary rocks (bioclastic limestone, marly limestone, and argillaceous limestone) containing the fauna suggests that the substrate was fine mud with occasional influx of fine sand.

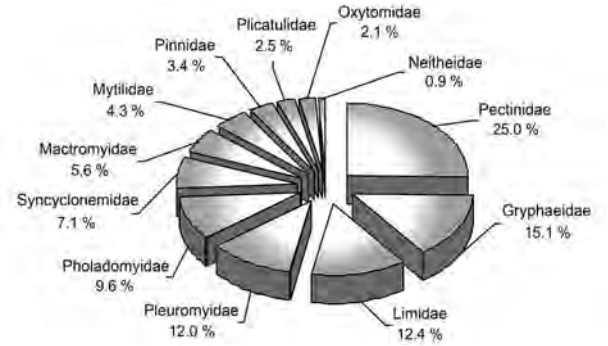
Genus/Subgenus	Boreal Realm	Tethyan Realm	
	Boreal Province	S. Transitional Province	Mediterranean Province
Modiolus (M.)	+	+	+
Pinna (P.)	+	+	+
Antiquilima (A.)	+	+	+
Plagiostoma	+	+	+
Limea (P.)	+	+	+
Gryphaea (G.)	+	+	+
Harpax	+	+	+
Oxytoma (O.)	+	+	
Pseudopecten (P.)	+	+	+
Camptonectes (C.)	+	+	+
Eopecten	+	+	+
Chlamys (C.)	+	+	+
Entolium (E.)	+	+	+
Weyla (W.)		+	+
Unicardium		+	+
Pholadomya (P.)	+	+	+
Pachymya (A.)	+	+	+
Pleuromya	+	+	+

Tab. 3. Occurrence of the bivalve species of eastern Serbia in the Boreal Realm (Boreal Bivalve Province), and the Tethyan Realm (Southern Transitional Province and Mediterranean Province).

The depositional environment slowly deepened (low cyclic sedimentation) from the Pliensbachian to the Toarcian, when ammonites and belemnites were deposited in comparatively deep water.

Material and methods

About 320 specimens of Lower Jurassic bivalves from the eastern-Serbian Carpatho-Balkanides were collected between 1981 and 2008 during field visits of undergraduates led by J. Mitrović-Petrović, V. Radulović and myself. Most of the specimens were collected on the Stara Planina Mountain and the Vidlič Mountain but also on the Straža, Šomrda and Sokolovac mountains. The fossils were cleaned in the laboratory and prepared mechanically by means of vibrotools and needles. The dominantly internal moulds and subordinately external and composite moulds varied in preservational quality.



Text-fig. 2. Total percentages of the Lower Jurassic bivalve families from eastern Serbia.

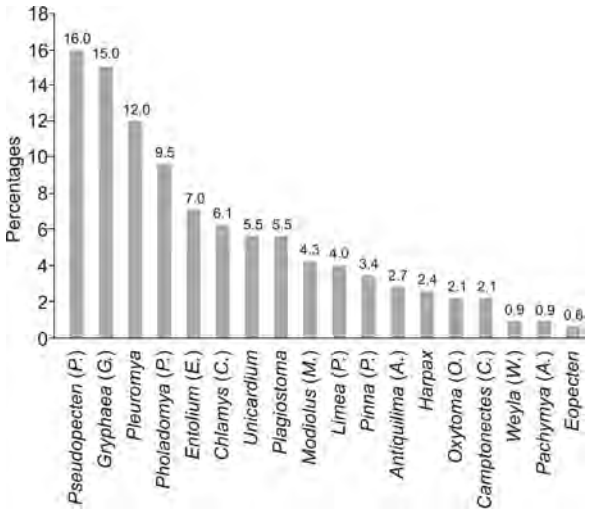
The synonymy list gives only the most important references, beginning with the introduction of the taxon, followed by records from eastern Serbia and adjoining regions (Hungary, Romania, and Bulgaria). In cases where a modern revision of a particular taxon with extensive discussion is available, the reference is included in the synonymy list. In addition, additional references are given when thought appropriate.

Higher taxa are classified following the scheme of AMLER et al. (2000). Biometric parameters and the respective abbreviations are given in Text-fig. 4 (according to JOHNSON 1984; JAITLY et al. 1995; PANDEY et al. 1996; DELVENE 2001). Specimens were measured whenever their preservation allowed.

The Jurassic Bivalve Catalogue of the Institut für Paläontologie, Würzburg, was a very useful reference for the identification of specimens and compilation of the synonymies. The examined material has been deposited in the Department of Palaeontology, Faculty of Mining and Geology, University of Belgrade (RGF BR).

Plates 1-16: All specimens coated with ammonium chloride and figured in natural size.

Plates 17-19: Determinations and photos made by D. IVANOVA.



Text-fig. 3. Total percentages of the Lower Jurassic bivalve genera/subgenera from eastern Serbia.

All specimens on Plates 1-19 are Pliensbachian in age, unless otherwise stated.

Taxonomy

Class Bivalvia LINNÉ, 1758
Infraclass Autobranchia(ta) GROBBEN, 1894
Subclass Pteriomorphia BEURLEN, 1944
Superorder Isofilibranchia (IREDALE, 1939) POJETA, 1971
Order Mytiloida FÉRUSSAC, 1822
Superfamily Mytilacea RAFINESQUE, 1815
Family Mytilidae RAFINESQUE, 1815
Genus *Modiolus* LAMARCK, 1799

Remarks. A great number of nominal species assigned to the Jurassic genus *Modiolus* are known from published literature, often described under the name *Modiola* or *Mytilus*. Many of these names are now synonyms. Individuals of one and the same species, which differ in morphology as a result of diagenetic deformations, were assigned to different species. This makes the nomenclature of this bivalve group complex and often confusing; it is, therefore, in urgent need of revision. In view of the fact that the degree of deformation is impossible to assess from published photographs the detailed examination of the type material seems extremely important.

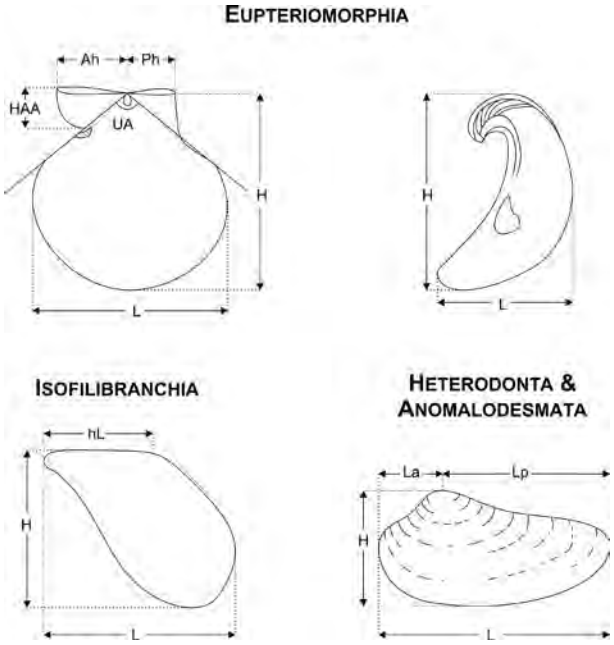
Subgenus *Modiolus* LAMARCK, 1799

Type species. *Mytilus modiolus* LINNÉ, 1758.

Modiolus (*Modiolus*) *scalprum* (J. SOWERBY, 1821)
Pl. 1, Figs. 1-5

1821 *Modiola scalprum* sp. nov. – J. SOWERBY: 87, pl. 248, fig. 2.
1968 *Modiolus thiollierei* (DUMORTIER) – SHOPOV: 315, pl. 1, figs. 12-15.
1968 *Modiolus scalprum* (J. SOWERBY) – SHOPOV: 316, pl. 1, fig. 16.
1982 *Modiola thiollierei* DUMORTIER – RADULOVIĆ: 303, pl. 1, fig. 2.
1987a *Modiolus* cf. *thiollierei* (DUMORTIER) – DAMBORENEA: 89, pl. 3, figs. 8-13; text-figs. 21, 23.
1990 *Modiolus thiollierei* (DUMORTIER) – UROŠEVIĆ & RADULOVIĆ: 28, pl. 1, figs. 10, 11.
1991 *Modiolus* sp. – POULTON: 25, pl. 9, fig. 5.
1991 *Modiolus scalprum* (Sow.) – SCIAU: 46, pl. 27, fig. 5.
1992 *Modiolus* cf. *thiollierei* (DUMORTIER) – DAMBORENEA: 614-615, pl. 117, fig. 6.
1993 *Modiolus scalprum* (J. SOWERBY) – ŽIVANOVIĆ: 181, 186, 190, 194, pl. 1, fig. 2.
1994 *Modiolus* (*Modiolus*) cf. *scalprum* J. SOWERBY – ABERHAN: 50, pl. 28, figs. 2-5.
1996 *Modiolus* cf. *scalprum* SOWERBY – DAMBORENEA: 156, 158.
1998 *Modiolus* (*Modiolus*) cf. *scalprum* J. SOWERBY – ABERHAN: 134, pl. 17, figs. 2-4, 7.

Material. Five partially preserved articulated specimens and 1 right valve from Senokos (RGF BR 79/72, 79/73, 79/74, 79/75, 79/76, 79/77); 1 well-preserved articulated



Text-fig. 4. Biometric parameters used for each taxonomic group with their abbreviations: H: height, L: length, LA: anterior length, LP: posterior length, UA: umbonal angle, hL: length of hinge, HAA: height of anterior auricle, Ah: anterior length of hinge, Ph: posterior length of hinge (after Johnson 1984; Jaitly et al. 1995; Pandey et al. 1996; Delvene 2001).

specimen, 1 right and 1 left valve from Bogorodica (RGF BR 80/25, 80/27, 80/28); 2 partially preserved articulated specimens from Velika Lukanja (RGF BR 98/42, 98/43).
Measurements (in mm).

	L	H	H/L
RGF BR 79/73	48.0	21.4	0.44
RGF BR 79/74	53.9	27.9	0.52
RGF BR 79/75	87.7	49.2	0.56
RGF BR 79/76	61.1	42.0	0.69
RGF BR 79/77	62.2	39.7	0.64
RGF BR 80/25	61.3	32.9	0.54
RGF BR 80/28	35.7	19.6	0.55

Description. Shell small to medium in size, equivalved, very elongated. Umbones not so prominent, prosogyrate. Dorsal and ventral margins almost parallel. A low and rounded umbonal ridge extends from the umbo to the postero-ventral margin. Ornamentation consists of fine and regular growth lines.
Remarks. Several species from the Liassic of Europe are closely related to *M.* (*M.*) *scalprum*: *M. productus* from the Sinemurian (Terquem 1855: 311, pl. 21, fig. 7) and *M. thiollierei* (Dumortier 1869: 284, pl. 34, figs. 5, 6) and *M. numismalis* (Dumortier 1869: 126, pl. 29, figs. 8, 9) from the Pliensbachian.

Aberhan (1994) distinguished three morphological variants of *M.* (*M.*) *scalprum* within a single population from the Early and Late Pliensbachian of northern Chile. The level of curvature of the dorsal and ventral margins in his material greatly varies which also indicates the generally high variability of this species.

A detailed revision of the original material may lead to the conclusion that all the above-mentioned species are conspecific. Preference in this paper is given to *M. scalprum* J. Sowerby, the oldest available name.
Occurrence. Sinemurian and Pliensbachian of Senokos; Pliensbachian of Velika Lukanja and Bogorodica.

Modiolus (*Modiolus*) *zujovici* (Radovanović, 1888)

Pl. 1, Figs. 6, 7

1851 *Mytilus scalprum* Goldf. – Bayle & Coquand: 15, pl. 7, figs. 3, 4.
1888 *Modiola Žujovići* sp. nov. – Radovanović: 93, pl. 2, fig. 32.
1899 *Modiola baylei* sp. nov. – Philippi: 48, pl. 24, fig. 8 (copy from Bayle & Coquand, 1851: pl. 7, figs. 3, 4).
1987a *Modiolus baylei* Philippi – Damborenea: 91, pl. 4, figs. 2-5.
1994 *Modiolus* (*Modiolus*) *baylei* Philippi – Aberhan: 47, pl. 26, figs. 1-4.

Material. One articulated specimen and 1 left valve from Bogorodica (RGF BR 80/26, 80/54); 1 left valve from Rgotina (RGF BR 99/24).
Measurements (in mm).

	L	H	H/L
RGF BR 80/26	46.3	28.4	0.61
RGF BR 80/54	46.8	32.7	0.70
RGF BR 99/24	44.7	25.8	0.58

Description. Shell medium in size, trapeziform in outline, equivalved, moderately elongated; length greater than height. Dorsal margin almost straight, anterior margin slightly convex, together forming an angle of about 90°. Ventral margin slightly concave; posterior margin convex. A low and broad umbonal ridge extends from the umbo to the postero-ventral part of the shell. Surface of shell covered with irregularly spaced commarginal growth lines.
Remarks. Radovanović (1888: 93, pl. 2, fig. 32) introduced the species *Modiola zujovici* from the Rgotina Liassic rocks and compared it with other species of Liassic *Modiolus* from which it differs, in his opinion, in the length-height ratio. The length of the species is, on average, 1.6 times its height, quite unlike *M.* (*M.*) *scalprum*, which has a length/height ratio of 2.75.

Based on the specimens identified by Bayle & Coquand (1851: 15, pl. 7, figs. 3, 4) as *Mytilus scalprum*, Philippi (1899: 48, pl. 24, fig. 8), probably unaware of the paper by Radovanović (1888), introduced the new species *Modiola baylei* from the Pliensbachian and Lower Toarcian of Chile, clearly a younger synonym of *Modiola zujovici.*
Occurrence. Pliensbachian of Bogorodica and Rgotina.

Superorder Eupteriomorphia Boss, 1982
[= Anisomyaria Neumayr, 1883]
Order Pterioida Newell, 1965
Suborder Pinnina Waller, 1978
Superfamily Pinnacea Leach, 1819
Family Pinnidae Leach, 1819
Genus *Pinna* Linné, 1758
Subgenus *Pinna* Linné, 1758

Type species. *Pinna rudis* Linné, 1758.

Pinna (*Pinna*) cf. *folium* Young & Bird, 1822
Pl. 1, Fig. 8; Pl. 2, Figs. 1-3

cf. 1822 *Pinna folium* sp. nov. – Young & Bird: 243, pl. 10, fig. 6.
cf. 1987a *Pinna* (*Pinna*) cf. *folium* Young & Bird – Damborenea: 95, text-fig. 24; pl. 4, figs. 6, 11-14.
cf. 1993 *Pinna folium* Young & Bird – Živanović: 181, 182, 186, 190, 191, 193, pl. 1, fig. 3.
cf. 1994 *Pinna* (*Pinna*) cf. *folium* Young & Bird – Aberhan: 22, pl. 7, figs. 3, 4.
cf. 1996 *Pinna* cf. *folium* Young & Bird – Damborenea: 155, 159.
cf. 1998 *Pinna* (*Pinna*) cf. *folium* Young & Bird – Aberhan: 80, pl. 5, figs. 10-12; pl. 6, fig. 1.
cf. 2002 *Pinna* (*Pinna*) cf. *folium* Young & Bird – Gahr: 117, pl. 1, fig. 13.

Material. Six internal moulds with partially preserved shell from Senokos (RGF BR 79/23, 79/25, 79/26, 79/27, 79/91, 79/92); 2 internal moulds with partially preserved shell from Bogorodica (RGF BR 80/13, 80/12); 1 right valve from Velika Lukanja (RGF BR 98/11); 2 internal moulds with partially preserved shell from Rgotina (RGF BR 99/2, 99/3).

Measurements (in mm).

	L	H	H/L
RGF BR 79/23	136.0	203.0	1.49
RGF BR 79/25	80.0	154.0	1.92
RGF BR 79/26	29.0	82.0	2.82

Description. Shell medium to large, triangular in outline. Dorsal and ventral margins straight to slightly concave, forming an angle of about 28°-37°. Both valves ornamented with more or less regularly spaced narrow and low ribs; space between ribs two-times wider than rib. There are about seven ribs on the ventral region; the dorsal area of the specimens is damaged; thus, the number of ribs could not be determined with certainty. Radial ornament crossed by commarginal growth-lines, bearing small tubercles. In juvenile specimens, both the dorsal and ventral areas are covered by radial ribs which are transversely crossed by growth-lines; in adults, the number of ribs in the ventral part is lower, especially towards the ventral margin, where only commarginal growthlines are present.

Remarks. The described specimens, albeit poorly preserved, have features, such as the acute apical angle and number of ribs, which are very similar to those of *Pinna* (*P.*) *folium*. Some variations in ornamentation are noted among individuals of different age; juvenile specimens have radial riblets all over the shell, which are ventrally reduced to commarginal growth lines in adults (pers. comm., M. Heinze 2007).

According to Aberhan (1994) the related species *P.* (*P.*) *radiata* Münster differs in having a somewhat wider apical angle.

The published literature mentions several Lower Jurassic species from Europe (*Pinna inflata* Chapius & Dewalque, *P. zieteni* Rollier, *P. semistriata* Terquem) with the morphologies very similar to *Pinna* (*P.*) *folium*, which are probably younger synonyms of this species.

Occurrence. Pliensbachian of Senokos, Bogorodica, Velika Lukanja, and Rgotina.

Order Limoida (Rafinesque, 1815) Waller, 1978
Superfamily Limacea Rafinesque, 1815
Family Limidae Rafinesque, 1815
Genus *Antiquilima* Cox, 1943
Subgenus *Antiquilima* Cox, 1943

Type species. *Lima antiquata* J. Sowerby, 1818.

Antiquilima (*Antiquilima*) *succincta*
(von Schlotheim, 1813)
Pl. 2, Figs. 4-6; Pl. 3, Fig. 1

1813 *Chamites succinctus* sp. nov. – von Schlotheim: 72.
1867 *Lima Succincta* (Schlotheim, spec.) – Dumortier: 66, 212, pl. 47, figs. 6, 7; pl. 48, fig. 1.
1869 *Lima succincta* (Schlotheim sp.) – Dumortier: 286, pl. 34, figs. 3, 4.
1929 *Lima succincta* (Schlotheim) – Lanquine: 133.
1968 *Antiquilima succincta* (Schlotheim) – Shopov: 439, pl. 9, figs. 7, 8.
1971 *Antiquilima succincta* (Schlotheim) – Vörös: 184, pl. 3, Fig. 3.

Plate 1. Figs. 1-5. *Modiolus* (*Modiolus*) *scalprum* J. Sowerby, 1821.
1. Articulated specimen; a: left valve view, b: dorsal view. Senokos. - RGF BR 79/75.
2. Right valve. Bogorodica. - RGF BR 80/25.
3. Articulated specimen, right valve view. Senokos. - RGF BR 79/73.
4. Composite mould of articulated specimen, right valve view. Bogorodica. - RGF BR 80/28.
5. Articulated specimen, right valve view. Senokos. - RGF BR 79/74.
Figs. 6, 7. *Modiolus* (*Modiolus*) *zujovici* (Radovanović, 1888).
6. Left valve. Rgotina. - RGF BR 99/24.
7. Left valve. Bogorodica. - RGF BR 80/54. –
Fig. 8. *Pinna* (*Pinna*) cf. *folium* Young & Bird, 1822 – Left valve. Velika Lukanja. - RGF BR 98/11.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1983 *Lima* (*Plagiostoma*) *succincta* (SCHLOTHEIM) – JANKIČEVIĆ et al.: 170, pl. 1, fig. 4.
1993 *Antiquilima succincta* (SCHLOTHEIM) – ŽIVANOVIĆ: 182, 184, 186, 191, 193.
1994 *Antiquilima succincta* (SCHLOTHEIM) – MANCINELLI: 164, pl. 2, fig. 1.
1998 *Antiquilima* (*Antiquilima*) *succincta* (VON SCHLOTHEIM) – ABERHAN: 82, pl. 6, figs. 6, 7.

Material. 1 right valve, 1 left valve and 3 partially preserved articulated specimens from Senokos (RGF BR 79/39, 79/40, 79/41, 79/42, 79/43); 2 partially preserved articulated specimens from Radejna (RGF BR 94/3, 94/13); 1 articulated specimen from Velika Lukanja (RGF BR 98/1).

Measurements (in mm).

	L	H	H/L
RGF BR 79/39	63.3	87.8	1.39
RGF BR 79/40	59.4	77.5	1.30
RGF BR 79/41	61.4	86.5	1.41
RGF BR 79/42	34.3	45.9	1.34
RGF BR 79/43	27.8	34.6	1.24
RGF BR 94/3	118.0	123.0	1.04
RGF BR 94/13	49.6	66.9	1.35
RGF BR 98/1	41.7	52.3	1.25

Description. Shell medium in size, higher than long; equilateral; sub-elliptical in outline. Shell surface ornamented with 16-30 smooth and slightly wavy radial ribs, which differ in strength and are irregularly spaced. Space between ribs wider than the ribs; in some specimens second and third order ribs are present. Radial ribs crossed by commarginal growth lines.

Remarks. The specimens from eastern Serbia correspond with respect to shape of the shell and type of ornamentation to those in the synonymy list.

Several palaeontologists (e.g., BRONN 1836; DUMORTIER 1867, 1869) regared the other two Lower Jurassic species, *Antiquilima* (*A.*) *antiquata* (J. SOWERBY, 1818: 25, pl. 214, fig. 2; see also BRONN 1836: 338, pl. 15, fig. 10; QUENSTEDT 1856: 78, pl. 9, fig. 11) and *A.* (*A.*) *hermanni* (VOLTZ) (see also GOLDFUSS 1835: 80, pl. 100, fig. 5a, b; CHAPIUS & DEWALQUE 1853: 194, pl. 27, fig. 1) as synonyms of *A.* (*A.*) *succincta*, differing only in having a finer and denser ornamentation and smaller ears.

Cox et al. (1969) also regarded *Lima antiquata* J. SOWERBY, 1818 and *Chamites succinctus* VON SCHLOTHEIM, 1813 as one species. A final conclusion on the identity of the species is not possible with the presently available information.

Occurrence. Pliensbachian of Senokos, Radejna, and Velika Lukanja.

Antiquilima (*Antiquilima*) cf. *succincta* (VON SCHLOTHEIM, 1813)

Pl. 3, Fig. 2

Material. One left valve from Radejna (RGF BR 94/8).

Description and remarks. The specimen is very large in size, about 15 cm in height, gerontic. The shell surface is covered with 50 rounded and irregular ribs, which are crossed by concentric growth lines.

The poorly preserved specimen does not allow reconstruction of details of the shell. Compared with other specimens of the species, which are convex, this specimen is flat, a possible consequence of compaction.

From the same outcrop, *Antiquilima* (*A.*) *succincta* has been determined, based on the ribbing pattern and the shape of the shell. It was therefore decided to place this specimen in *A.* (*A.*) *succincta* with some doubt.

Occurrence. Pliensbachian of Radejna.

Genus *Plagiostoma* J. SOWERBY, 1814

Type species. *Plagiostoma giganteum* J. SOWERBY, 1814.

Remarks. The genus *Plagiostoma* includes many species from the Jurassic, of which many have been inadequately described and illustrated, being likely the younger synonyms of the earlier created species. The essential features used in the identification of species of this genus are shell shape, valve convexity, umbonal angle, depth and width of lunule, presence, number and height of ribs, and their appearance in cross-section, and their spacing. These features vary considerably even among specimens from the same bed, which increases the difficulty of their identification.

Plagiostoma punctatum J. SOWERBY, 1818

Pl. 4, Figs. 1, 2

1818 *Plagiostoma punctata* sp. nov. – J. SOWERBY: 25, pl. 113, fig. 2 (non pl. 113, fig. 1).
1968 *Plagiostoma punctata* J. SOWERBY – SHOPOV: 426, pl. 8, figs. 13, 14.
1991 *Plagiostoma punctatum* J. SOWERBY – HEINZE: 114.
1994 *Plagiostoma punctatum* J. SOWERBY – ABERHAN: 25, pl. 9, figs. 3-5.
1995 *Plagiostoma punctatum* J. SOWERBY – JAITLY et al.: 179, pl. 10, fig. 5; pl. 12, fig. 13.
1996 *Plagiostoma punctatum* J. SOWERBY – DAMBORENEA: 155, 157.
1997 *Plagiostoma* cf. *punctatum* J. SOWERBY – DAMBORENEA & GONZÁLES-LEÓN: 188, fig. 5.2.
2002 *Plagiostoma punctatum* J. SOWERBY – GAHR: 122, pl. 3, fig. 3.

Plate 2. Figs. 1-3. *Pinna* (*Pinna*) cf. *folium* YOUNG & BIRD, 1822
1. Left valve. Rgotina. - RGF BR 99/3.
2. Left valve. Rgotina. - RGF BR 99/2.
3. Left valve. Senokos. - RGF BR 79/23.
Figs. 4-6. *Antiquilima* (*Antiquilima*) *succincta* (VON SCHLOTHEIM, 1813)
4. Left valve. Senokos. - RGF BR 79/40.
5. Articulated specimen, left valve view. Senokos. - RGF BR 79/43.
6. Articulated specimen, left valve view. Velika Lukanja. - RGF BR 98/1.


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Material. Two poorly preserved right valves and 2 shell fragments of from Velika Lukanja (RGF BR 98/2, 98/45, 98/46, 98/64).

Measurements (in mm).

	L	H	H/L
RGF BR 98/2	38.3	44.8	1.17

Description. Shell medium in size, obliquely ovate; inequilateral, and moderately convex. Ventral margin slightly curved; anterior part long and straight; umbonal angle about 90°. Shell surface covered with about 26 fine riblets per 10 mm at the ventral margin, which are undulating and separated by minute puncta, crossed by commarginal growth lines.

Remarks. The specimens from eastern Serbia, albeit poorly preserved, correspond well with the description of SOWERBY (1818: 25, pl. 113, fig. 1). The surface features and the size and shape of the shell also fit the descriptions of several authors (e.g. SHOPOV 1968; ABERHAN 1994; JAITLY et al. 1995). ABERHAN (1998) mentions the similarity of the shell outline with that of *Plagiostoma semicirculare* (GOLDFUSS, 1835), which differs, however, in having fewer and more pronounced riblets.

Occurrence. Pliensbachian of Velika Lukanja.

Plagiostoma cf. *alticostum*
(CHAPUIS & DEWALQUE, 1853)
Pl. 3, Figs. 3, 4

cf. 1853 *Lima alticosta* sp. nov. – CHAPUIS & DEWALQUE: 203, pl. 28, fig. 3.
cf. 1936 *Plagiostoma alticosta* CHAPIUS & DEWALQUE – DECHASEAUX: 37, pl. 3, figs. 1-4; text fig. 11.
cf. 1938 *Lima* (*Plagiostoma*) aff. *alticosta* CHAPUIS & DEWALQUE – WEIR: 53, pl. 4, fig. 9.
cf. 1943 *Lima* (*Plagiostoma*) *alticosta* CHAPUIS & DEWALQUE – COX: 168, pl. 18, figs. 46-48.
cf. 1993 *Lima alticosta* CHAPUIS & DEWALQUE – ŽIVANOVIĆ: 184, 190, pl. 1, fig. 4.

Material. Two poorly preserved specimens from Senokos (RGF BR 79/60, 79/61) and 1 from Rosomač (RGF BR 81/11).

Measurements (in mm).

	L	H	H/L
RGF BR 79/60	37.5	39.8	1.06
RGF BR 79/61	54.2	52.0	0.96
RGF BR 81/11	44.3	42.6	0.96

Description. Shell medium in size, subcircular in outline, equilateral and equivalve; valves slightly inflated. Anterior and posterior margins straight, forming an angle of about 90°. Ventral margin slightly convex; lunule wide and deep. Shell ornamented with about 50 radial ribs, which are wider than the space between them and have a rounded cross-section.

Remarks. Without ears, which could not be observed in the specimens from Serbia, the shape and the size of the shell, number of ribs and their interspaces correspond to *Lima alticosta* CHAPIUS & DEWALQUE (1853: 203, pl. 28, fig. 3). As their fig. 3a shows a well-developed posterior ear, it was decided to assign the species to the genus *Plagiostoma*. The ribbing pattern and the rectangular rib cross-section shown in their fig. 3c differ from the present specimens which have rounded ribs. This could be a result of shell modification. For this reason, the specimens from Serbia are assigned to the species of CHAPIUS & DEWALQUE with reservation. Compared to the material presented by Cox (1943: 168, pl. 18, figs. 46-48) the present specimens are less convex, a likely consequence of compactional deformation.

Occurrence. Sinemurian and Pliensbachian of Senokos; Pliensbachian of Rosomač.

?*Plagiostoma* cf. *amoenum* (TERQUEM, 1855)
Pl. 3, Fig. 5

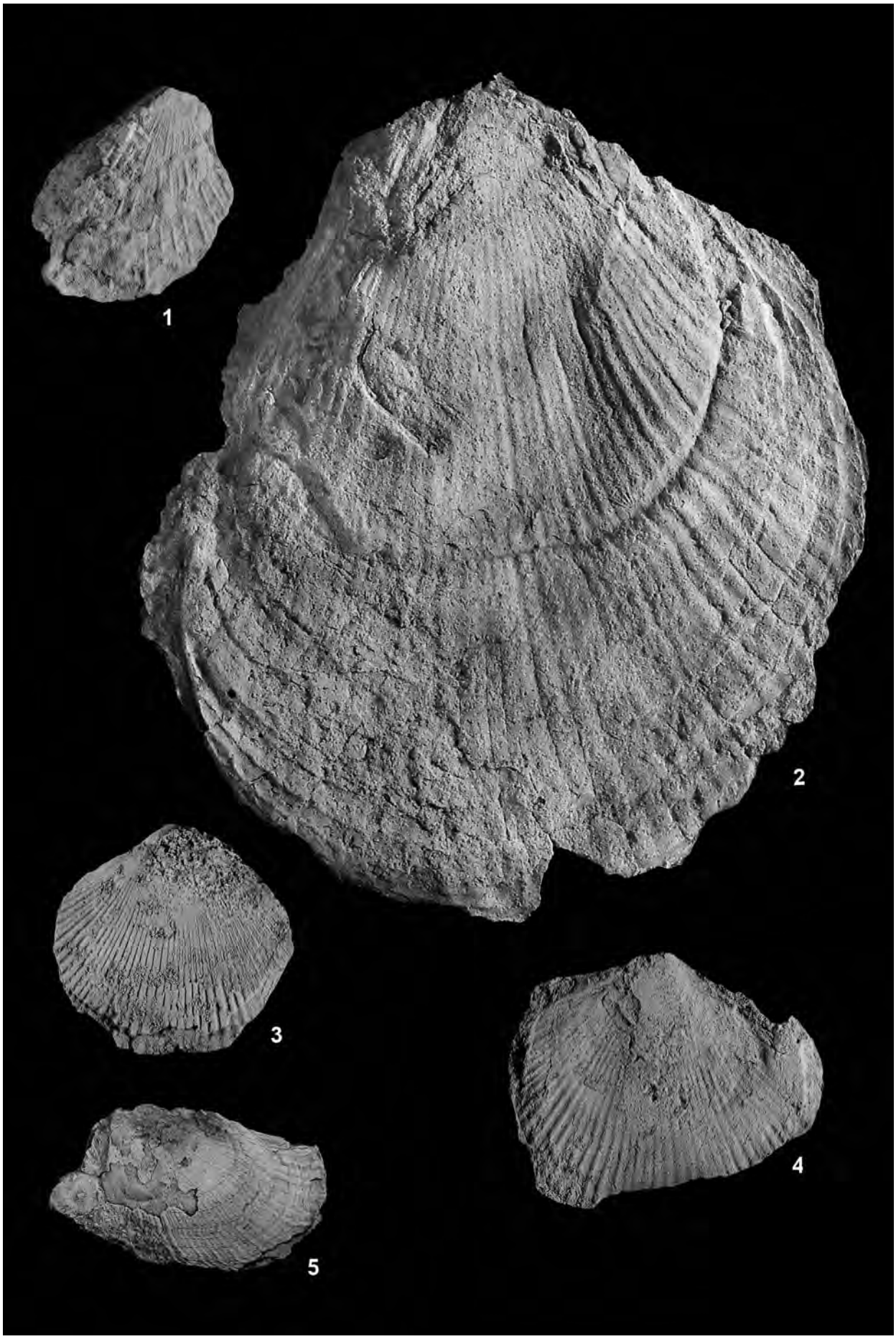
cf. 1855 *Lima amoenum* sp. nov. – TERQUEM: 320, pl. 23, fig. 2.
cf. 1987 *Plagiostoma amoenum* (TERQUEM) – CHEN: 56, pl. 11, figs. 25-27.
cf. 1993 *Lima amoenum* TERQUEM – ŽIVANOVIĆ: 184, 190, pl. 1, fig. 5.

Material. One poorly preserved ?right valve from Bogorodica (RGF BR 80/14).

Remarks. The specimen is poorly preserved, but the ribs suggest that it belongs in the vicinity of *Lima amoenum* of TERQUEM, 1855: 320, pl. 23, fig. 2. The specimens on which TERQUEM based his new species have a dense ribbing and rounded ribs cut across by growth lines. This partly fits the description of the present specimen which has more or less flattened ribs in a small area of the ?right valve. The ears and umbo are very poorly preserved, even the generic position is questionable.

Occurrence. Pliensbachian of Bogorodica.

Plate 3. Fig. 1. *Antiquilima* (*Antiquilima*) *succincta* (VON SCHLOTHEIM, 1813)
Left valve. Senokos. - RGF BR 79/42.
Fig. 2. *Antiquilima* (*Antiquilima*) cf. *succincta* (VON SCHLOTHEIM, 1813)
Left valve. Velika Lukanja. - RGF BR 94/8.
Figs. 3, 4. *Plagiostoma* cf. *alticostum* (CHAPUIS & DEWALQUE, 1853)
3. Articulated specimen. Bosman. - RGF BR 81/11.
4. Single valve. Senokos. - RGF BR 79/61.
Fig. 5. ?*Plagiostoma* cf. *amoenum* (TERQUEM, 1855)
Single valve. Bosman. - RGF BR 81/14.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Plagiostoma sp. A
Pl. 4, Figs. 4-9

Material. Seven articulated specimens and 1 poorly preserved ?left valve from Velika Lukanja (RGF BR 98/12, 98/13, 98/14, 98/15, 98/17, 98/18, 98/19, 98/20); 1 articulated specimen from Protopopinci (RGF BR 100/1).
Measurements (in mm).

	L	H	H/L
RGF BR 98/12	56.9	62.5	1.10
RGF BR 98/13	49.5	56.7	1.14
RGF BR 98/17	47.6	57.2	1.20
RGF BR 98/18	42.2	50.0	1.18
RGF BR 98/19	40.6	49.2	1.21
RGF BR 98/20	16.6	20.7	1.25
RGF BR 100/1	34.3	42.2	1.23

Description. *Plagiostoma* sp. A has a medium-sized, inequilateral and moderately inflated shell, is subovate to trapeziform in outline, and somewhat higher than long. Umbo orthogyrate to prosogyrate, slightly larger than 90°. Anterior margin slightly concave, lunule moderately broad and concave. Ornamentation consisting of 40 relatively broad and slightly rounded ribs with irregularly spaced commarginal growth lines.
Remarks. The specimens could not be assigned to any known species of *Plagiostoma* based on their external features, such as shell shape and type of ornamentation. Their poor preservation allows neither a detailed description nor a precise identification; hence, it was decided to keep them as *Plagiostoma* sp. A.
Occurrence. Pliensbachian of Velika Lukanja and Protopopinci.

?*Plagiostoma* sp.
Pl. 4, Fig. 3

Material. One left valve from Rosomač (RGF BR 81/3).

Measurements (in mm).

	L	H	H/L
RGF BR 81/3	32.5	40.0	1.23

Remarks. The morphological parameters, such as shell size and shape, moderate inflation, a well developed anterior umbonal carina and a deep lunule indicate that the specimen may be assigned to *Plagiostoma*. The poorly preserved ears and ribs stronger than usual for the genus make the generic association questionable.
Occurrence. Pliensbachian of Rosomač.

Genus *Limea* Bronn, 1815

Type species. *Ostrea strigilata* Brocchi, 1814.

Subgenus. *Pseudolimea* Arkell in Douglas & Arkell, 1932

Type species. *Plagiostoma duplicata* J. de C. Sowerby, 1827.

Remarks. Dhondt (1989) suggested that on morphological and phylogenetic grounds *Pseudolimea* should be considered as a subgenus of *Limea*. This view was followed by Aberhan (1998) and also in this paper.

Limea (*Pseudolimea*) *duplicata* (J. de C. Sowerby, 1827)
Pl. 4, Figs. 10-14

1827 *Plagiostoma duplicata* sp. nov. – J. de C. Sowerby: 114, pl. 559, fig. 3.
1933 *Lima duplicata* Sow. – Tzankov & Bončev: 230, 240, pl. 1, fig. 7.
1944 *Pseudolimea duplicata* (J. de C. Sowerby) – Cox: 84 (cum syn.).
1968 *Pseudolimea duplicata* (J. de C. Sowerby) – Shopov: 432, pl. 9, figs. 2, 3.
1982 *Lima* cf. *duplicata* Sowerby – Radulović: 310, pl. 3, figs. 1-3.
1983 *Plagiostoma pectinoides* Sowerby – Jankičević et al.: 170, pl. 1, fig. 5.

Plate 4. Figs. 1, 2. *Plagiostoma punctatum* J. Sowerby, 1818
1. Right valve. Velika Lukanja. - RGF BR 98/2.
2. Single valve. Velika Lukanja. - RGF BR 98/64.
Fig. 3. ?*Plagiostoma* sp.
?Left valve. Rosomač. - RGF BR 81/3.
Figs. 4-9. *Plagiostoma* sp. A
4. Articulated specimen, left valve view. Velika Lukanja. - RGF BR 98/13.
5. Left valve. Velika Lukanja. - RGF BR 98/14.
6. Articulated specimen, right valve view. Velika Lukanja. - RGF BR 98/15.
7. Articulated specimen, left valve view. Velika Lukanja. - RGF BR 98/17.
8. Articulated specimen, left valve view. Velika Lukanja. - RGF BR 98/18.
9. Articulated specimen, right valve view. Protopopinci. - RGF BR 100/1.
Figs. 10-14. *Limea* (*Pseudolimea*) *duplicata* (J. de C. Sowerby, 1827)
10. Articulated specimen, left valve view. Senokos. - RGF BR 79/51.
11. Articulated specimen, left valve view. Rudine. - RGF BR 96/3.
12. Left valve. Rgotina. - RGF BR 99/1.
13. Right valve. Velika Lukanja. - RGF BR 98/8.
14. Left valve. Senokos. - RGF BR 79/54.


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1988 *Pseudolimea duplicata* (J. DE C. SOWERBY) – FÜRSICH & WERNER: 150, pl. 16, figs. 5, 6; text-fig. 23 (cum syn.).
1991 *Pseudolimea duplicata* (J. DE C. SOWERBY) – HEINZE: 31, 32, 114.
1994 *Pseudolimea duplicata* (J. DE C. SOWERBY) – ABERHAN: 27, pl. 11, figs. 1, 2.
1994 *Limea* (*Pseudolimea*) *duplicata* (J. DE C. SOWERBY) – MANCINELLI: 164, pl. 2, figs. 4-6.
1995 *Pseudolimea duplicata* (J. DE C. SOWERBY) – JAITLY et al.: 183, pl. 13, figs. 3-5.
1996 *Pseudolimea duplicata* (J. DE C. SOWERBY) – DAMBORENEA: 154, 157-59.
1998 *Limea* (*Pseudolimea*) *duplicata* (J. DE C. SOWERBY) – ABERHAN: 88, pl. 8, figs. 6-10.
2001 *Pseudolimea duplicata* (J. DE C. SOWERBY) – DELVENE: 64, pl. 3, fig. 5.
2002 *Lima* (*Pseudolimea*) *duplicata* (J. DE C. SOWERBY) – GAHR: pl. 3, fig. 2.
2004 *Pseudolimea duplicata* (Sow.) – BARBU & LAZĂR: 9.

Material. Two left valves and 2 right valves from Senokos (RGF BR 79/51, 79/52, 79/53, 79/54); 1 left valve, 1 right valve, and 1 poorly preserved shell fragment from Bogorodica (RGF BR 80/9, 80/19, 80/97); 1 left valve from Rosomač (RGF BR 81/1); 1 left valve from Rudine (RGF BR 96/3); 1 left valve, 2 right valves, and 1 ?left valve from Velika Lukanja (RGF BR 98/7, 98/8, 98/9, 98/27).

Measurements (in mm).

	L	H	H/L
RGF BR 79/54	34.5	35.0	1.01
RGF BR 96/3	38.8	43.8	1.13
RGF BR 98/9	20.3	27.6	1.36
RGF BR 98/27	18.2	25.2	1.38
RGF BR 99/1	27.7	30.0	1.08

Description. Shell small- to medium-sized, oval in shape; inequilateral, moderately inflated. Umbones prominent, protruding beyond the hinge line. Ornamentation consisting of 24-28 V-shaped primarly radial ribs. The interspace between the primaries bears 1-2 secondary riblets, which are also V-shaped. Space between the ribs variable, usually wider than the ribs, but occasionally equal.

Remarks. Shell shape, type of ornamentation, number of primary and secondary ribs, and prominence of the secondary riblets are variable in this species (FÜRSICH & WERNER 1988). The closely related *Limea* (*Pseudolimea*) *hettangiensis* (TERQUEM) from the Lower Liassic of Europe (TERQUEM 1855: 320, pl. 23, fig. 1; Cox 1944: 77, pl. 2, figs. 1, 3, 4) differs in having fewer ribs (15-18) and numerous radial striae that cover the ribbed area (ABERHAN 1994). Another similar species known from the Hettangian to the Aalenian of Europe, *Limea* (*Pseudolimea*) *pectinoides* (J. SOWERBY) differs from *Limea* (*Pseudolimea*) *duplicata* in having blunt low ribs, interspaces bearing weak radial ribs, and often smooth anterior and posterior parts of the shell (Cox 1944: 79, pl. 2, figs. 5, 6).

RADOVANOVIĆ (1888) gives a scanty description of *Lima* (*Radula*) *pectinoides* SOWERBY from the Liassic of Rgotina. Without pictures of the described specimens, which have been lost, its true nature could not be asserted, but it has been included in the synonymy list.

The specimens described by JANKIČEVIĆ et al. (1983: 170, pl. 1, fig. 5) as *Plagiostoma pectinoides* SOWERBY correspond in terms of the type and number of ribs (22-25) and interspaces bearing secondary riblets to *L.* (*P.*) *duplicata*.

Occurrence. Pliensbachian of Senokos, Bogorodica, Rosomač, Rudine, Velika Lukanja, and Rgotina.

Order Ostreoida FÉRUSSAC, 1822 (= Ostreina WALLER, 1978)
Superfamily Ostreacea WILKES, 1810
Family Gryphaeidae VIALOV, 1936
Genus *Gryphae* LAMARCK, 1801
Subgenus *Gryphaea* LAMARCK, 1801

Type species. *Gryphea arcuata* LAMARCK, 1801.

Gryphaea (*Gryphaea*) *cymbium* LAMARCK, 1801

Pl. 5, Figs. 1-5; Pl. 6, Figs. 1-5

1801 *Gryphaea cymbula* sp. nov. – LAMARCK: 598.
1968 *Liogryphaea cymbium* (LAMARCK) – SHOPOV: 454, pl. 12, figs. 1-4 (cum syn.).
1982 *Gryphaea cymbium* LAMARCK – RADULOVIĆ: 320, pl. 7, figs. 4, 5.
1982 *Ostrea cymbium depressa* PHILLIPS – RADULOVIĆ: 319, pl. 7, fig. 1.
1991 *Gryphaea cymbium* LAMARCK – HEINZE: 26, 106.
1992 *Gryphaea* cf. *cymbium* LAMARCK – ABERHAN: 151.
1993 *Gryphaea cymbium* LAMARCK – ŽIVANOVIĆ: 181, 182, 184, 190, 191, 194, pl. 1, fig. 7.
2004 *Gryphaea cymbium* LAMARCK – BARBU & LAZĂR: 9.
2005 *Gryphaea* aff. *cymbium* LAMARCK – DAMBORENEA & MANCEÑIDO: 170.

Material. Eight partially preserved left valves from Senokos (RGF BR 79/2, 79/4, 79/21, 79/79, 79/86, 79/87, 79/88, 79/96); 4 left valves from Bogorodica (RGF BR 80/61, 80/62, 80/77, 80/78); 5 left valves from Rosomač (RGF BR 81/5, 81/6, 81/7, 81/8, 81/9); 1 left valve from Pesača (RGF BR 93/2); 1 partially preserved articulated specimen and 2 left valves from Radejna (RGF BR 94/7; 94/15, 94/16); 1 left valve from Mali Vrh (RGF BR 95/2); 1 articulated specimen and 6 left valves from Velika Lukanja (RGF BR 98/60, 98/61, 98/62, 98/63,

Plate 5. Figs. 1-5. *Gryphaea* (*Gryphaea*) *cymbium* LAMARCK, 1801
1. Left valve. Mali Vrh. - RGF BR 95/2.
2. Left valve. Protopopinci. - RGF BR 100/3.
3. Left valve. Radejna. - RGF BR 94/16.
4. Left valve. Rgotina. - RGF BR 99/6.
5. Left valve. Senokos. - RGF BR 79/87.


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98/73, 98/76, 98/77); 7 partially preserved left valves from Rgotina (RGF BR 99/5, 99/6, 99/8, 99/11, 99/19, 99/20, 99/21); 1 left valve and 1 articulated specimen from Protopopinci (RGF BR 100/3, 100/4); 1 left valve from Petrlaš (RGF BR 101/10).

Measurements (in mm).

	L	H	H/L
RGF BR 79/87	60.7	90.3	1.50
RGF BR 94/16	56.9	61.8	1.09
RGF BR 95/2	95.3	112.0	1.17
RGF BR 99/6	81.5	111.0	1.36
RGF BR 100/3	60.1	83.2	1.38

Description. Shell medium to large in size; subtrigonal, elongated-oval to suboval in outline. Ratio of height and length variable, in some specimens almost equal, in others, the height is greater than the length. Left valve strongly inflated, covered with rough and irregular concentric lamellae; right valve flat or slightly concave. Umbo strong, rounded, mesially placed. Anterior margin straight to slightly convex, becoming gradually rounded ventrally. In some specimens a posterior wing is present.

Remarks. Several species are known from the Liassic of Europe, e.g. *Gryphaea gigantea* (SOWERBY, 1823: 127, pl. 391; GOLDFUSS 1833: 29, pl. 85, fig. 5), *Gryphaea obliquata* (J. SOWERBY, 1815: 24, pl. 112, fig. 3), and *Gryphaea obliqua* (GOLDFUSS, 1833: 28, pl. 85, fig. 2; DUMORTIER 1869: 142, pl. 22, fig. 5), which may be younger synonyms of *Gryphaea* (*G.*) *cymbium.* These are closely related in morphology to the specimens from eastern Serbia presently assigned to *G.* (*G.*) *cymbium*. Specimens, both those from Serbia and those mentioned in the literature, are highly variable in shape and size, umbilical angle, and the development of a posterior wing. Consequently, it is difficult to differentiate between the species. According to M. HEINZE (pers. comm., 2007), who studied a large population including many transitional forms between *G.* (*G.*) *cymbium* and *G.* (*G.*) *gigantea*, the two species are synonyms. A final conclusion may be drawn only after a detailed examination of the type material.

Occurrence. Pliensbachian of Senokos, Bogorodica, Rosomač, Pesača, Radejna, Mali Vrh, Velika Lukanja, Rgotina, Protopopinci, and Petrlaš.

Gryphaea (*Gryphaea*) cf. *cymbium* LAMARCK, 1801

Pl. 7, Figs. 1, 2

Material. Five partially preserved left valves from Petrlaš (RGF BR 101/12, 101/13, 101/14, 101/20, 101/22).

Measurements (in mm).

	L	H	H/L
RGF BR 101/12	86.5	86.7	1.00
RGF BR 101/13	117.5	132.0	1.12

Description and remarks. Shell medium to large in size, with a very pronounced ridge, which extends from the umbo to the postero-ventral margin. In view of the high variability of the species and the lack of reference forms similar to the specimens from eastern Serbia, these are referred to *G.* (*G.*) *cymbium* with reservation.

Occurrence. Pliensbachian of Petrlaš.

Gryphaea (*Gryphaea*) cf. *arcuata* (LAMARCK, 1801)

Pl. 7, Fig. 3

cf. 1801 *Gryphaea arcuata* sp. nov. – LAMARCK: 398.
cf. 1925 *Gryphaea arcuata* LAMARCK – PETKOVIĆ: pl. 23, fig. 6.
cf. 1968 *Liogryphaea arcuata* (LAMARCK) – SHOPOV: 447, pl. 10, figs. 1-7 (cum syn.).
cf. 1970 *Liogryphaea arcuata* (LAMARCK) – SHOPOV: 17, 31.
cf. 1974 *Gryphaea arcuata* LAMARCK – SHOPOV: 64, pl. 1, figs. 3, 4.
cf. 1982 *Gryphaea arcuata* LAMARCK – RADULOVIĆ: 320, pl. 7, figs. 2, 3.
cf. 1986 *Gryphaea arcuata* (LAMARCK) – PEDERSON: 147.
cf. 1991 *Gryphaea arcuata* LAMARCK – HEINZE: 106, 114.
cf. 1991 *Gryphaea arcuata* LAMARCK – SCIAU: 27, pl. 8, fig. 4.
cf. 1992 *Gryphaea arcuata* LAMARCK – ABERHAN: 145, 146, 150, 155, 156.

Material. One left valve and 1 fragmented left valve from Velika Lukanja (RGF BR 98/74, 98/75).

Measurements (in mm).

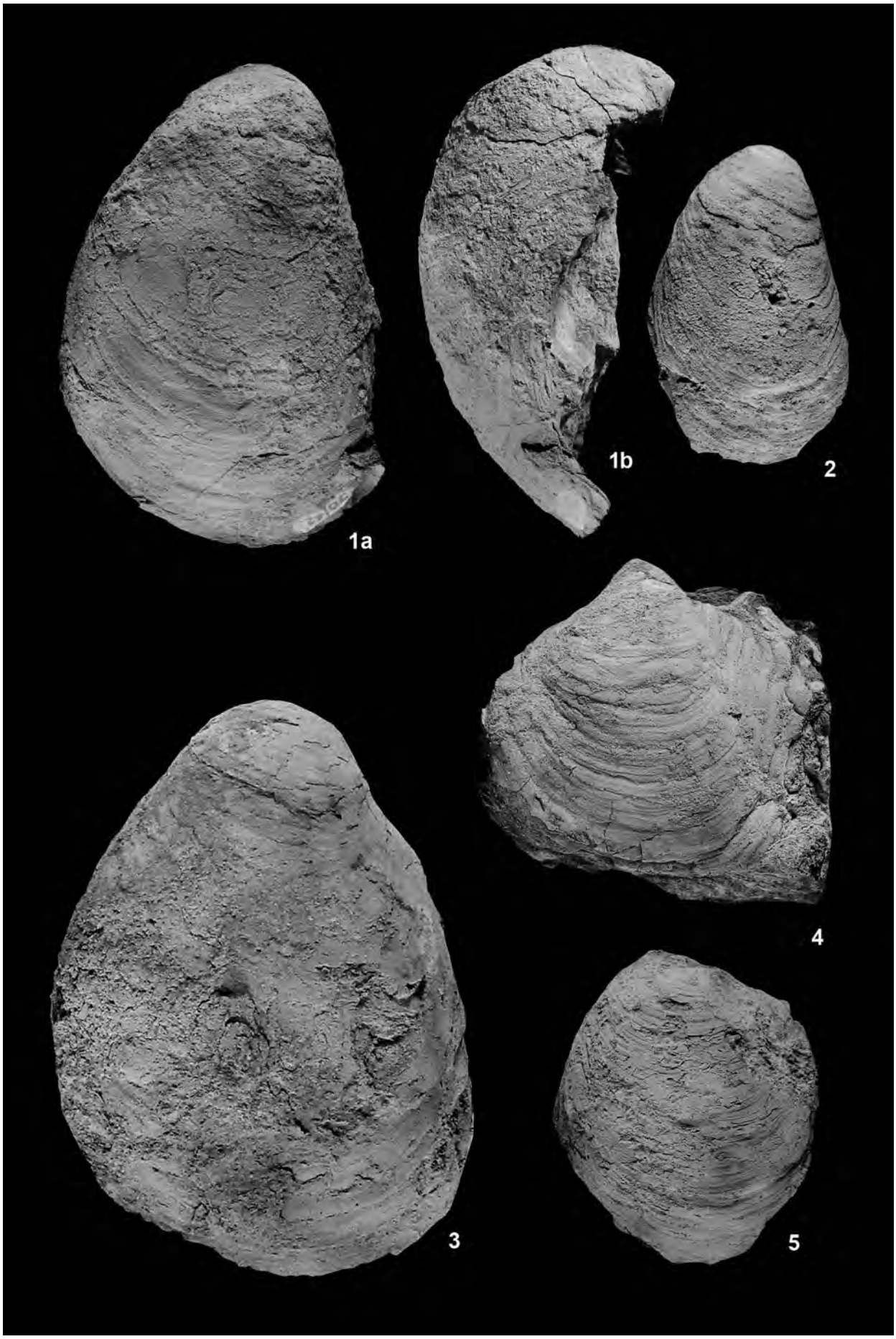
	L	H	H/L
RGF BR 98/74	34.2	59.0	1.72

Description. Shell medium in size; height greater than length. Left valve strongly inflated, possessing a posterior wing; right valve slightly concave. Umbo of the left valve strong, strongly curved and rounded. Anterior margin slightly concave; posterior margin with developed wing. Shell ornamented with clearly defined irregularly spaced concentric lamellae.

Remarks. The specimens correspond in morphology to the specimens given in the synonymy list but, because of the partial preservation, they are assigned, with reservation, to *G.* (*G.*) *arcuata* which differs from *G.* (*G.*) *cymbium* in a more erect umbo.

Occurrence. Pliensbachian of Velika Lukanja.

Plate 6. Figs. 1-5. *Gryphaea* (*Gryphaea*) *cymbium* LAMARCK, 1801
1. Left valve; a: left valve view, b: posterior view. Velika Lukanja. - RGF BR 98/62.
2. Left valve. Rgotina. - RGF BR 99/8.
3. Left valve. Velika Lukanja. - RGF BR 98/60.
4. Left valve. Pesača. - RGF BR 93/2.
5. Left valve. Velika Lukanja. - RGF BR 98/76.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Gryphaea (*G.*) sp.
Pl. 7, Fig. 4

Material. Three poorly preserved specimens from Senokos (RGF BR 79/10, 79/22, 79/24).
Remarks. Medium to large specimens with commarginal growth lines. Outlines and other morphological features are difficult to observe in the damaged and deformed specimens. They are identified as *Gryphaea* (*G.*) sp. based on the ornamentation, which consists of growth rugae that are identical to those on the specimens identified as *G.* (*G.*) *cymbium* and *G.* (*G.*) *arcuata*, and on the large attachment area identical to that of *G.* (*G.*) *cymbium*.
Occurrence. Pliensbachian of Senokos.

Superfamily Plicatulacea WATSON, 1930
Family Plicatulidae WATSON, 1930
Genus *Harpax* PARKINSON, 1811

Type species. *Harpax parkinsoni* BRONN, 1824.

Remarks. In this paper the view of DAMBORENEA (2002b) and POULTON (1991) concerning the genera *Harpax* and *Plicatula* is adopted. The main diagnostic feature of the two genera is the curvature of the attached valve. Both genera are attached with the right valve which is concave in *Harpax* and convex in *Plicatula*. The shell ornamentation and hinge structure also differ.

Harpax spinosa (J. SOWERBY, 1819)
Pl. 8, Figs. 1-5

1819 *Plicatula spinosa* sp. nov. – J. SOWERBY: 79, pl. 245, figs. 1-4.
1909 *Plicatula* (*Harpax*) *spinosa* – TRAUTH: 94.
1931 *Plicatula spinosa* SOWERBY – COHEN: 73, pl. 1, fig. 18.
1934 *Plicatula spinosa* SOWERBY – PROTIĆ: 114, pl. 1, fig. 8.
1935 *Plicatula spinosa* SOWERBY – BONČEV & TZANKOV: 18, pl. 4, figs. 2, 3.
1937 *Harpax Parkinsoni* BRONN – DECHASEAUX: 247, pl. 16, figs. 1-4, 9, 16-18, 20, 21.
1937 *Harpax spinosus* SOWERBY – DECHASEAUX: 248, pl. 16, fig. 24.
1937 *Harpax pectinoides* LAMARCK – DECHASEAUX: 248, pl. 16, figs. 5-8, 13-15.
1968 *Plicatula pectinoides* (LAMARCK) – SHOPOV: 417, pl. 8, figs. 1-3.
1968 *Plicatula spinosa* SOWERBY – SHOPOV: 419, pl. 8, figs. 4-6.
1983 *Plicatula spinosa* SOWERBY – JANKIČEVIĆ et al.: 169, pl. 1, figs. 2, 3.
1991 *Plicatula spinosa* SOWERBY – HEINZE: 18, 26, 27, 95, 114.
1991 *Plicatula pectinoides* (LAM.) – SCIAU: 66, pl. 47, fig. 7.
1992 *Harpax spinosus* (SOW.) – DAMBORENEA: 622-623, pl. 121, figs. 3, 4.
2002 *Plicatula* (*Harpax*) *spinosa* SOWERBY – GAHR: 123, pl. 2, figs. 10, 11, 13-15.
2002b *Harpax spinosa* SOWERBY – DAMBORENEA: 87.

Material. Five articulated specimens from Bogorodica and Rosomač (RGF BR 80/30, 80/81, 80/90, 80/91, 81/4).
Measurements (in mm).

	L	H	H/L
RGF BR 80/30	24.3	28.7	1.18
RGF BR 80/81	23.3	29.6	1.27
RGF BR 80/90	21.5	24.3	1.13
RGF BR 80/91	12.6	16.1	1.28
RGF BR 81/4	19.5	28.5	1.46

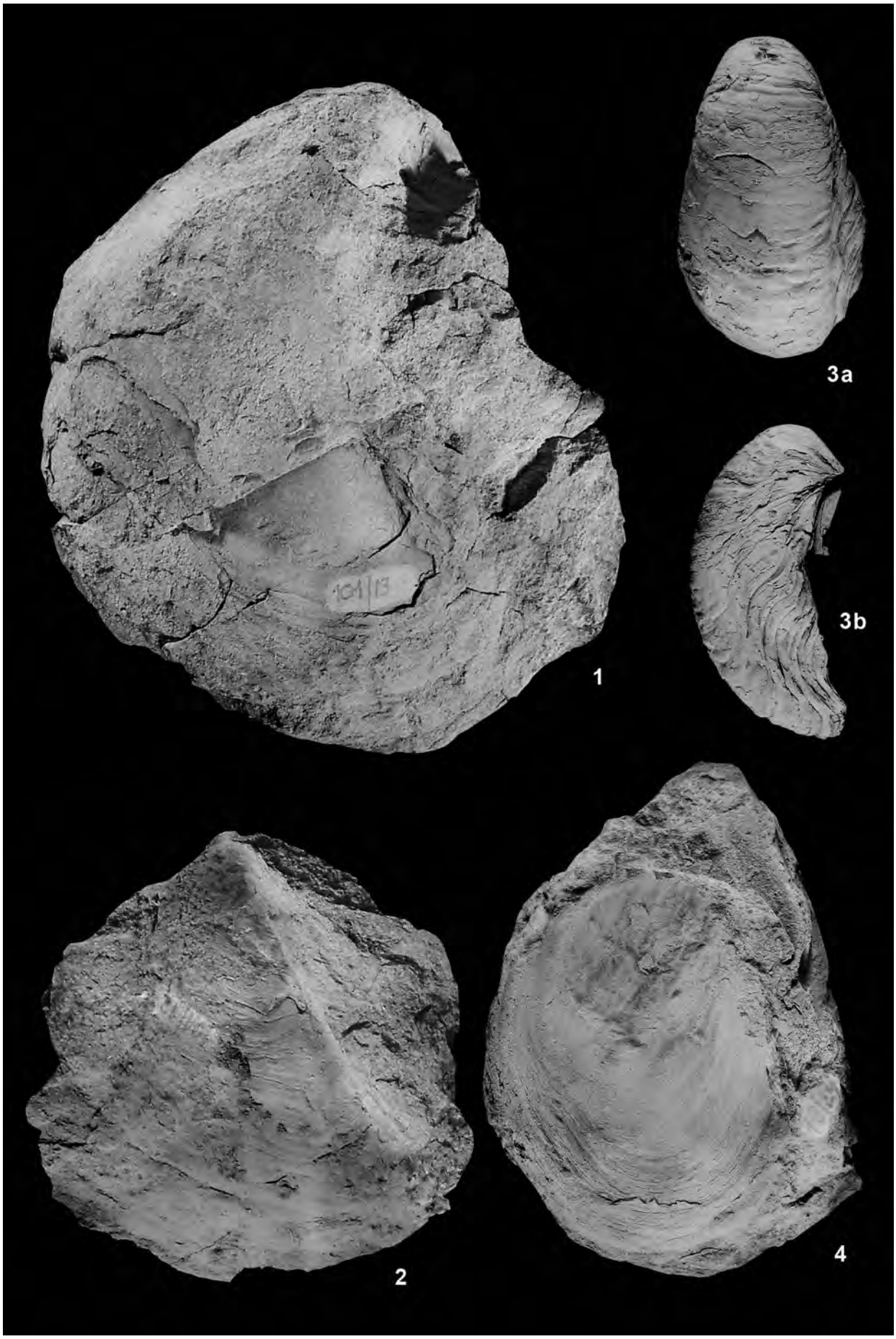
Description. Shell thick, small to medium in size, sub-elliptical in outline; inequivalved and inequilateral. Umbo low, subcentrally placed. Left valve slightly convex, right valve concave. Posterior margin straight to slightly convex, all other margins convex. Left valve ornamented with irregularly placed radial costae, which may bear spines of different strength and density; right valve with somewhat stronger radial costae. Attachment scar occupying about one-fifth of the height of the valve.
Remarks. The ornamentation of this widespread Lower Jurassic species is highly variable consisting of irregular, radial ribs bearing spines of different size and density. *Harpax pectinoides* (DUMORTIER, 1869: 310, pl. 40, figs. 6-8; LANQUINE 1929: 133; SHOPOV 1968: 417, pl. 8, figs. 1-3) is almost identical to the specimens described here and is probably a junior synonym.

Plicatula spinosa was introduced in 1819 by J. SOWERBY, and in the same year LAMARCK introduced *Placuna pectinoides.* As SOWERBY's name of the species has been extensively accepted in the published literature and because it could not be verified which of the two names was published first, SOWERBY's name is given the status "*nomen conservandum*".

Based on a large number of specimens from different Liassic deposits of England, COX (1935) noticed the highly variable ornamentation of *Harpax spinosus*. In his opinion *Plicatula spinosa* SOWERBY 1819 and *Harpax parkinsoni* BRONN 1824 should be regarded as subjective synonyms. DAMBORENEA (2002b) also mentioned the external variability of the species. The views of these two authors concerning the obvious variations of the species are followed in this work.

Specimens from NW Canada identified by POULTON (1991) as *H.* cf. *spinosus* (SOWERBY) do not possess radial ribs and are similarly ornamented as *H. rapa*.
Occurrence. Pliensbachian of Bogorodica and Rosomač.

Plate 7. Figs. 1, 2. *Gryphaea* (*Gryphaea*) cf. *cymbium* LAMARCK, 1801
1. Left valve. Petrlaš. - RGF BR 101/13.
2. Left valve. Petrlaš. - RGF BR 101/12.
Fig. 3. *Gryphaea* (*Gryphaea*) cf. *arcuata* LAMARCK, 1801
Left valve; a: left valve view, b: posterior view. Velika Lukanja. - RGF BR 98/74.
Fig. 4. *Gryphaea* (*G.*) sp.
Right valve. Senokos. - RGF BR 79/24.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Harpax cf. *spinosa* (J. SOWERBY, 1819)

Pl. 8, Fig. 6

Material. One left valve from Rudine (RGF BR 96/2).
Measurements (in mm).

	L	H	H/L
RGF BR 96/2	16.9	20.7	1.22

Description and remarks. Shell small-sized, higher than long, inequilateral. Left valve slightly convex with a sub-elliptical outline; all margins weakly convex. Umbo of left valve low and subcentrally placed. External ornament consisting of irregular ribs, which are crossed by concentric growth lines. Based on the size, shape, convexity, and ornamentation of the shell, it closely fits *Harpax spinosa* (J. SOWERBY). As the spines are not distinct in the poorly preserved specimen, it is identified as *Harpax* cf. *spinosa.*
Occurrence. Pliensbachian of Rudine.

Harpax rapa (BAYLE & COQUAND, 1851)

Pl. 8, Figs. 7, 8

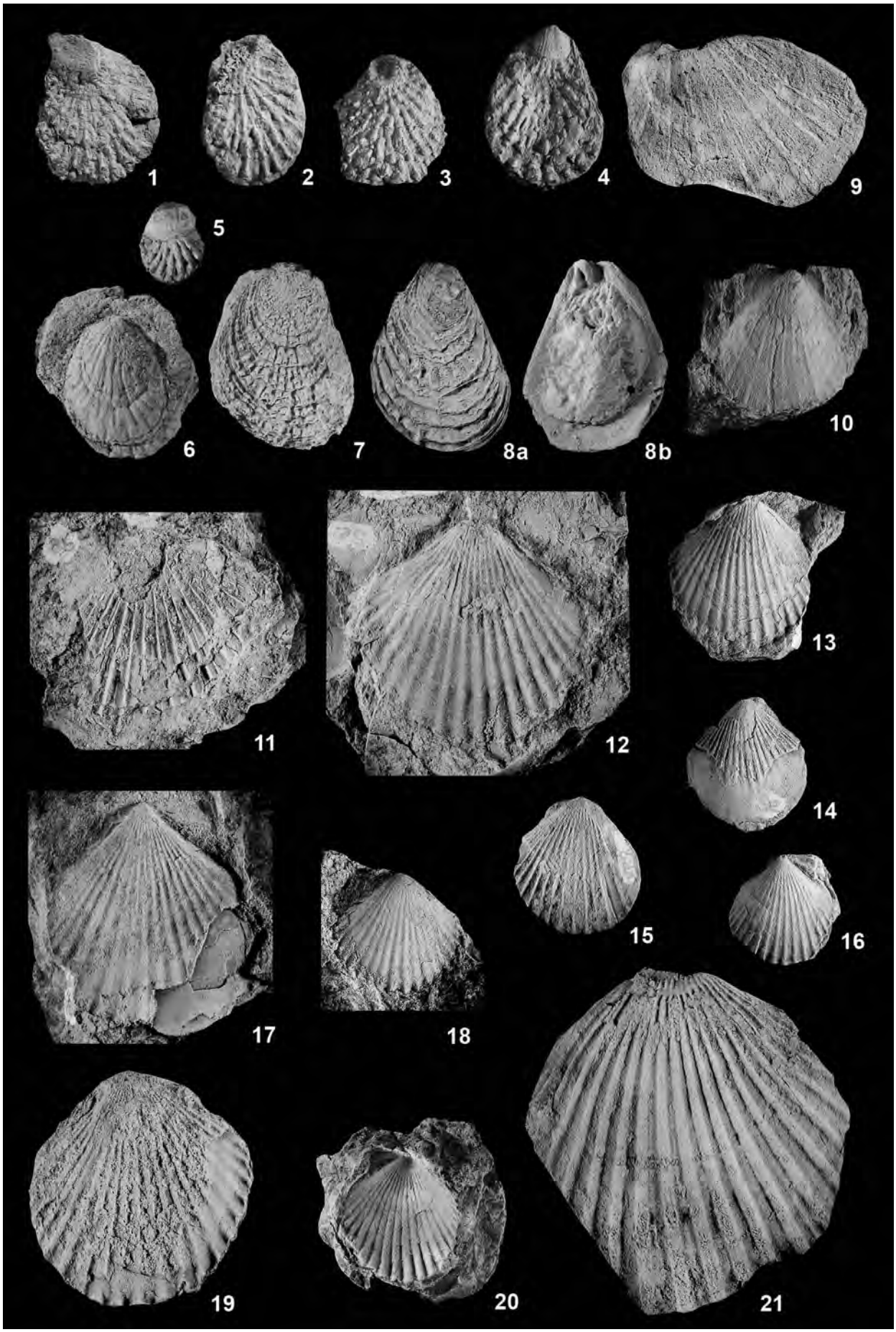
1851 *Plicatula rapa* sp. nov. – BAYLE & COQUAND: 16, pl. 5, figs. 8-10.
1983 *Plicatula spinosa* SOWERBY – JANKIČEVIĆ et al.: 169, pl. 1, figs. 2, 3.
1991 *Harpax* sp. cf. *H. spinosus* – POULTON: 29, pl. 7, figs. 2-7, 27, 28; pl. 9, figs. 7, 12.
1992 *Plicatula* (*Plicatula*) *rapa* BAYLE & COQUAND – ABERHAN: 19.
1992 *Plicatula rapa* BAYLE & COQUAND – DAMBORENEA: 612-613, pl. 116, figs. 13, 14.
1993 *Plicatula* (*Harpax*) *rapa* BAYLE & COQUAND – DAMBORENEA: fig. 3(h).
1994 *Plicatula* (*Harpax*) *rapa* BAYLE & COQUAND – ABERHAN: 29, pl. 11, figs. 15-18.
1996 *Harpax rapa* (BAYLE & COQUAND) – DAMBORENEA: 154, 156, 159, 162.
1998 *Plicatula* (*Harpax*) *rapa* BAYLE & COQUAND – ABERHAN: 91, pl. 8, figs. 13, 14.
2002a *Harpax rapa* (BAYLE & COQUAND) – DAMBORENEA: 54.
2002b *Harpax rapa* (BAYLE & COQUAND) – DAMBORENEA: 89, pl. 2, fig. 10; pl. 7, fig. 1; pl. 10, figs. 1-17; text-fig. 45a-c (cum syn.).
2002 *Plicatula* (*Harpax*) *rapa* BAYLE & COQUAND – GAHR: 123, pl. 2, fig. 9.

Material. One articulated specimen from Rudine (RGF BR 96/1); 1 left valve from Velika Lukanja (RGF BR 98/47).
Measurements (in mm).

	L	H	H/L
RGF BR 96/1	24.6	32.0	1.30
RGF BR 98/47	25.5	35.2	1.38

Description. Shell small, sub-elliptical in outline; inequivalved and inequilateral. Umbo low, subcentrally placed. Posterior margin straight, all other margins slightly convex. Left valve moderately globose, right slightly concave. Inner ligamental pit of the left valve triangular, placed closer to posterior area; on each side of the ligamental pit, there is one subrectangular tooth. The teeth meet each other dorsally at an angle of about 30°; anterior tooth slightly stronger than posterior. Ornamentation on both valves equal, consists of commarginal lamellae, irregularly placed, that are distally prolonged into numerous spines. The attachment scar occupies one-third of the height of the valve.

Plate 8. Figs. 1-5. *Harpax spinosa* (J. SOWERBY, 1819)
1. Articulated specimen, right valve view. Bogorodica. - RGF BR 80/30.
2. Articulated specimen, right valve view. Rosomač. - RGF BR 81/4.
3. Articulated specimen, right valve view. Bogorodica. - RGF BR 80/90.
4. Articulated specimen, right valve view. Bogorodica. - RGF BR 80/81.
5. Articulated specimen, right valve. Bogorodica. - RGF BR 80/91.
Fig. 6. *Harpax* cf. *spinosa* (J. SOWERBY, 1819)
Left valve. Rudine. - RGF BR 96/2.
Figs. 7, 8. *Harpax rapa* (BAYLE & COQUAND, 1851)
7. Left valve. Rudine. - RGF BR 96/1.
8. Left valve; a: exterior view, b: interior view. Velika Lukanja. - RGF BR 98/47.
Figs. 9-11. *Oxytoma* (*Oxytoma*) *inequivalve* (J. SOWERBY, 1819)
9. Left valve, latex cast. Senokos. - RGF BR 79/58.
10. Left valve. Bogorodica. - RGF BR 80/96.
11. Left valve. Bogorodica. - RGF BR 80/11.
Figs. 12-21. *Pseudopecten* (*Pseudopecten*) *equivalvis* (J. SOWERBY, 1816)
12. Right valve. Senokos. - RGF BR79/66.
13. Single valve. Senokos. - RGF BR79/65.
14. Single valve. Senokos. - RGF BR79/79.
15. ?Left valve. Bogorodica. - RGF BR 80/20.
16. Left valve. Bogorodica. - RGF BR 80/33.
17. Right valve. Senokos. - RGF BR79/55.
18. Single valve. Sinemurian, Senokos. - RGF BR 80/23.
19. Articulated specimen. Senokos. - RGF BR 79/70.
20. Internal mould of right valve. Bogorodica. - RGF BR 80/34.
21. Articulated specimen. Rosomač. - RGF BR 81/2.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Remarks. *Harpax rapa* differs from *Harpax spinosa* in the shell ornamentation. The specimens of *Harpax rapa* lack radial ribs (see also DAMBORENEA 2002b). The specimen shown in Pl. 8, Fig. 7 could be a transitional form between the two species because both valves are ornamented by faint radial ribs in addition to commarginal lamellae and spines.
Occurrence. Pliensbachian of Rudine and Velika Lukanja.

Order Pectinoida NEWELL & BOYD, 1995 (= Pectinina WALLER, 1978)
Superfamily Monotacea FISCHER, 1887 [= Buchiacea (COX, 1953) WALLER, 1978]
Family Oxytomidae ICHIKAWA, 1958
Genus *Oxytoma* MEEK, 1864
Subgenus *Oxytoma* MEEK, 1864

Type species. *Avicula münsteri* BRONN, 1830.

Oxytoma (*Oxytoma*) *inequivalve* (J. SOWERBY, 1819)
Pl. 8, Figs. 9-11

1819 *Avicula inaequivalvis* sp. nov. – J. SOWERBY: 78, pl. 244, figs. 2, 3.
1830 *Avicula inaequivalvis* SOWERBY – ZIETEN: 73, pl. 55, fig. 2.
1853 *Monotis inaequivalvis* QUENST. – OPPEL: 120, pl. 4, fig. 15.
1929 *Avicula* (*Oxytoma*) *inaequivalvis* SOWERBY – LANQUINE: 199.
1940 *Oxytoma inequivalv*e (J. SOWERBY) – COX: 98, pl. 6, figs. 9-12.
1968 *Oxytoma inequivalvis* (J. SOWERBY) – SHOPOV: 390, pl. 5, fig. 5.
1978 *Oxytoma* (*Oxytoma*) *inequivalve* (J. SOWERBY) – DUFF: 54, pl. 4, figs. 7, 9, 11, 13, 15-19, 21-23; text-fig. 17 (cum syn).
1986 *Oxytoma inequivalve* (SOWERBY) – PEDERSEN: 143, pl. 1, figs. A-D.
1987b *Oxytoma* (*Oxytoma*) *inequivalve* (J. SOWERBY) – DAMBORENEA: 160, pl. 6, figs. 9-12; text-fig. 15 (cum syn.).
1991 *Oxytoma* (*Oxytoma*) *inequivalve* (J. Sow.) – HEINZE: 90, 123.
1992 *Oxytoma* (*Oxytoma*) *inequivalve* (SOWERBY) – ABERHAN: 18.
1994 *Oxytoma* (*Oxytoma*) *inequivalve* (J. SOWERBY) – ABERHAN: 35, pl. 17, figs. 1-5.
1994 *Oxytoma* (*Oxytoma*) *inequivalve* (J. SOWERBY) – MANCINELLI: pl. 2, fig. 9.
1995 *Oxytoma* (*Oxytoma*) *inequivalve* (J. SOWERBY) – JAITLY et al.: 191, pl. 17, figs. 12-14.
1996 *Oxytoma inequivalvis* (J. SOWERBY) – DAMBORENEA: 154, 156, 159.
1998 *Oxytoma* (*Oxytoma*) *inequivalve* (J. SOWERBY) – ABERHAN: 95, pl. 9, figs. 8-14.
2004 *Oxytoma inequivalve* (J. Sow.) – BARBU & LAZĂR: 8.

Material. One fragment of a left valve from Senokos (RGF BR 79/58); 3 left valves from Bogorodica (RGF BR 80/10, 80/11, 80/96); 2 fragments of a left valves from Rosomač (RGF BR 81/14, 81/15); 1 left valve from Velika Lukanja (RGF BR 98/22).
Measurements (in mm).

	L	H	H/L
RGF BR 80/10	26.2	26.6	1.01
RGF BR 80/96	26.2	>24.4	-
RGF BR 81/14	26.9	>24.3	-
RGF BR 98/22	22.5	29.1	1.29

Description. Shell medium in size; subcircular and inequilateral. Ornamentation consisting of 10-16 first-order radial ribs, which are thin and straight. The spaces between the ribs have second- and third-order ribs.
Remarks. The described species is cosmopolitan with a wide stratigraphic distribution. Variable in morphology, a few synonyms exist in the literature. The type species of the genus, *Oxytoma muensteri* (BRONN), (see also Cox 1940 and Cox et al. 1969) is regarded to be a junior synonym of *O. inequivalve*. Other authors agree with this view and mention that *O. muensteri* (BRONN) differs in having more ribs and almost equal valves (DUFF 1978).

DAMBORENEA (1987b) mentions that some authors (WAAGEN 1902; Cox 1940) also regard *Oxytoma sinemuriense* (D'ORBIGNY) as a synonym of *O. inequivalve*, whereas others consider it as a subspecies (GILLET 1924) or a different species (ROLLIER 1914; DECHASEAUX 1938; TROEDSSON 1951; KOCHANOVA 1961, amongst others). The criteria, however, for classifying it as a different species very and are often contradictory. Consequently, the final conclusion should follow a revision of the taxon.
Occurrence. Pliensbachian of Senokos, Bogorodica, Rosomač, and Velika Lukanja.

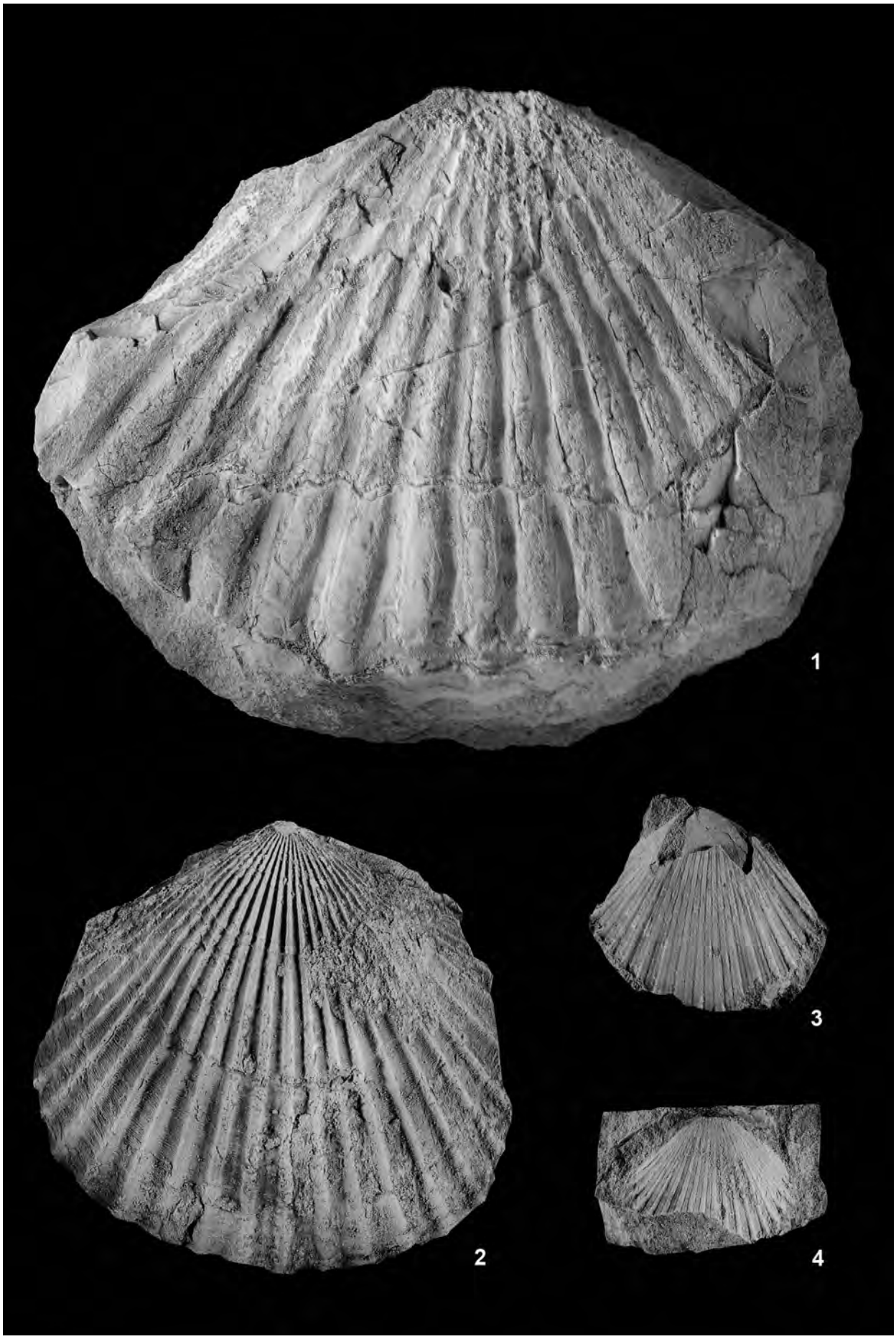
Superfamily Pectinacea WILKES, 1810
Family Pectinidae WILKES, 1810
Genus *Pseudopecten* BAYLE, 1878
Subgenus *Pseudopecten* BAYLE, 1878

Type species. *Pecten equivalvis* J. SOWERBY, 1816.

Pseudopecten (*Pseudopecten*) *equivalvis*
(J. SOWERBY, 1816)
Pl. 8, Figs. 12-21; Pl. 9, Figs. 1, 2

1816 *Pecten equivalvis* sp. nov. – J. SOWERBY: 83, pl. 136, fig. 1.
1933 *Pecten* (A*equipecten*) *aequivalvis* SOWERBY – TZANKOV & BONČEV: 231.
1934 *Pecten aequivalvis* SOWERBY – PROTIĆ: 113, pl. 2, fig. 1.
1935 *Pecten* (A*equipecten*) *aequivalvis* SOWERBY – BONČEV & TZANKOV: 18.

Plate 9. Figs. 1, 2. *Pseudopecten* (*Pseudopecten*) *equivalvis* (J. SOWERBY, 1816)
1. Articulated specimen. Pesača. - RGF BR 93/1.
2. Articulated specimen. Radejna. - RGF BR 94/10.
Figs. 3, 4. *Pseudopecten* (*Pseudopecten*) cf. *equivalvis* (J. SOWERBY, 1816)
3. Single valve. Bosman. - RGF BR 92/2.
4. Single valve. Bosman. - RGF BR 92/3.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1968 *Pseudopecten equivalvis* (J. SOWERBY) – SHOPOV: 374, pl. 4, fig. 12; pl. 5, fig. 1.
1970 *Pseudopecten equivalvis* (J. SOWERBY) – SHOPOV: 21, pl. 2, figs. 5, 6.
1982 *Pecten equivalvis* J. SOWERBY – RADULOVIĆ: 306, 321, pl. 1, fig. 8.
1982 *Pecten priscus* SCHLOTHEIM – RADULOVIĆ: 307, 321, pl. 2, fig. 4.
1984 *Pseudopecten* (*Pseudopecten*) *equivalvis* (J. SOWERBY) – JOHNSON: 61, pl. 2, figs. 1, 2, 4-10, ?fig. 3; text-figs.44-58 (cum syn.).
1990 *Pseudopecten* (*Pseudopecten*) *equivalvis* (J. SOWERBY) – UROŠEVIĆ & RADULOVIĆ: 27, pl. 1, fig. 12.
1991 *Pseudopecten equivalvis* (J. SOWERBY) – HEINZE: 26, 77, 123.
1992 *Pseudopecten* (*Pseudopecten*) *equivalvis* (J. SOWERBY) – ABERHAN: 18, 149.
1992 *Pseudopecten* (*Pseudopecten*) *equivalvis* (J. SOWERBY) – SZENTE & VÖRÖS: 99, pl. 2, fig. 4.
2002b *Pseudopecten* aff. *equivalvis* (J. SOWERBY) – DAMBORENEA: 80, pl. 7, figs. 11-17.
2002 *Pseudopecten* (*Pseudopecten*) *equivalvis* (J. SOWERBY) – GAHR: 120, pl. 1, fig. 17; pl. 2, fig. 3.

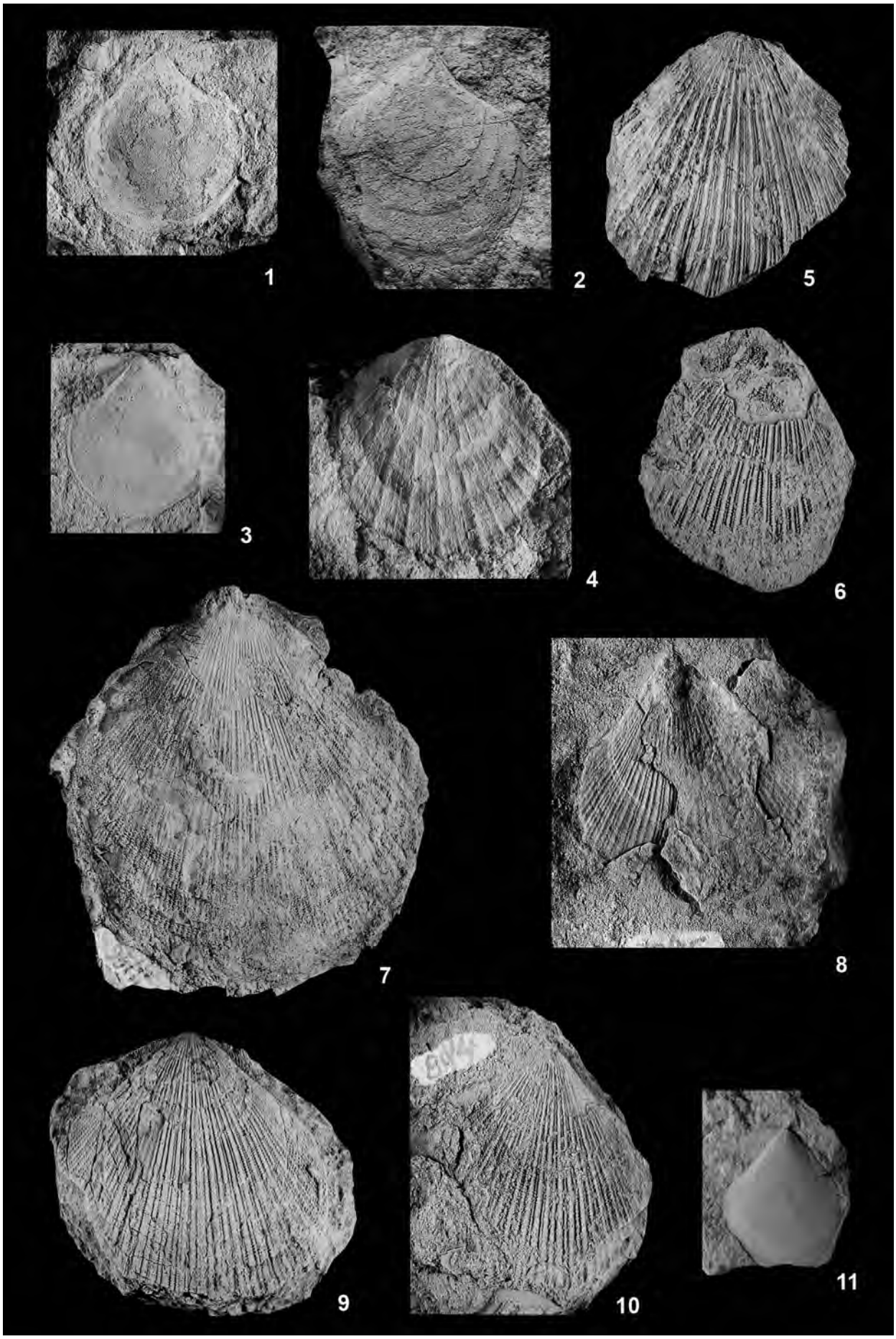
Material. Fifteen articulated or single-valved specimens from Senokos (RGF BR 79/8, 79/55, 79/56, 79/57, 79/64, 79/ 65, 79/66, 79/67, 79/68, 79/69, 79/70, 79/71, 79/78, 79/79, 79/80); 11 articulated or single-valved specimens from Bogorodica (RGF BR 80/16, 80/18, 80/20, 80/21, 80/22, 80/23, 80/32, 80/33, 80/34, 80/35, 80/36); 1 articulated specimen from Rosomača (RGF BR 81/2); 1 articulated specimen from Pesača (RGF BR 93/1); 7 articulated specimens from Radejna (RGF BR 94/1, 94/2, 94/4, 94/5, 94/6, 94/9, 94/10); 1 articulated specimen from Mali Vrh (95/1); 8 single valves from Velika Lukanja (RGF BR 98/10, 98/23, 98/24, 98/25, 98/26, 98/29, 98/49, 98/50); 1 articulated specimen from Rgotina (RGF BR 99/10).

Measurements (in mm).

	L	H	H/L
RGF BR 79/55	29.5	28.4	0.96
RGF BR 79/65	24.7	27.4	1.10
RGF BR 79/66	43.8	37.5	0.86
RGF BR 79/70	37.4	39.4	1.05
RGF BR 79/79	19.2	21.6	1.12
RGF BR 80/20	21.2	22.8	1.07
RGF BR 80/23	24.4	21.2	0.86
RGF BR 80/33	19.3	19.2	0.99
RGF BR 80/34	19.9	21.6	1.08
RGF BR 81/2	60.0	66.8	1.11
RGF BR 93/1	153.2	130.0	0.85
RGF BR 94/10	87.7	81.2	0.92

Description. Shell small to large in size, sub-ovate in outline with low disc flanks. Equilateral and equivalved, moderately convex, with left valve more convex. Shell ornamented with 16-20 ribs, which are angular in juvenile specimens but more rounded in adult specimens; space between the ribs greater than the ribs; commarginal lines indistinct. Ears not preserved; apical angle about 90°.
Remarks. JOHNSON (1984) emphasized that "*Pecten*" *acuticosta* LAMARCK differs from "*Pecten*" *equivalvis* SOWERBY in having sharper ribs as a consequence of abrasion; hence, this feature cannot be used as a criterion for species designation. "*Pectinites*" *priscus* SCHLOTHEIM was identified on a single specimen and this name was later often used for small specimens of *Pseudopecten* (*P.*) *equivalvis.* JOHNSON (1984) also mentioned the criteria on which he believes "*P*". *priscus* SCHLOTHEIM should be assigned to *P.* (*P.*) *equivalvis.* With respect to JOHNSON's (1984) extensive research on Jurassic pectinids, his opinion about the identity of the three species is herein accepted.
Occurrence. Sinemurian and Pliensbachian of Senokos; Pliensbachian of Bogorodica, Rosomač, Pesača, Radejna, Mali Vrh, Velika Lukanja, and Rgotina.

Plate 10. Figs. 1-3. *Camptonectes* (*Camptonectes*) cf. *auritus* (VON SCHLOTHEIM, 1813)
1. Right valve. Senokos. - RGF BR 79/35.
2. Right valve. Senokos. - RGF BR 79/89.
3. Left valve. Senokos. - RGF BR 79/34.
Figs. 4, 5. *Eopecten velatus* (GOLDFUSS, 1833)
4. Right valve. Senokos. - RGF BR 79/90.
5. Articulated specimen, left valve view. Mazgoš. – RGF BR 97/1.
Figs. 6-10. *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM, 1820)
6. Articulated specimen. Senokos. - RGF BR 79/46.
7. Articulated specimen. Radejna. - RGF BR 94/11.
8. Single valve, internal mould of ?right valve. Senokos. - RGF BR 79/45.
9. Single valve. Senokos. - RGF BR 79/47.
10. Single valve. Bogorodica. - RGF BR 80/4.
Fig. 11. *Chlamys* (*Chlamys*) sp.
Single valve. Rosomač. - RGF BR 81/10.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Pseudopecten (*Pseudopecten*) cf. *equivalvis*
(J. SOWERBY, 1816)

Pl. 9, Figs. 3, 4

Material. Seven partially preserved single valves from Bosman (RGF BR 92/2, 92/3, 92/4, 92/5, 92/6, 92/7, 92/8).

Measurements (in mm).

	L	H	H/L
RGF BR 92/2	48.2	46.9	0.97
RGF BR 92/3	28.5	29.9	1.05
RGF BR 92/5	47.2	36.5	0.77

Description. Shell of medium size, equilateral, sub-ovate in outline, covered by 19 simple radial ribs, which are narrower than the intervals between them. Anterior and posterior disc flanks vertically striated.

Remarks. A species very closely related to *Pseudopecten* (*P*) *equivalvis* is *Pseudopecten* (*P.*) *dentatus* (J. DE C. SOWERBY) which possesses a feature which JOHNSON (1984) called "vertically striated disc flanks".

According to DAMBORENEA (2002b), the absence of this feature, which JOHNSON (1984) regarded as a diagnostic characteristic of *P.* (*P.*) *equivalvis* (J. DE C SOWERBY), in some species is questionable. Researching a large number of specimens, DAMBORENEA concluded that this is probably a diagnostic feature of higher rank, as all species of *Pseudopecten* may possess it.

Other differences which JOHNSON mentioned to distinguish *P.* (*P.*) *equivalvis* and *P.* (*P.*) *dentatus* are the presence of down-sulcal tonguing of the commarginal striae and the higher disc flanks in the latter one. Due to the small number of Serbian specimens and their poor preservation, it was not possible to observe these characters well; hence they are referred to as *P.* (*P.*) *equivalvis* with reservation.

Specimens from eastern Serbia determined as *Pseudopecten* (*P.*) *equivalvis* do not show "vertically striated disc flanks", which was the main reason for their separation from specimens which have this feature and which were determined as *Pseudopecten* (*P.*) cf. *equivalvis*.

Occurrence. Pliensbachian of Bosman.

Genus *Camptonectes* AGASSIZ in MEEK, 1864
Subgenus *Camptonectes* AGASSIZ in MEEK, 1864

Type species. *Pecten lens* J. SOWRBY, 1818.

Camptonectes (*Camptonectes*) cf. *auritus*
(VON SCHLOTHEIM, 1813)

Pl. 10, Figs. 1-3

cf. 1813 *Chamites auritus* sp. nov. – SCHLOTHEIM: 103.
cf. 1978 *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – DUFF: 66, pl. 5, figs. 22, 25; text-fig. 22 (cum syn).
cf. 1984 *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – JOHNSON: 113, pl. 3, figs. 25-40; text-figs. 98-107 (cum syn.).
cf. 1988 *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – FÜRSICH & WERNER: 136, pl. 15, figs. 1-5; text- fig. 18.
cf. 1991 *Camptonectes auritus* (SCHLOTHEIM) – HEINZE: 72, 77, 90.
cf. 1991 *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – YIN & FÜRSICH: 141, pl. 5, figs. 3, 4.
cf. 1994 *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – ABERHAN: 39, pl. 18, figs. 7-9.
cf. 1995 *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – JAITLY et al.: 195, pl. 195, figs. 1-4.
cf. 1998 *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – ABERHAN: 109, pl. 12, fig. 8.
cf. 1998 *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – SHA et al.: 33, pl. 5, figs. 1-6.
cf. 2001 *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – DELVENE: 69, pl. 4, fig. 5.
cf. 2002b *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – DAMBORENEA: 57, pl. 6, figs. 9-10; text-fig. 26.
cf. 2002 *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – GAHR: 118, pl. 1, fig. 18.
cf. 2004 *Camptonectes* (*Camptonectes*) *auritus* (SCHLOTHEIM) – LAZĂR et al.: 237, pl. 3, fig. 10.

Material. Four right and 2 left valves from Senokos (RGF BR 79/3, 79/11, 79/34, 79/35, 79/88, 79/89); 1 left valve from Velika Lukanja (RGF BR 98/79).

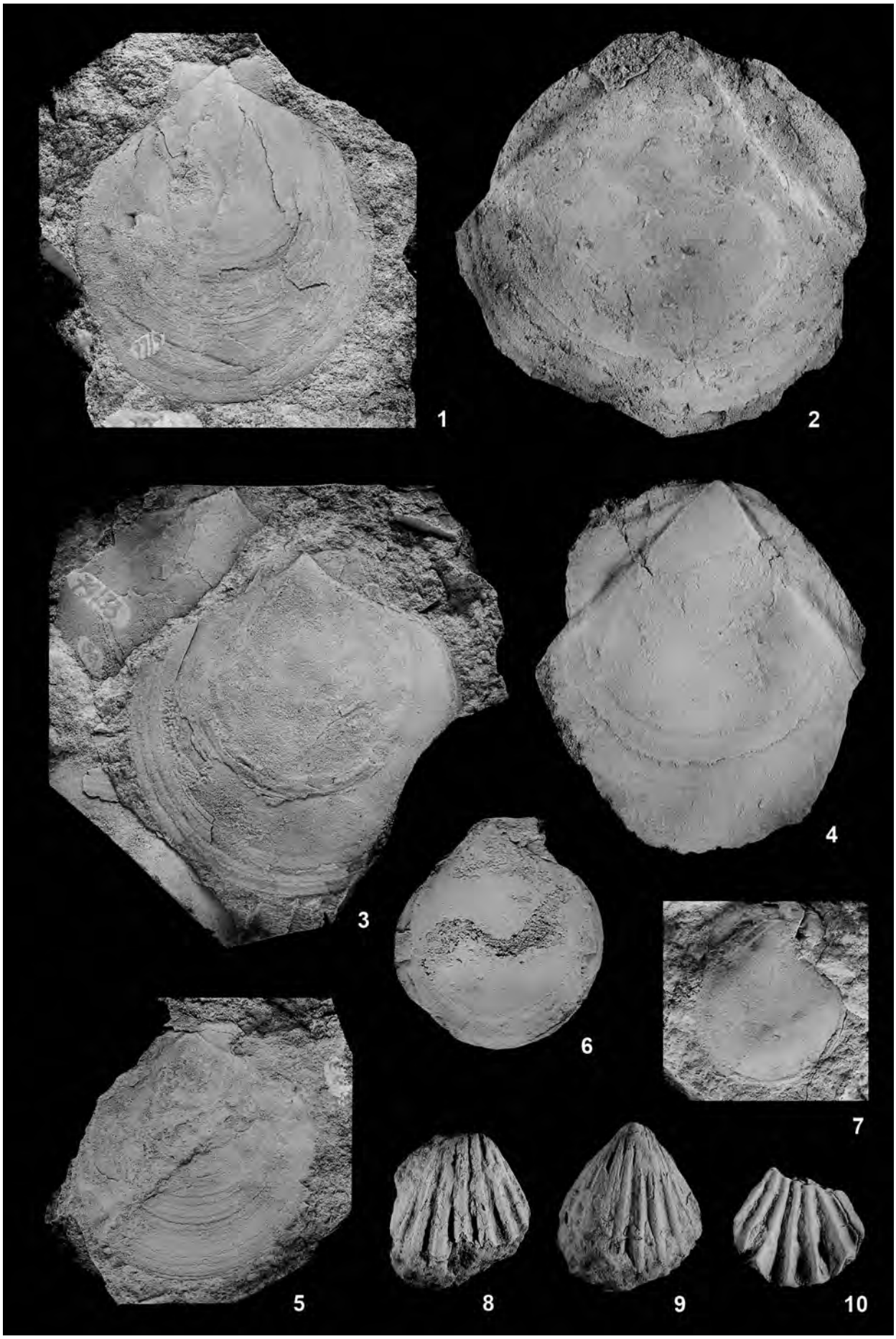
Measurements (in mm).

	L	H	H/L
RGF BR 79/3	35.9	41.8	1.16
RGF BR 79/11	39.8	42.4	1.06
RGF BR 79/34	23.9	26.3	1.10
RGF BR 79/35	27.6	30.7	1.11
RGF BR 79/88	29.2	37.2	1.27
RGF BR 79/89	36.9	37.6	1.01
RGF BR 98/79	26.0	27.4	1.05

Plate 11. Figs. 1-7. *Entolium* (*Entolium*) *lunare* (ROEMER, 1839)
1. Single valve, ?right valve view. Senokos. - RGF BR 79/9.
2. Articulated specimen. Rgotina. - RGF BR 99/9.
3. Single valve, ?right valve view. Senokos. - RGF BR 79/33.
4. Articulated specimen. Bosman. - RGF BR 92/1.
5. Single valve. Senokos. - RGF BR 79/31.
6. Articulated specimen. Senokos. - RGF BR 79/38.
7. Single valve. Senokos. - RGF BR 79/95.

Figs. 8, 9. *Weyla* (*Weyla*) sp.
8. Single valve, right valve view. Senokos. - RGF BR 79/63.
9. Single valve, right valve view. Senokos. - RGF BR 79/62.

Fig. 10. *Weyla* (*Weyla*) cf. *rollieri* (COSSMAN, 1916)
Articulated specimen. Velika Lukanja. - RGF BR 98/16.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Description. Shell medium in size, sub-orbicular in outline, inequilateral; valves slightly inflated. Dorsal margin straight, anterior concave, ventral slightly convex. Auricles well demarcated from disc and ornamented with fine striae; anterior auricle larger than posterior. Umbones small, orthogyrate; umbonal angle between 90° and 100°. Shell surface covered with fine commarginal growthlines.
Remarks. Closely related to the described species is *Camptonectes* (*C.*) *subulatus* (MÜNSTER), which differs from *C.* (*C.*) *auritus* in the restriction of the surface ornamentation to the anterior and posterior margins. With respect to the poor preservation of the specimens and in view of the fact that *C.* (*C.*) *auritus* is widespread in Europe, the specimens from eastern Serbia are identified as *C.* (*C.*) *auritus* with reservation.

This seems to be the first find of the genus *Camptonectes* from the Lower Jurassic of eastern Europe.
Occurrence. Pliensbachian of Senokos and Velika Lukanja.

Genus *Eopecten* DOUVILLÉ, 1897

Type species. *Hinnites tuberculatus* GOLDFUSS, 1835 (errore pro *Spondylus tuberculosus* GOLDFUSS 1835).

Eopecten velatus (GOLDFUSS, 1833)
Pl. 10, Figs. 4, 5

1833 *Pecten velatus* sp. nov. – GOLDFUSS: 45, pl. 90, fig. 2.
1833 *Pecten tumidus* sp. nov. – HARTMANN in v. ZIETEN: 68, pl. 52, fig. 1.
1931 *Pecten (Hinnites) velatus* GOLDFUSS – COHEN: 72, pl. 2, fig. 22.
1935 *Pecten (Velopecten) tumidus* ZIETEN – BONČEV & CANKOV: 18, pl. 4, fig. 1.
1968 *Eopecten velatus* (GOLDFUSS) – SHOPOV: 385, pl. 5, figs. 3, 4.
1984 *Eopecten velatus* (GOLDFUSS) – JOHNSON: 150, pl. 5, figs. 4, 5, 7, 8; text-figs. 137-141 (cum syn.).
1988 *Eopecten velatus* (GOLDFUSS) – FÜRSICH & WERNER: 140, pl. 13, figs. 1-3.
1992 *Eopecten velatus* (GOLDFUSS) – ABERHAN: 19, 155.
1994 *Eopecten velatus* (GOLDFUSS) – ABERHAN: 41, pl. 21, figs. 2, 6-7.
1995 *Eopecten velatus* (GOLDFUSS) – JAITLY et al.: 196, pl. 19, figs. 5, 9-11; pl. 20, fig. 1.
1996 *Eopecten velatus* (GOLDFUSS) – DAMBORENEA: 154, 157.
1998 *Eopecten velatus* (GOLDFUSS) – HOLZAPFEL: 101, pl. 4, figs. 19-21.
1999 *Eopecten velatus* (GOLDFUSS) – AHMAD: 24, pl. 5, figs. 1, 2.
2001 *Eopecten velatus* (GOLDFUSS) – DELVENE: 72, pl. 4, fig. 9.
2002b *Eopecten* cf. *velatus* (GOLDFUSS) – DAMBORENEA: 54, pl. 6, figs. 1-3.
2002 *Eopecten velatus* (GOLDFUSS) – GAHR: 118, pl. 1, fig. 19.

Material. One right valve from Senokos (RGF BR 79/90) and 1 articulated specimen from Mazgoš (RGF BR 97/1).
Measurements (in mm).

	L	H	H/L
RGF BR 79/90	37.6	38.8	1.03
RGF BR 97/1	44.7	51.3	1.15

Description. Shell approximately equilateral, with the right valve flat and the left valve slightly convex. Higher than long with low and not prominent umbones. Disc flanks low, vertically striated. Auricles are not preserved. Left valve ornamented with about 20 primary narrow radial ribs. Between the main ribs, 3-4 secondary ribs are intercalated, some of them (the ones in the middle) are stronger. The right valve is also covered with primary and secondary ribs, which are somewhat less pronounced and also slightly reduced in number. All ribs are very slightly sinusoid. Faint tubercles are present in some areas of the shell.
Remarks. The specimens match the holotype (GOLDFUSS 1833) and material described by JOHNSON (1984) in shape and strength and arrangement of ribs. Compared to material from Portugal (FÜRSICH & WERNER 1988), Chile (ABERHAN 1994), southern Tunisia (HOLZAPFEL 1998) and Argentina (DAMBORENEA 2002b), the specimens from eastern Serbia have less pronounced but more numerous ribs.

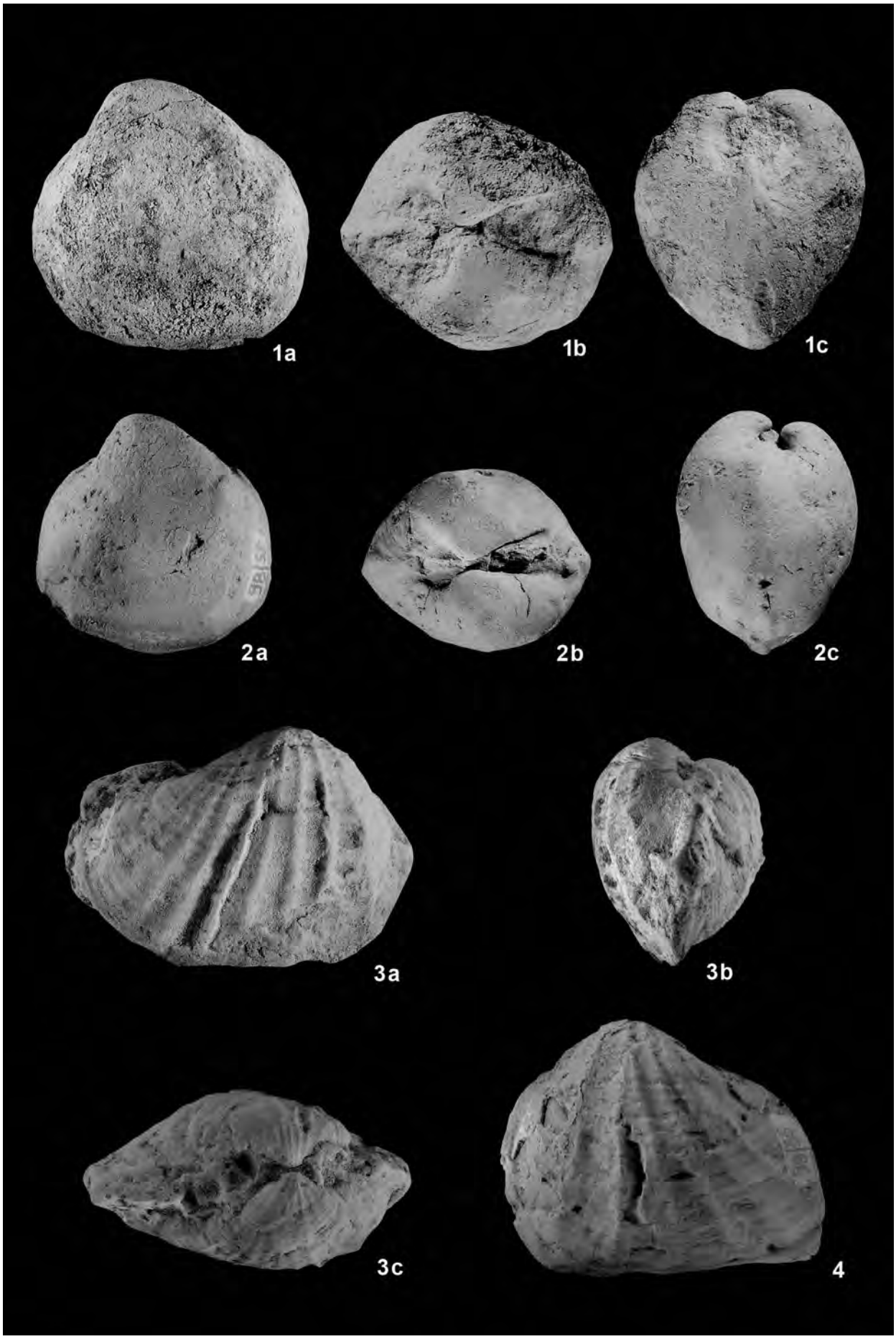
Related species are *Eopecten abjectus* (PHILLIPS) and *Eopecten spondyloides* (ROEMER); the detailed difference to them is given by JOHNSON. The presence of tubercles is referred to by JOHNSON (1984) as a diagnostic characteristic of *E. abjectus*, although FÜRSICH & WERNER (1988) and ABERHAN (1994) document on material from Portugal and Chile that this feature is also present in *E. velatus*. The material from eastern Serbia, which also bears tubercles, supports this opinion.

The present specimens have "vertically striated disc flanks", which JOHNSON (1984) mentioned as a characteristic feature of *Pseudopecten (Ps.) dentatus*. Specimens from eastern Serbia are evidence that vertically striated disc flanks are not a particular distinction of *P.* (*P.*) *dentatus*, but a feature common in *Pseudopecten* and *Eopecten* members, and definitely more widespread than originally believed (see also DAMBORENEA 2002b).
Occurrence. Pliensbachian of Senokos and Mazgoš.

Genus *Chlamys* RÖDING, 1798
Subgenus *Chlamys* RÖDING, 1798

Type species. *Pecten islandicus* MÜLLER, 1776.

Plate 12. Figs. 1, 2. *Unicardium robustum* TRAUTH, 1909
1. Articulated specimen, internal mould; a: left valve view, b: dorsal view, c: anterior view. Senokos. - RGF BR 79/83.
2. Articulated specimen, internal mould; a: left valve view, b: dorsal view, c: anterior view. Velika Lukanja. - RGF BR 98/57.
Figs. 3, 4. *Pholadomya* (*Pholadomya*) *ambiqua* (J. SOWERBY, 1819)
3. Articulated specimen; a: right valve view, b: anterior view, c: dorsal view. Velika Lukanja. - RGF BR 98/53.
4. Articulated specimen, left valve view. Velika Lukanja. - RGF BR 98/55.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Chlamys (*Chlamys*) *textoria* (SCHLOTHEIM, 1820)

Pl. 10, Figs. 6-10

1820 *Pectinites textorius* sp. nov. – SCHLOTHEIM: 29.
1933 *Pecten* (*Chlamys*) *textoria* SCHLOTHEIM – TZANKOV & BONČEV: 230, pl. 1, fig. 8.
1968 *Chlamys textorius* SCHLOTHEIM – SHOPOV: 338, pl. 3, figs. 6, 7.
1968 *Chlamys trigeri* OPPEL – SHOPOV: 347, pl. 3, figs. 12, 13.
1968 *Chlamys dispar* TERQUEM – SHOPOV: 349, pl. 3, figs. 14-16.
1982 *Chlamys textoria* SCHLOTHEIM – RADULOVIĆ: 305, pl. 1, fig. 7.
1984 *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM) – JOHNSON: 163, pl. 6, figs. 10-12; pl. 7, figs. 1-21; pl. 8, figs. 1-3, 5-20, ?fig. 4; text-figs. 146-157 (cum syn.).
1986 *Chlamys textorius* SCHLOTHEIM – PEDERSEN: 143, 148-149, pl. 2, figs. A-C.
1987 *Chlamys textoria* SCHLOTHEIM – CHEN: 51, pl. 7, figs. 15-18.
1988 *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM) – FÜRSICH & WERNER: 138, pl. 11, figs. 2-4.
1991 *Chlamys textoria* (SCHLOTHEIM) – HEINZE: 23-25, 40, 77.
1991 *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM) – YIN & FÜRSICH: 143, pl. 6, figs. 4-7.
1992 *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM) – ABERHAN: 18, 19, 66, 144-152.
1992 *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM) – SZENTE & VÖRÖS: pl. 1, fig. 3.
1994 *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM) – ABERHAN: 39, pl. 18, fig. 10; pl. 19, figs. 1-6; text-fig. 18.
1995 *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM) – JAITLY et al.: 197, pl. 20, figs. 3-7.
1996 "*Chlamys*" *textoria* (SCHLOTHEIM) – DAMBORENEA: 154, 157, 158.
1998 *Chlamys* (*Chlamys*) *textoria* (VON SCHLOTHEIM) – ABERHAN: 111, pl. 12, figs. 15-16, 20, 21, 23.
1999 *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM) – AHMAD: 24, pl. 4, fig. 10; pl. 5, figs. 3, 4, 6.
2001 *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM) – DELVENE: 70, pl. 4, figs. 4, 8.
2002b "*Chlamys*" *textoria* (SCHLOTHEIM) – DAMBORENEA: 76, pl. 8, figs. 1-8; text-figs. 27d, 34.
2004 *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM) – BARBU & LAZĂR: 8.

Material. Three single valves (RGF BR 79/44, 79/47, 79/48), 1 right valve (RGF BR 79/45) and 3 partially preserved articulated specimens from Senokos (RGF BR 79/46, 79/49, 79/50); 1 left valve (RGF BR 80/1), 2 partially preserved articulated specimens (RGF BR 80/2, 80/3), 1 single valve (RGF BR 80/4) and 1 right valve (RGF BR 80/5) from Bogorodica; 2 partially preserved single valves from Rosomač (RGF BR 81/12, 81/13); 1 articulated specimen from Radejna (RGF BR 94/11); 4 single valves from Velika Lukanja (RGF BR 98/3, 98/4, 98/5, 98/6).

Measurements (in mm).

	L	H	H/L
RGF BR 79/44	37.2	44.4	1.19
RGF BR 79/45	49.8	59.4	1.19
RGF BR 79/46	39.8	49.8	1.25
RGF BR 79/47	50.5	50.7	1.00
RGF BR 79/48	22.4	23.8	1.06
RGF BR 79/49	51.1	61.2	1.20
RGF BR 79/50	48.2	53.2	1.10
RGF BR 80/2	46.7	53.8	1.15
RGF BR 80/3	46.3	49.5	1.07
RGF BR 80/4	35.3	42.2	1.19
RGF BR 80/5	29.5	33.6	1.14
RGF BR 81/13	18.6	23.4	1.26
RGF BR 94/11	76.6	81.4	1.06
RGF BR 98/4	21.8	23.3	1.07

Description. Shell small to medium in size, higher than long, slightly inequilateral and almost equivalved. Disc weakly inflated with low disc flanks, sub-ovate in adults, sub-orbicular in young specimens. Auricles well demarcated from disc, bearing commarginal imbricate lamellae. Shell ornamented with a variable number of radial plicae, which increase in number by splitting or by intercalation. Distance between plicae variable. Shell surface covered with imbricate commarginal lamellae, which are irregularly arranged.

Remarks. This species has a cosmopolitan distribution in the Jurassic and a highly varied morphology. It is distinguished from other Jurassic *Chlamys* (*C.*) species by the presence of imbricate lamellae on the plicae.

Specimens described by JOHNSON (1984) vary in the number of plicae. Accordingly he divided *C. textoria* into three ecophenotypic variants. Most specimens from eastern Serbia bear dense plicae (more than 36) and belong to the "fine" phenotype. The same density of plicae was observed in Bulgarian specimens (BONČEV & CANKOV 1935; SHOPOV 1968). Another common characteristic of the Bulgarian material is a maximum height of about 80 mm, slightly less than the maximum height (88 mm) of the species given by JOHNSON (1984).

Occurrence. Sinemurian and Pliensbachian of Senokos; Pliensbachian of Bogorodica, Rosomač, Radejna, and Velika Lukanja.

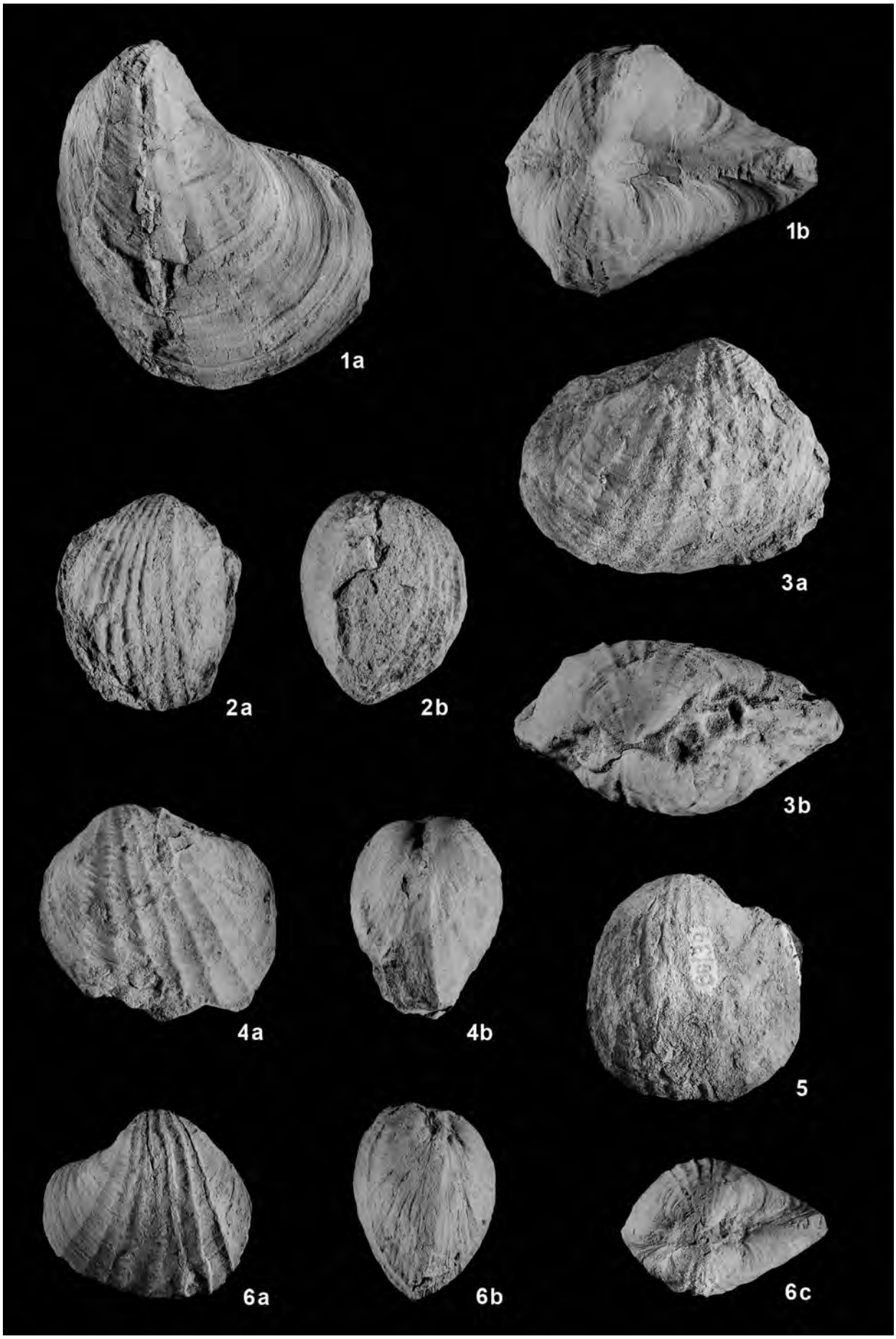
Chlamys (*Chlamys*) sp.

Pl. 10, Fig. 11

Material. One partially preserved ?right valve from Senokos (RGF BR 81/10).

Plate 13. Figs. 1-6. *Pholadomya* (*Pholadomya*) *decorata* HARTMANN, 1830

1. Articulated specimen; a: left valve view, b: dorsal view. Bogorodica. - RGF BR 80/38.
2. Articulated specimen; a: right valve view, b: anterior view. Bogorodica. - RGF BR 80/41.
3. Articulated specimen; a: right valve view, b: dorsal view. Bogorodica. - RGF BR 80/53.
4. Articulated specimen; a: left valve view, b: anterior view. Bogorodica. - RGF BR 80/42.
5. Articulated specimen, left valve view. Bogorodica. - RGF BR 80/39.
6. Articulated specimen; a: right valve view, b: lateral view, c: dorsal view. Bogorodica. - RGF BR 80/37.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6a
6b
6c

Measurements (in mm).

	L	H
RGF BR 81/10	21.3	>24.8

Description and remarks. Shell small in size, sub-pentagonal in outline; higher than long, equilateral; slightly inflated. Auricles well demarcated from disc, with commarginal lamellae. Umbonal angle acute. Shell ornamented with fine radial ribs crossed with concentric lines so as to form a fine grid. The poorly preserved specimen could not be identified at the species lavel.
Occurrence. Pliensbachian of Senokos.

Family Syncyclonemidae WALLER, 1978 [= Entoliidae TEPPNER, 1922 (KOROBKOV, 1960)]

Genus *Entolium* MEEK, 1865

Subgenus *Entolium* MEEK, 1865

Type species. *Pecten demissus* PHILLIPS, 1829.

Entolium (*Entolium*) *lunare* (ROEMER, 1839)

Pl. 11, Figs. 1-7

1839 *Pecten lunaris* sp. nov. – ROEMER: 26.
1891 *Pecten liassinus* var. Nyst – RADOVANOVIĆ: 46, pl. 1, fig. 1.
1968 *Entolium lunaris* (ROEMER) – SHOPOV: 396, pl. 6, figs. 1, 2.
1970 *Entolium lunaris* (ROEMER) – SHOPOV: 28, 32, pl. 1, figs. 3, 4.
1984 *Entolium* (*Entolium*) *lunare* (ROEMER) – JOHNSON: 36, pl. 1, figs. 17, 18, ?23; text-figs. 19-29 (cum syn.).
1991 *Entolium lunare* (ROEMER) – HEINZE: 75, 77.
1996 *Entolium* cf. *lunare* (ROEMER) – DAMBORENEA: 154, 156, 158.
1998 *Entolium* (*Entolium*) *lunare* (ROEMER) – ABERHAN: 108, pl. 11, figs. 18, 19.
2002b *Entolium* (*Entolium*) cf. *lunare* (ROEMER) – DAMBORENEA: 45, pl. 3, figs. 1-14.

Material. Five partially preserved articulated specimens (RGF BR 79/28, 79/30, 79/38, 79/93, 79/94) and 10 single valves (RGF BR 79/5, 79/6, 79/9, 79/29, 79/31, 79/32, 79/33, 79/36, 79/37, 79/95) from Senokos; 2 partially preserved articulated specimens from Bogorodica (RGF BR 80/79, 80/80); 1 articulated specimen from Bosman (RGF BR 92/1); 3 single valves from Radejna (RGF BR 94/12, 94/13, 94/14); 1 partially preserved articulated specimen from Velika Lukanja (RGF BR 98/78); 1 partially preserved articulated specimen from Rgotine (RGF BR 99/9).

Measurements (in mm).

	L	H	H/L
RGF BR 79/9	51.7	56.9	1.10
RGF BR 79/31	46.4	48.3	1.04
RGF BR 79/33	68.5	65.7	0.96
RGF BR 79/38	35.6	39.9	1.12
RGF BR 79/95	25.9	28.6	1.10
RGF BR 92/1	62.2	68.6	1.10
RGF BR 99/9	76.8	74.3	0.97

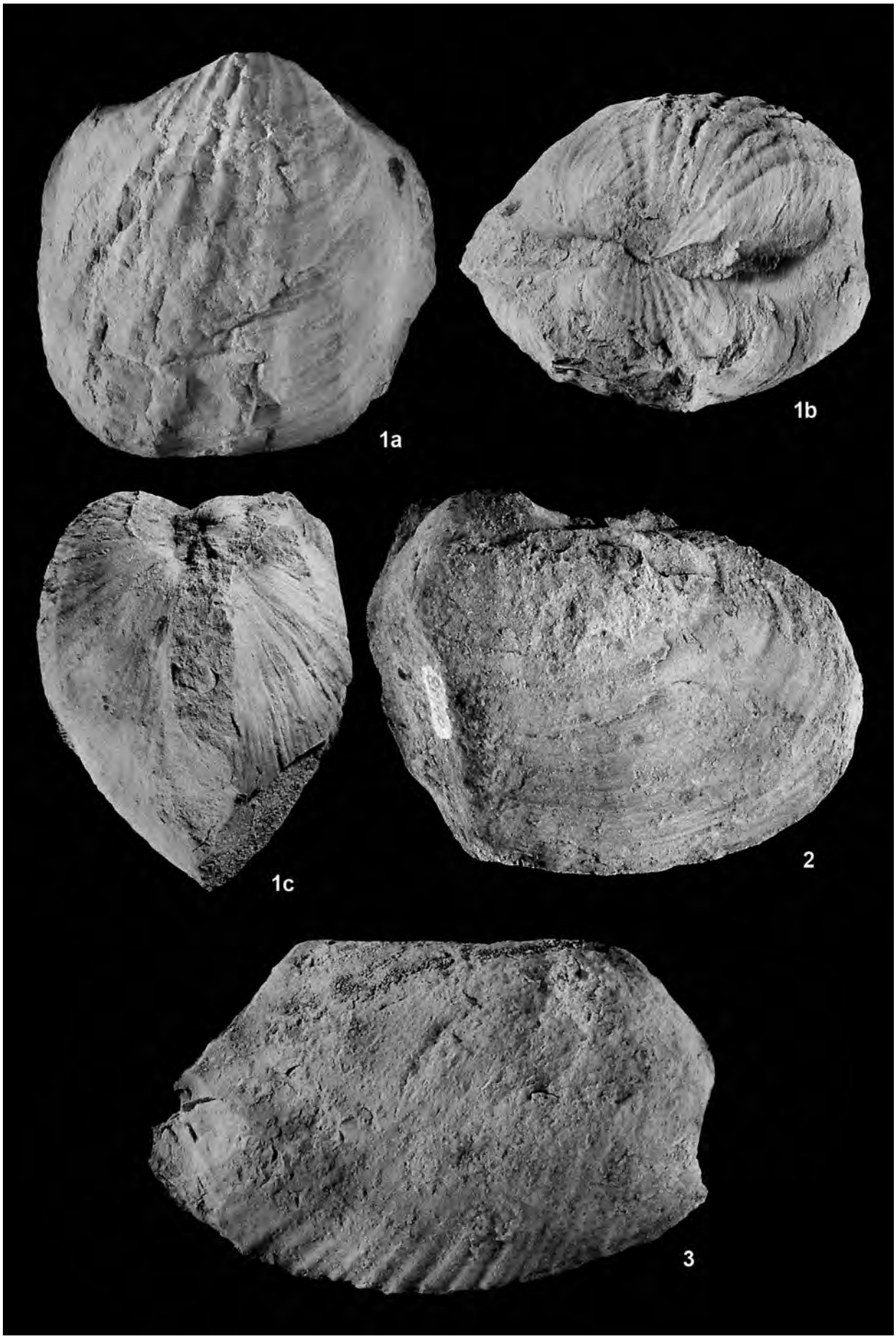
Description. Shell small to medium in size; almost equivalved, equilateral, orbicular to suborbicular in outline. Apical angle of umbo commonly 90°-100°, in some specimens slightly less than 90°. Auricules small, equal in size, extended dorsally beyond the hinge line. On the interior of the shell, in some specimens, two wide radiating internal ridges can be observed. External shell surface covered with fine commarginal growth lines.
Remarks. According to STAESCHE (1926) the genus is represented in the Lower Jurassic of Europe by two species: *Entolium* (*E.*) *lunare* (ROEMER) in older and *Entolium* (*E.*) *liassinus* (Nyst) in younger strata. JOHNSON (1984), however, assigned all Lower Jurassic specimens of the genus to one species, *E.* (*E.*) *lunare*.

A few of the present specimens have a slightly more acute apical angle. Some authors (e.g., STAESCHE 1926; VÖRÖS 1971), based on this feature, regarded *E.* (*E.*) *hehli* (D'ORBIGNY) as a separate species. JOHNSON (1984) listed this species with a detailed explanation as a synonymy of *E.* (*E.*) *lunare*.

Another similar species is *E.* (*E.*) *disciforme* (SCHÜBLER in ZIETEN, 1833), according to some authors (JOHNSON 1984) a synonym of *E.* (*E.*) *corneolum* (YOUNG & BIRD, 1828). The originally determined stratigraphic range of this species is greater than the Lower Pliensbachian; hence, the specimen from eastern Serbia must be *E.* (*E.*) *lunare*.

JOHNSON (1984) writes that the Toarcian specimens, which could be assigned to this species, have poorly preserved ears and thus cannot be clearly distinguished from *E.* (*E.*) *corneolum* which was first found in the Toarcian. JOHNSON further points out that *E.* (*E.*) *lunare*, recorded in the literature from the Middle and Upper Jurassic, should be treated with some caution.
Occurrence. Sinemurian and Pliensbachian of Senokos; Pliensbachian of Bogorodica, Bosman, Radejna, Velika Lukanja, and Rgotina.

Plate 14. Figs. 1, 2. *Pholadomya* (*Pholadomya*) cf. *decorata* HARTMANN, 1830
1. Articulated specimen; a: right valve view, b: dorsal view, c: anterior view. Bogorodica. - RGF BR 80/40.
2. Articulated specimen, left valve view. Bogorodica - RGF BR 80/46.
Fig. 3. *Pholadomya* (*Pholadomya*) *fidicula* (J. DE C. SOWERBY, 1826)
Articulated specimen, right valve view. Petrlaš. - RGF BR 101/21.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Family Neitheidae SOBETZKY, 1960
Genus *Weyla* BÖHM,1922
Subgenus *Weyla* BÖHM, 1922

Type species. *Pecten alatus* VON BUCH, 1838.

Weyla (*Weyla*) cf. *rollieri* (COSSMANN, 1916)

Pl. 11, Fig. 10

cf. 1916 *Pecten* (*Neithea*?) *Rollieri* sp. nov. – COSSMANN: 44, pl. 5, figs. 13-15.
cf. 1925 *Pecten* (*Neithea*) cf. *Rollieri* COSSMANN – DUBAR: 269, pl. 5, figs. 8, 10-12.
cf.? 1914 *Vola alata* (v. BUCH) – KOCH: 98, text-fig. 1.

Material. One poorly preserved articulated specimen from Velika Lukanja (RGF BR 98/16).

Measurements (in mm).

	L	H
RGF BR 98/16	25.0	>22.8

Description. Shell small in size, equilateral, inequivalved; right valve slightly inflated, left valve concave. Anterior and posterior margins straight; ventral margin convex. Shell ornamented with strong and regular ribs. Right valve possesses eight, the left one seven ribs. Ribs of the right valve rounded and flattened in cross-section; space between the ribs shallow, flattened, and slightly wider than ribs. In the left valve ribs are sharp, their cross-sections triangular, and the space between ribs is undulating and wider that in the right valve.

Remarks. The specimen from eastern Serbia resembles in terms of the shell shape, features of left and right valves, number and type of ribs and their interspaces specimens from the Lower Pliensbachian of France, based on which COSSMANN (1916: 44, pl. 5, figs. 13-15) introduced the species *Pecten* (*Neithea*?) *rollieri*. The specimen also is similar to specimens from the Lower Pliensbachian (*Uptonia jamesoni* Zone) of France, which DUBAR (1925: 269, pl. 5, figs. 8, 10, 11) identified as *P.* (*N.*) cf. *rollieri*. The assignment is questionable because the shell is damaged, particular its apex.

KOCH (1914: 98, text-fig. 1) identified a poorly preserved specimen of a left valve from the Middle Liassic of the Velebit Mountain (Croatia) as *Vola alata* (VON BUCH). The specimen determined here as *Weyla* (*W.*) cf. *rollieri* resembles KOCH's specimen in shape and size, and in the number and type of ribs. In my opinion the specimen mentioned by KOCH is probably *W.* (*W.*) *rollieri*, because *W.* (*W.*) *alata*, except for the one specimen mentioned by KOCH, has not yet been found in Europe and because *W.* (*W.*) *rollieri* differs in shape and in number and type of ribs.

In addition, based on poorly preserved material JEKELIUS (1915: 66. pl. 6, fig. 11) introduced *Pecten* (*Janira*) *hungaricus* from the Hungarian Liassic, which clearly differs from *W.* (*W.*) *rollieri* with respect to its ornamentation.

Pecten (*Neithea*) *lacazei* from the Lower Pliensbachian (*Uptonia jamesoni* Zone) of Spain, introduced by HAIME (1855: 745, pl. 15), has also ribs that differ from the specimen of eastern Serbia.

Occurrence. Pliensbachian of Velika Lukanja.

Weyla (*Weyla*) sp.

Pl. 11, Figs. 8, 9

Material. Two poorly preserved articulated specimens from Senokos (RGF BR 79/62, 79/63).

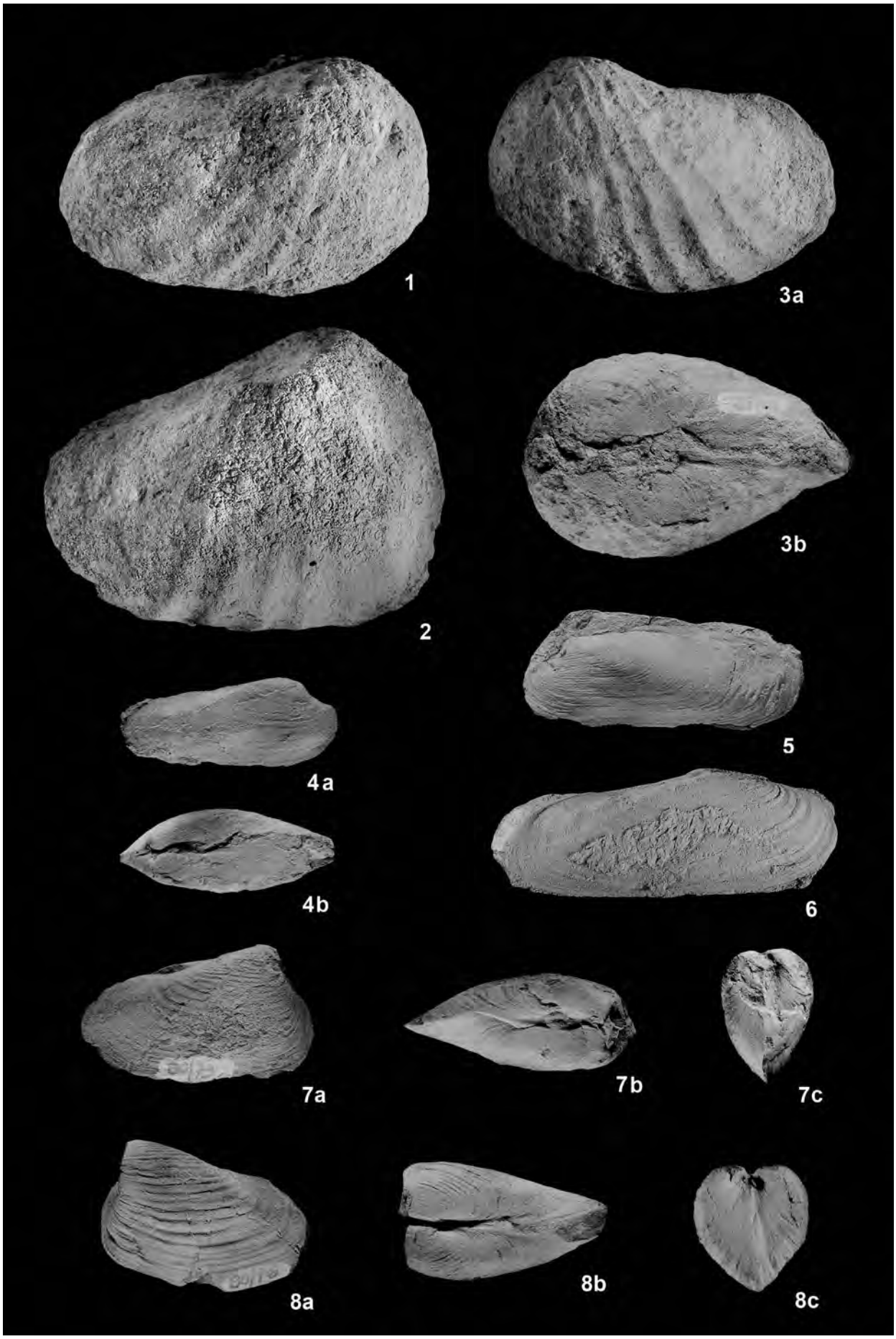
Measurements (in mm).

	L	H
RGF BR 79/62	24.7	>29.5
RGF BR 79/63	>24.0	>29.2

Description and remarks. Shell small in size, slightly asymmetrical, vertically elongated. Right valve convex. Anterior and posterior margins straight; ventral margin convex. Shell ornamented with 12-13 regular ribs, flattened in cross-section. Space between ribs slightly concave, almost the same width as the ribs.

The specimens differ from the one identified as *Weyla* (*W.*) cf. *rollieri* in the shape of shell, number and type of ribs and their interspaces. The specimens from Serbia, although poorly preserved, are related to *Weyla* (*W.*) *alata* (VON BUCH) by the number and type of ribs. It was decided to classify the species only to the subgeneric level because that taxon has not been found in Europe so far, except for the one poorly preserved specimen from the Middle Liassic of the Velebit Mountain (Croatia) mentioned by KOCH (1914: 98, text-fig. 1).

Plate 15. Figs. 1, 2. *Pholadomya* (*Pholadomya*) sp.
1. Articulated specimen, right valve view. Rosomač. - RGF BR 81/17.
2. Articulated specimen, right valve. Rosomač. - RGF BR 81/18.
Fig. 3. *Pholadomya* (*Pholadomya*) sp. A
Articulated specimen; a: left valve view; b: dorsal view. Bogorodica. - RGF BR 80/52.
Figs. 4-6. *Pachymya* (*Acromya*) *elongata* (AGASSIZ, 1843)
4. Composite mould of articulated specimen; a: right valve view, b: dorsal view. Bogorodica. - RGF BR 80/94.
5. Composite mould of articulated specimen; left valve view. Bogorodica. - RGF BR 80/6.
6. Composite mould of articulated specimen; right valve view. Bogorodica. - RGF BR 80/7.
Figs. 7, 8. *Pleuromya uniformis* (J. SOWERBY, 1813)
7. Composite mould of articulated specimen; a: right valve view, b: dorsal view, c: anterior view. Bogorodica. - RGF BR 80/73.
8. Composite mould of articulated specimen; a: left valve view, b: dorsal view, c: lateral view. Bogorodica. - RGF BR 80/76.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Occurrence. Pliensbachian of Senokos.

Subclass Heteroconchia HERTWIG, 1895
Superorder Heterodonta NEUMAYR, 1883
Order Veneroida ADAMS & ADAMS, 1856
Superfamily Lucinacea FLEMING, 1828
Family Mactromyidae COX, 1929
Genus *Unicardium* D'ORBIGNY, 1850

Type species. *Corbula cardioides* PHILLIPS, 1829.

Remarks. The difference between *Unicardium* D'ORBIGNY, 1850 and *Mactromya* AGASSIZ, 1842 has not been clarified (FÜRSICH et al. 2000). A criterion for their separation, used in this paper, is the outline of the shell: *Unicardium* is more rounded and spherical while *Mactromya* is transversally elliptical to subquadrate. The diagnosis by CHAVAN (in COX et al. 1969), for separating the two taxa is not satisfactory, and the problem needs further study.

Unicardium robustum TRAUTH, 1909

Pl. 12, Figs. 1, 2

1909 *Unicardium robustum* sp. nov. – TRAUTH: 112, pl. 3, figs. 23, 24.
1931 *Unicardium robustum* TRAUTH – COHEN: 75, pl. 2, fig. 29.
1968 *Mactromya robusta* (TRAUTH) – SHOPOV: 468, pl. 19, figs. 5-8.
1982 *Unicardium robustum* TRAUTH – RADULOVIĆ: 312, pl. 3, fig. 6.
1993 *Unicardium robustum* TRAUTH – ŽIVANOVIĆ: 181, 182, 184, 187, 190, 191, 194, pl. 1, fig. 8.

Material. Two articulated specimens from Senokos (RGF BR 79/82, 79/83); 9 articulated specimens (RGF BR 80/55, 80/56, 80/57, 80/58, 80/59, 80/82, 80/83, 80/85, 80/92) and 1 single valve from Bogorodica (RGF BR 80/60); 3 articulated specimens from Velika Lukanja (RGF BR 98/57, 98/58, 98/59); 3 articulated specimens from Petrlaša (RGF BR 101/1, 101/2, 101/11).

Measurements (in mm).

	L	H	H/L
RGF BR 79/82	37.7	32.0	0.84
RGF BR 79/83	49.2	48.9	0.99
RGF BR 80/55	41.6	35.3	0.85
RGF BR 80/56	46.4	47.1	1.01
RGF BR 80/57	31.5	27.2	0.86
RGF BR 80/58	32.5	28.5	0.88
RGF BR 80/82	38.7	38.5	0.99
RGF BR 80/83	43.0	39.0	0.90
RGF BR 80/85	38.7	39.2	1.01
RGF BR 80/92	32.9	29.8	0.90
RGF BR 80/60	42.5	35.8	0.84
RGF BR 98/57	42.4	42.9	1.01
RGF BR 98/58	49.7	39.2	0.79
RGF BR 98/59	43.7	41.7	0.95
RGF BR 101/1	46.3	41.9	0.90
RGF BR 101/2	59.8	50.7	0.85
RGF BR 101/11	69.9	62.3	0.89

Description. Shell medium in size, subcircular in outline; height and length approximately equal. Valves strong and unequally inflated; the right valve more than the left one. Umbones strong, massive and wide, prosogyrate. Anterio-dorsal margin slightly concave, posterodorsal margin slightly convex. The ornamentation consists of numerous more or less coarse commarginal growth lines.

Remarks. Little reference is made in the literature to the described species. Somewhat similar species from the Lower Liassic are *Unicardium rugosum* DUNKER and *Corbula cardioides* PHILLIPS.

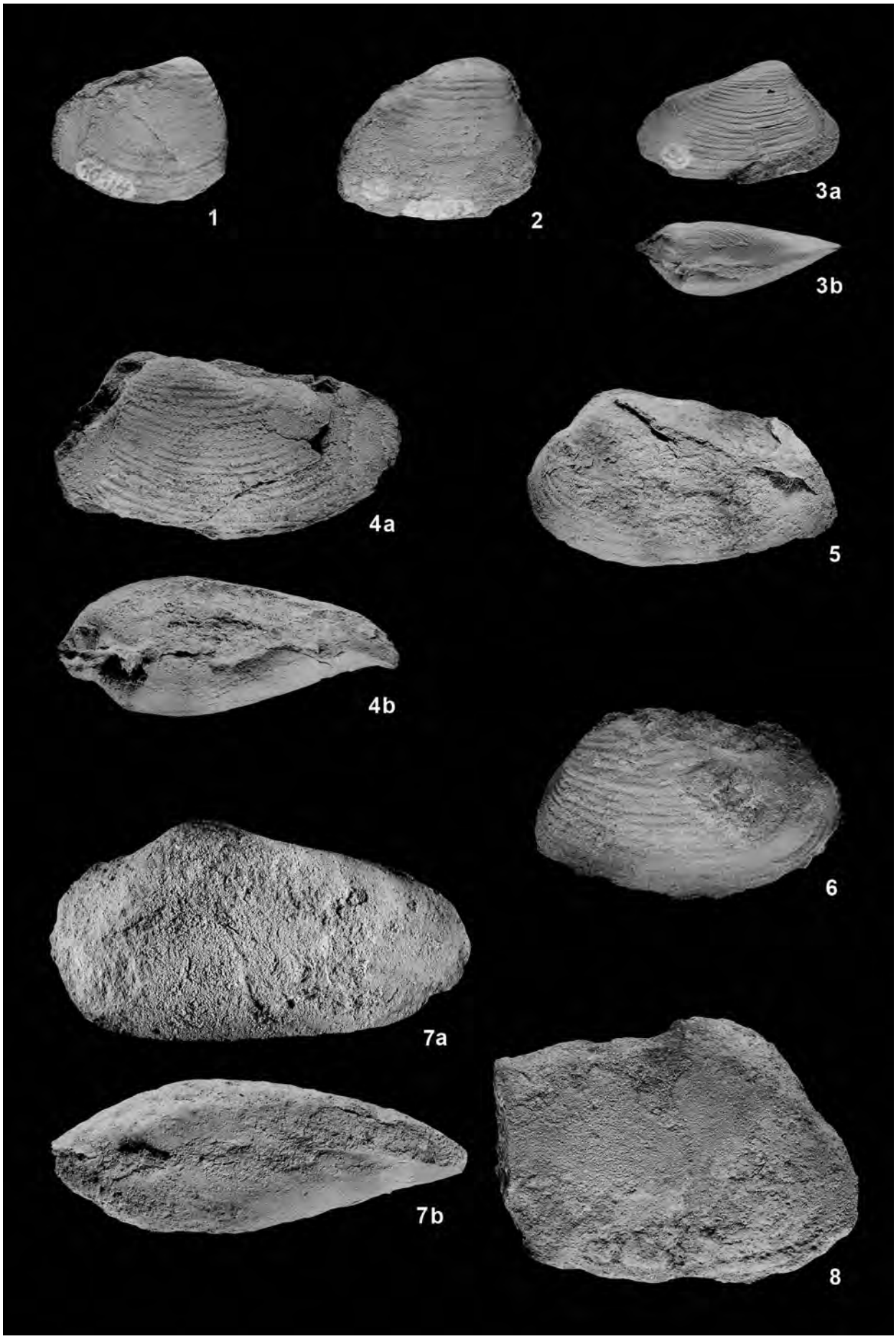
Occurrence. Pliensbachian of Senokos, Bogorodica, Velika Lukanja, and Petrlaš.

Superorder Anomalodesmata DALL, 1889 (1899)
Order Pholadomyoida NEWELL, 1965
Superfamily Pholadomyacea (KING, 1844) GRAY, 1847
Family Pholadomyidae GRAY, 1847
Genus *Pholadomya* G.B. SOWERBY, 1823
Subgenus *Pholadomya* G.B. SOWERBY, 1823

Type species. *Pholadomya candida* G. B. SOWERBY, 1823.

Plate 16. Figs. 1-6. *Pleuromya uniformis* (J. SOWERBY, 1813)
1. Composite mould of articulated specimen, right valve view. Petrlaš. - RGF BR 101/4.
2. Composite mould of articulated specimen, right valve view. Bogorodica. - RGF BR 80/63.
3. Composite mould of articulated specimen, a: right valve view, b: dorsal view. Bogorodica. - RGF BR 80/70.
4. Composite mould of articulated specimen; a: left valve view, b: dorsal view. Petrlaš. - RGF BR 101/9.
5. Composite mould of articulated specimen, left valve view. Petrlaš. - RGF BR 101/15.
6. Composite mould of left valve. Petrlaš. - RGF BR 101/16.

Figs. 7, 8. *Pleuromya* cf. *uniformis* (J. SOWERBY, 1813)
7. Internal mould of articulated specimen; a: left valve view, b: dorsal view. Rosomač. - RGF BR 81/16.
8. Internal mould of articulated specimen, left valve view. Rgotina. - RGF BR 99/25.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Pholadomya (*Pholadomya*) *ambiqua* (J. SOWERBY, 1819)

Pl. 12, Figs. 3, 4

1819 *Lutaria ambiqua* sp. nov. – J. SOWERBY: 48, pl. 227, figs. 1, 2.
1931 *Pholadomya ambiqua* Sow. – COHEN: 78, pl. 2, figs. 24a, b.
1968 *Pholadomya ambiqua* (J. SOWERBY) – SHOPOV: 490, pl. 21, figs. 1-5.
?1982 *Pholadomya ambiqua* SOWERBY. – RADULOVIĆ: 312, pl. 3, fig. 7.
1991 *Pholadomya ambiqua* SOWERBY. – POULTON: 33, pl. 4, fig. 13.
1993 *Pholadomya voltzi* AGASSIZ – ŽIVANOVIĆ: 181, 184, 187, 190, 194, pl. 2, fig. 4.
1997 *Pholadomya* cf. *P. ambiqua* (J. SOWERBY) – DAMBORENEA & GONZALES-LEÓN: 195, fig. 9.4.
2002 *Pholadomya* (*Pholadomya*) cf. *ambiqua* (J. SOWERBY) – GAHR: pl. 5, fig. 1.
2003 *Pholadomya* (*Pholadomya*) *ambiqua* (J. SOWERBY) – RÁBANO & DELVENE: 23, fig. 17.
2004 *Pholadomya ambiqua* (Sow.) – BARBU & LAZĂR: 9.

Material. Five articulated specimens from Velika Lukanja (RGF BR 98/52, 98/53, 98/54, 98/55, 98/56).
Measurements (in mm).

	L	H	H/L
RGF BR 98/53	63.8	43.7	0.68
RGF BR 98/54	66.7	41.6	0.62
RGF BR 98/56	52.4	39.5	0.75

Description. Shell medium in size, transversally elongated with approximately equally and strongly inflated valves. Umbones massive, strongly curved, situated in the anterior third of the shell. Anterior and posterior margins convex, ventral margin straight. Shell ornamentation consisting of 7-9 strong radial ribs which are crossed by commarginal growth lines. Lunule deep and conspicuous.
Remarks. It is almost certain that the specimen identified as *Pholadomya voltzii* by ŽIVANOVIĆ (1993) is closely related to the specimens described herein and should be assigned to the same species, lacking of any diagnostic differences. The name of the species used in this paper is that given by J. SOWERBY, which has priority.

Many Lower Jurassic species of the genus *Pholadomya* are described under different names, such as *P. voltzi* AGASSIZ (1842: 122, pl. 3c, figs. 1-9), *P. hausmanni* GOLDFUSS (1841: 266, pl. 155, fig. 4a, b), *P. idea* D'ORBIGNY (1850: 216), and *Lutaria ambiqua* J. SOWERBY (1819: 48, pl. 227). Many of these names are probably synonyms, but a detailed study of this group is beyond the scope of the present paper.
Occurrence. Pliensbachian of Velika Lukanja.

Pholadomya (*Pholadomya*) *decorata* HARTMANN, 1830 (in ZIETEN)

Pl. 13, Figs. 1-6

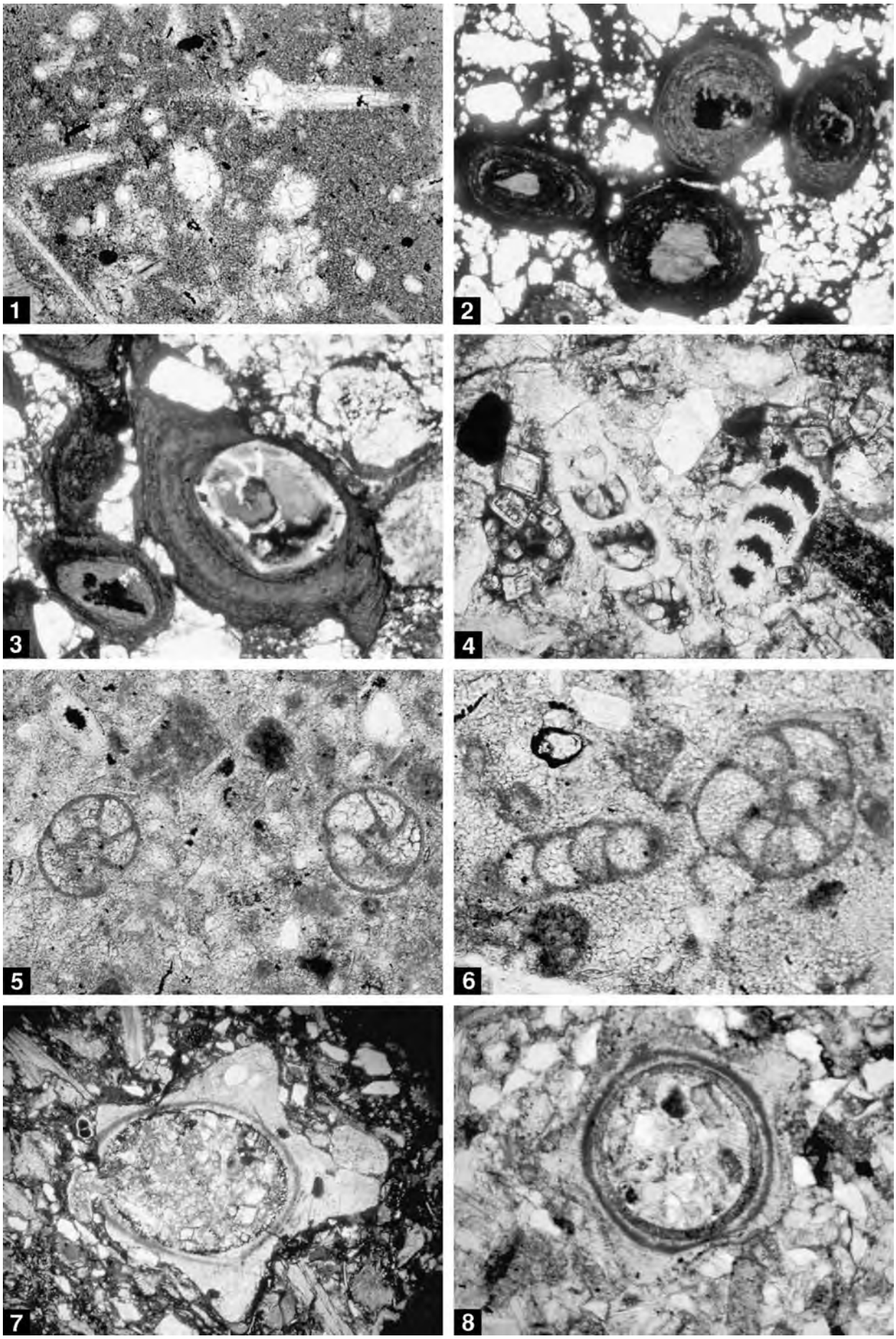
1830 *Pholadomya decorata* sp. nov. – HARTMANN (in ZIETEN): 87, pl. 66, fig. 2a-c.
1842-1845 *Pholadomya decorata* ZIETEN – AGASSIZ: 101, pl. 7f, figs. 17, 18.
1853 *Pholadomya decorata* HART. – CHAPIUS & DEWALQUE: 118, pl. 16, fig. 5a, b.
1874 *Pholadomya decorata* HARTMANN in ZIETEN – MOESCH: 21, pl. 5, figs. 7; pl. 7, figs. 2, 3.
1929 *Pholadomya decorata* v. ZIETEN – LANQUINE: 83.
1931 *Pholadomya decorata* HARTM. – COHEN: 79, 80, pl. 2, fig. 25.
1936 *Pholadomya decorata* v. ZIETEN – JOLY: 133.
1968 *Pholadomya decorata* HARTMANN – SHOPOV: 498, pl. 23, figs. 2-8.
1982 *Pholadomya decorata* HARTMANN – RADULOVIĆ: 313, pl. 4, fig. 1.
1991 *Pholadomya decorata* (ZIETEN) – SCIAU: 46, pl. 27, fig. 3, 3a.
1992 *Pholadomya* cf. *decorata* HARTMANN – DAMBORENEA: 612, pl. 116, fig. 15.

Material. Fourteen articulated specimens from Bogorodica (RGF BR 80/8, 80/37, 80/38, 80/39, 80/41, 80/42, 80/43, 80/44, 80/45, 80/49, 80/51, 80/53, 80/84, 80/89); 3 partly preserved specimens from Rgotina (RGF BR 99/4, 99/26, 99/27).
Measurements (in mm).

	L	H	H/L
RGF BR 80/37	38.2	32.5	0.85
RGF BR 80/38	57.3	69.2	1.20
RGF BR 80/41	33.8	40.2	1.19
RGF BR 80/43	41.2	41.2	1.00
RGF BR 80/45	59.3	55.2	0.93
RGF BR 80/53	57.5	42.1	0.73
RGF BR 80/84	51.6	47.3	0.91
RGF BR 99/4	42.9	42.5	0.99
RGF BR 99/26	39.8	40.0	1.00

Description. Shell medium in size, vertically elongated to sub-triangular in outline, asymmetrical. Valves equal, strongly inflated. Umbones massive, situated in the anterior third of the shell. Anterior margin very inclined, posterior one convex; ventral margin slightly convex. Shell ornamented with 8-9 strong and regular ribs. Prominent knobs are present at the intersection of the ribs and commarginal growth lines. Lunule deep and distinct.

Plate 17. (All figures x 80)
Fig. 1. Sponge spicules. Velika Lukanja; thin-section BR VL 1.
Fig. 2. Ooids. Pesača; thin-section BR Pe 93/5.
Fig. 3. Ooid with *Lenticulina* sp. as nucleus. Pesača; thin-section BR Pe 93/5.
Fig. 4. *Dentalina* sp. (left) and *Lingulina* sp. (right). Rgotina; thin-section BR Rg 1.
Fig. 5. Different sections of *Trochammina* sp. Petrlaš; thin-section BR Pr 2.
Fig. 6. *Pseudonodosaria* sp. (left) and *Trochammina* sp. (right). Petrlaš; thin-section BR Pr 1.
Fig. 7. Problematicum *"Gromia" liassica* (TERQUEM). Rgotina; thin-section BR Rg 3/1.
Fig. 8. Problematicum *"Gromia" liassica* (TERQUEM). Bosman; thin-section BR Bo 92/1a.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Remarks. The specimens resemble *Pholadomya* (*Pholadomya*) *ambiqua*, but differ in the shape of the shell and the presence of prominent knobs.
Occurrence. Pliensbachian of Bogorodica and Rgotina.

Pholadomya (*Pholadomya*) cf. *decorata* HARTMANN, 1830 (in ZIETEN)

Pl. 14, Figs. 1, 2

Material. Three single valves from Bogorodica (RGF BR 80/40, 80/46, 80/47).
Measurements (in mm).

	L	H	H/L
RGF BR 80/40	>86.5	82.3	-
RGF BR 80/46	99.2	77.6	0.78

Remarks. Specimens identified as *Pholadomya* (*Pholadomya*) cf. *decorata* resemble in morphology those assigned in this paper to *P.* (*P.*) *decorata*. The only difference is that *Pholadomya* (*P.*) cf. *decorata* is almost twice as large and is probably a gerontic form.

The fact that *P.* (*P.*) cf. *decorata* and *P.* (*P.*) *decorata* were found at the same locality and exhibit identical external features indicates that very likely they are conspecific. The affiliation, however, is questionable considering the unusual size and damage of the examined specimens.
Occurrence. Pliensbachian of Bogorodica.

Pholadomya (*Pholadomya*) *fidicula* (J. DE C. SOWERBY, 1826)

Pl. 14, Fig. 3

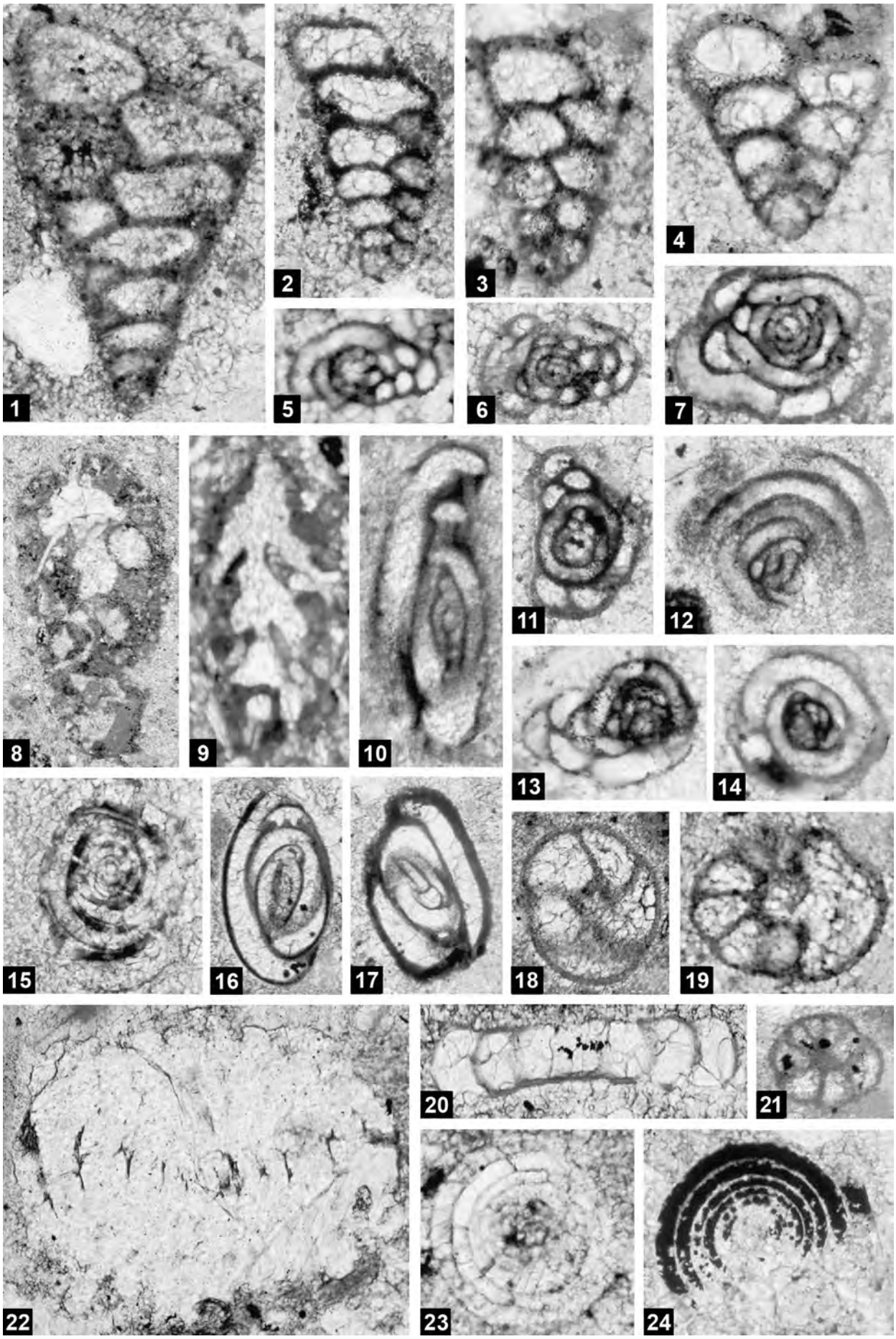
1819 *Lutraria lirata* sp. nov. – J. SOWERBY: 47, pl. 225.
1826 *Pholadomya fidicula* nom. nov. – J. de C. SOWERBY: 86.
1830 *Pholadomya fidicula* SOWERBY – ZIETEN: 86, pl. 65, fig. 2a-c.
1851 *Pholadomya fidicula* Sow. – BAYLE & COQUAND: 27, pl. 7, fig. 7.
1853 *Pholadomya fidicula* Sow. – CHAPIUS & DEWALQUE: 119, pl. 17, fig. 1.
1874 *Pholadomya fidicula* Sow. – MOESCH: 25, pl. 8, figs. 4-7; pl. 9, figs. 6-8.
1996 *Pholadomya fidicula* SOWERBY – DAMBORENEA: 159.
1996 *Pholadomya* (*Pholadomya*) *fidicula* J. DE C. SOWERBY – PANDEY et al.: 55, pl. 2, fig. 7.
1997 *Pholadomya* cf. *fidicula* (J. SOWERBY) – DAMBORENEA & GONZÁLES-LEÓN: 195, fig. 9.3.
2002 *Pholadomya* (*Pholadomya*) *fidicula* J. DE C. SOWERBY – GAHR: 130, pl. 5, fig. 5.

Material. One articulated specimen from Bogorodica (RGF BR 80/48) and 1 articulated specimen from Petrlaš (RGF BR 101/21).
Measurements (in mm).

	L	H	H/L
RGF BR 80/48	113.3	68.4	0.60

Description. Shell large, transversally elongated with valves that are equally and strongly inflated. Anterior margin straight, posterior margin slightly convex; dorsal and ventral margins straight. Umbones placed almost at the anterior end. Ornamentation consisting of about 20 irregularly placed radial ribs, which are directed toward to posterior part of the shell. Between some ribs secondary riblets are intercalated. The shell surface is covered with commarginal growth lines.
Remarks. The original name of the species *Lutraria lirata*, introduced by J. SOWERBY (1819), was changed into *fidicula* by J. DE C. SOWERBY (1826). The change was nec-

Plate 18. (All figures x 160)
Figs. 1-4. *Verneuilinoides mauritii* (TERQUEM, 1866)
1. Longitudinal section. Rgotina; thin-section BR Rg 1.
2. Longitudinal section. Bogorodica; thin-section BR Bo 2a.
3, 4. Longitudinal section. Senokos; thin-section BR Se 5.
Figs. 5-7, 11, 13. *Meandrovoluta isiagoensis* (FUGAGNOLI & RETTORI, 2003)
5-7. Bogorodica; thin-section BR Bo 2.
11, 13. Bogorodica; thin-section BR Bo 5.
Figs. 12, 14. *Glomospirella liassica* COPESTAKE & JOKNSON, 1987. Different transversal sections. Senokos; thin-section BR Se 6.
Fig. 8. *Reophax* sp. Longitudinal section. Petrlaš; thin-section BR Pr 101.
Fig. 9. *Reophax metensis* FRANKE, 1936. Longitudinal section. Petrlaš; thin-section BR Pr 2/1.
Figs. 10, 16, 17. *Ophthalmidium carinatum* (KUEBLER & ZWINGLI, 1866)
10. Longitudinal section. Petrlaš; thin-section BR Pr 2.
16. Oblique section. Petrlaš; thin-section BR Pr 1.
17. Oblique section. Senokos; thin-section BR Se 5.
Fig. 15. *Ophthalmidium liasicum* (KUEBLER & ZWINGLI, 1866). Transversal section. Pesača; thin-section BR 93/1.
Figs. 18, 19, 21. *Trochammina* cf. *canningensis* TAPPAN, 1955
18. Transversal section. Petrlaš; thin-section BR Pr 1.
19, 21. Different transversal sections. Petrlaš; thin-section BR Pr 2.
Fig. 22. *Involutina* sp. Oblique section. Senokos; thin-section BR Se 8.
Figs. 20, 23, 24. *Cornuspira orbicula* (TERQUEM & BERTHELIN, 1875)
20. Longitudinal section. Rgotina; thin-section BR Rg 3.
23. Longitudinal section. Rgotina; thin-section BR Rg 3.
24. Longitudinal section. Rosomač; thin-section BR Ro 0/2.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essary because in 1826 J. DE C. SOWERBY assigned both the species *Lutaria lirata* J. SOWERBY, 1819 and *Cardita ? lirata* J. SOWERBY, 1818 to the genus *Pholadomya.*
Occurrence. Pliensbachian of Bogorodica and Petrlaš.

Pholadomya (*Pholadomya*) sp. A
Pl. 15, Fig. 3

Material. One articulated specimen from Bogorodica (RGF BR 80/52).
Measurements (in mm).

	L	H	H/L
RGF BR 80/52	65.0	39.5	0.60

Remarks. *Pholadomya* (*Pholadomya*) sp. A resembles the Lower Jurassic specimens described as *Pholadomya corrugata* by MOESCH (1874: 11, pl. 2, figs. 1-4; pl. 5, figs. 4-6; pl. 8, fig. 1) in their generally elongated shape, position of umbones and style of ribbing. In this paper, the use of this name is refrained from because the holotype of *Pholadomya corrugata* KOCH & DUNKER (1837: 20, pl. 1, fig. 6) looks entirely different, the ribbing pattern does not include radial ribs and the inflation is very weak. In this respect, the relationship of *P. corrugata* KOCH & DUNKER to the genus *Pholadomya* is questionable.

CHOFFAT (1893: 9, pl. 2, figs. 8-10; pl. 3, fig. 1) also described specimens as *P. corrugata*, which bear some resemblance to the present specimen.

Pholadomya tumida, introduced by AGASSIZ (1842: 111, pl. 2a, figs. 6-11; pl, 5b, figs. 1-3) has ribs slightly curving towards the antero-ventral margin, in contrast to the specimen described herein in which the ribs are directed backward. As *P. tumida* is restricted to the Upper Jurassic, the stratigraphical range is also different.

The specimen is also related to *P. glabra* AGASSIZ (1842: 69, pl. 31, figs. 12-14) in shape, but *P.* (*Pholadomya*) sp. A does not possess commarginal ribs.

Occurrence. Pliensbachian of Bogorodica.

Pholadomya (*Pholadomya*) sp.
Pl. 15, Figs. 1, 2

Material. 1 articulated specimen from Senokos (RGF BR 79/81) and 2 articulated specimens from Rosomač (RGF BR 81/17, 81/18).
Measurements (in mm).

	L	H	H/L
RGF BR 79/81	81.2	55.4	0.68
RGF BR 81/17	73.5	47.5	0.65
RGF BR 81/18	81.7	61.2	0.75

Description and remarks. Shell medium in size, transversally elongated with valves which are equally and moderately inflated. Anterior and posterior margins convex; ventral margin straight. Umbones placed at quarter of shell-length from the anterior end. The ornamentation consists of radial ribs. In view of the poor preservation of the specimens it was identified to the subgenus only.
Occurrence. Pliensbachian of Senokos and Rosomač.

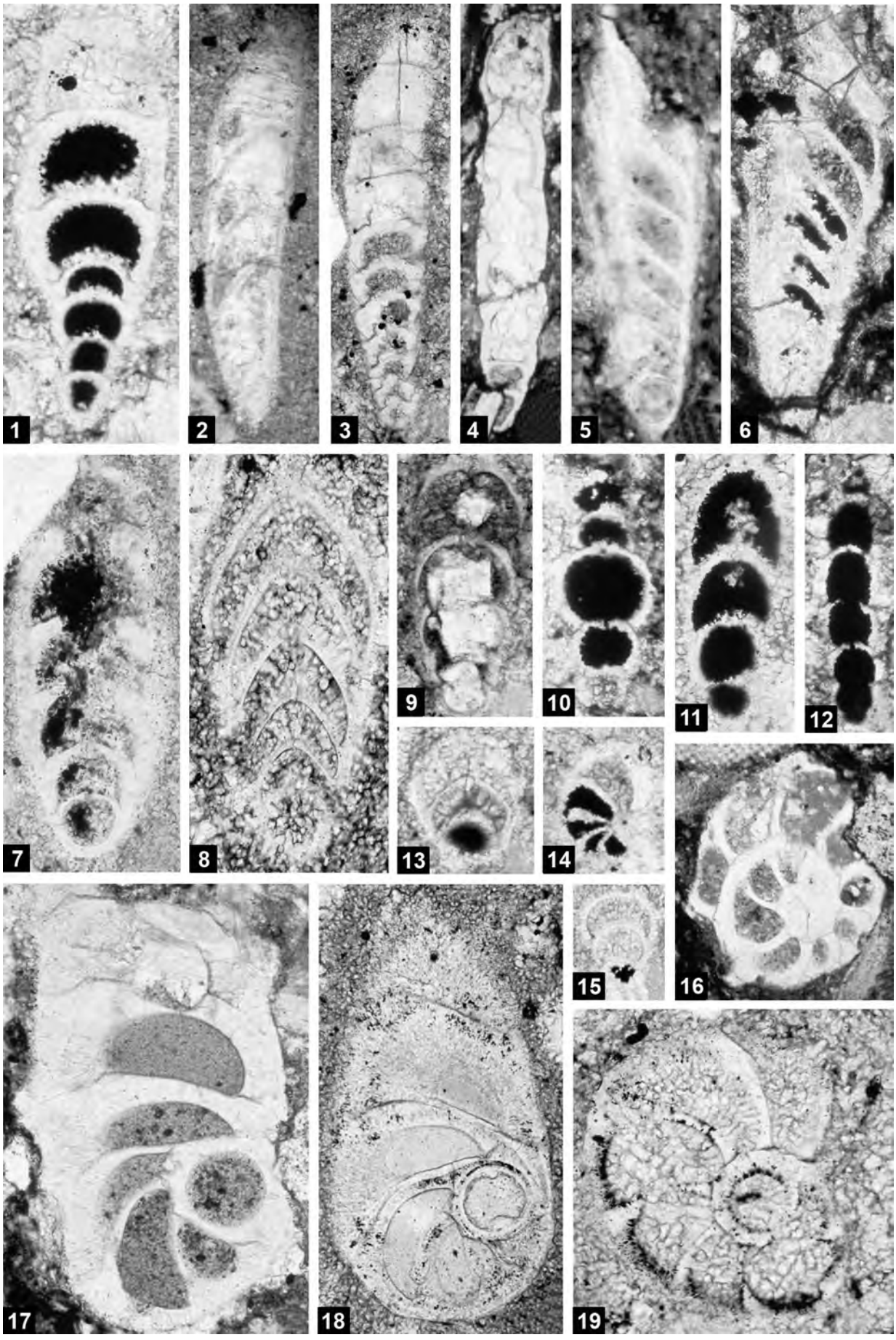
Genus *Pachymya* J. DE C. SOWERBY, 1826
Subgenus *Arcomya* ROEMER, 1839

Type species. *Solen helveticus* ROEMER, 1839.

Pachymya (*Arcomya*) *elongata* (AGASSIZ, 1843)
Pl. 15, figs. 4-6

1839 *Panopaea elongata* Nob. – ROEMER: 126, pl. 8, fig. 1.
1843 *Arcomya elongata* AG. – AGASSIZ; 179, pl. 10, figs. 2-5.
1968 *Arcomya elongata* AGASSIZ – SHOPOV: 506, pl 24, figs. 6-8.
1993 *Pachymya* (*Arcomya*) *elongata* (ROEMER) – ŽIVANOVIĆ: 190, pl. 2, fig. 2.

Plate 19. (All figures x 160)
Fig. 1. *Pseudonodosaria vulgata* (BORNEMANN, 1854). Longitudinal section. Rosomač; thin-section BR Ro 0/1.
Fig. 2. *Dentalina communis* D'ORBIGNY, 1826. Longitudinal section. Velika Lukanja; thin-section BR VL 2.
Fig. 3. *Dentalina terquiemi* D'ORBIGNY, 1850. Longitudinal section. Senokos; thin-section BR Se 3.
Fig. 4. *Marginulina* cf. *prima* D'ORBIGNY, 1849. Longitudinal section. Velika Lukanja; thin-section BR VL 2.
Figs. 5, 6. *Vaginulina listi* (BORNEMANN, 1854)
5. Longitudinal section. Velika Lukanja; thin-section BR VL 1/1.
6. Longitudinal section. Rgotina; thin-section BR Rg 3/1.
Fig. 7. *Pseudonodosaria melo* (BORNEMANN, 1854). Longitudinal section. Senokos; thin-section BR Se 3.
Figs. 8, 13. *Ichthyolaria brizaeformis* (BORNEMANN, 1854). Longitudinal sections. Rgotina; thin-section BR Rg 3.
Fig. 9. *Nodosaria metensis* TERQUEM, 1863. Longitudinal section. Senokos; thin-section BR Se 8.
Fig. 10. *Nodosaria* sp. Longitudinal section. Rosomač; thin-section BR Ro 0.
Figs. 11, 15. *Lingulina* gr. *tenera* BORNEMANN, 1854
11. Longitudinal section. Bogorodica; thin-section BR Bo 6;
15. Longitudinal section. Rgotina; thin-section BR Rg 3a.
Fig. 12. *Nodosaria dispar* FRANKE, 1936.Longitudinal section. Rgotina; thin-section BR Rg 2/1.
Fig. 14. *Lenticulina varians* (BORNEMANN, 1854). Longitudinal section. Bogorodica; thin-section BR Bo 4.
Fig. 16. *Lenticulina muensteri* (ROEMER, 1839). Longitudinal section. Velika Lukanja; thin-section BR VL 2.
Fig. 17. *Astacolus matutinus* (D'ORBIGNY, 1850). Senokos; thin-section BR Se 9.
Fig. 18. *Planularia cordiformis* (TERQUEM, 1863). Longitudinal section. Rgotina; thin-section BR Rg 4.
Fig. 19. *Lenticulina acutiangulata* (TERQUEM, 1863). Longitudinal section. Bogorodica; thin-section BR Bo 2a.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Material. Three articulated specimens from Bogorodica (RGF BR 80/94, 80/ 6, 80/7).
Measurements (in mm).

	L	H	H/L
RGF BR 80/94	39.2	15.9	0.40
RGF BR 80/6	51.1	18.2	0.36
RGF BR 99/7	62.5	23.2	0.37

Description. Shell strongly transversely elongated, equivalved, anterior and posterior margins equally rounded, dorsal and ventral margins almost straight, nearly parallel, with anterior and posterior ends gaping. Greatest inflation of the shell at anterior third or at mid-valves. Orthogyrous umbones low and broad, with obtuse umbonal carina, situated one-third to one-fourth of shell length from the anterior. Lunule large and wide. Posterior umbonal ridge slightly pronounced, extending diagonally to posteroventral corner, but does not reach it. Whole surface ornamented with irregularly spaced commarginal growth lines and faint undulations.
Remarks. The specimens of this species figured by ROEMER (1839) and AGASSIZ (1843) differ only a in somewhat wider posterior end, which is intraspecific variation of this species. The same with of the posterior end is observed in the Callovian *P.* (*A.*) *tunisiensis* HOLZAPFEL (1998: pl. 11, figs. 1-4) from southern Tunisia. The Bulgarian specimen of *P.* (*A.*) *elongata* from the Sinemurian is somewhat larger and has the same shell shape as the Serbian forms. In the shell shape, length/hight ratio and the presence of a posterior umbonal ridge, it is very close to the Kimmeridgian *Pachymya* (*Acromya*) *helvetica* AGASSIZ (1843: 167, pl. 10, figs. 7-10) from Switzerland. The length/height ratio in the present specimens ranges from 2.46 to 2.81 which corresponds well to that in the latter (in the holotype it is 2.56). It is most probably a long-ranging species conspecific with *P.* (*A.*) *elongata*.
Occurrence. Pliensbachian of Bogorodica.

Family Pleuromyidae DALL, 1900
Genus *Pleuromya* AGASSIZ,1842

Type species. *Mya gibbosa* J. DE C. SOWERBY, 1823.

Pleuromya uniformis (J. SOWERBY, 1813)

Pl. 15, Figs. 7, 8; Pl. 16, Figs. 1-6

1813 *Unio uniformis* sp. nov. – J. SOWERBY: 83, pl. 33, fig. 4.
1971 *Pleuromya uniformis* (J. SOWERBY) – VÖRÖS: 199, pl. 5, fig. 5.
1978 *Pleuromya uniformis* (J. SOWERBY) – DUFF: 116, pl. 13, figs. 11, 14, 18, 21 (cum syn.).
1991 *Pleuromya uniformis* (J. SOWERBY) – HEINZE: 28-31, 41-43, 72, 81, 82, 90.
1991 *Pleuromya uniformis* (J. SOWERBY) – YIN & FÜRSICH: 157, pl. 12, figs. 1-7.
1996 *Pleuromya* cf. *uniformis* (J. SOWERBY) – DAMBORENEA: 155, 157.
1996 *Pleuromya uniformis* (J. SOWERBY) – DAMBORENEA: 159.
1996 *Pleuromya uniformis* (J. SOWERBY) – PANDEY et al.: 62 , pl. 7, figs. 5-11.
1998 *Pleuromya* cf. *uniformis* (J. SOWERBY) – HOLZAPFEL: 123, pl. 10, fig. 22.
2001 *Pleuromya uniformis* (J. SOWERBY) – DELVENE: 100, pl. 8, figs. 6, 7.
2011 *Pleuromya uniformis* (J. SOWERBY) – RADULOVIĆ in CAREVIĆ et al.: 371, 373, 376, figs. 6.5, 6.

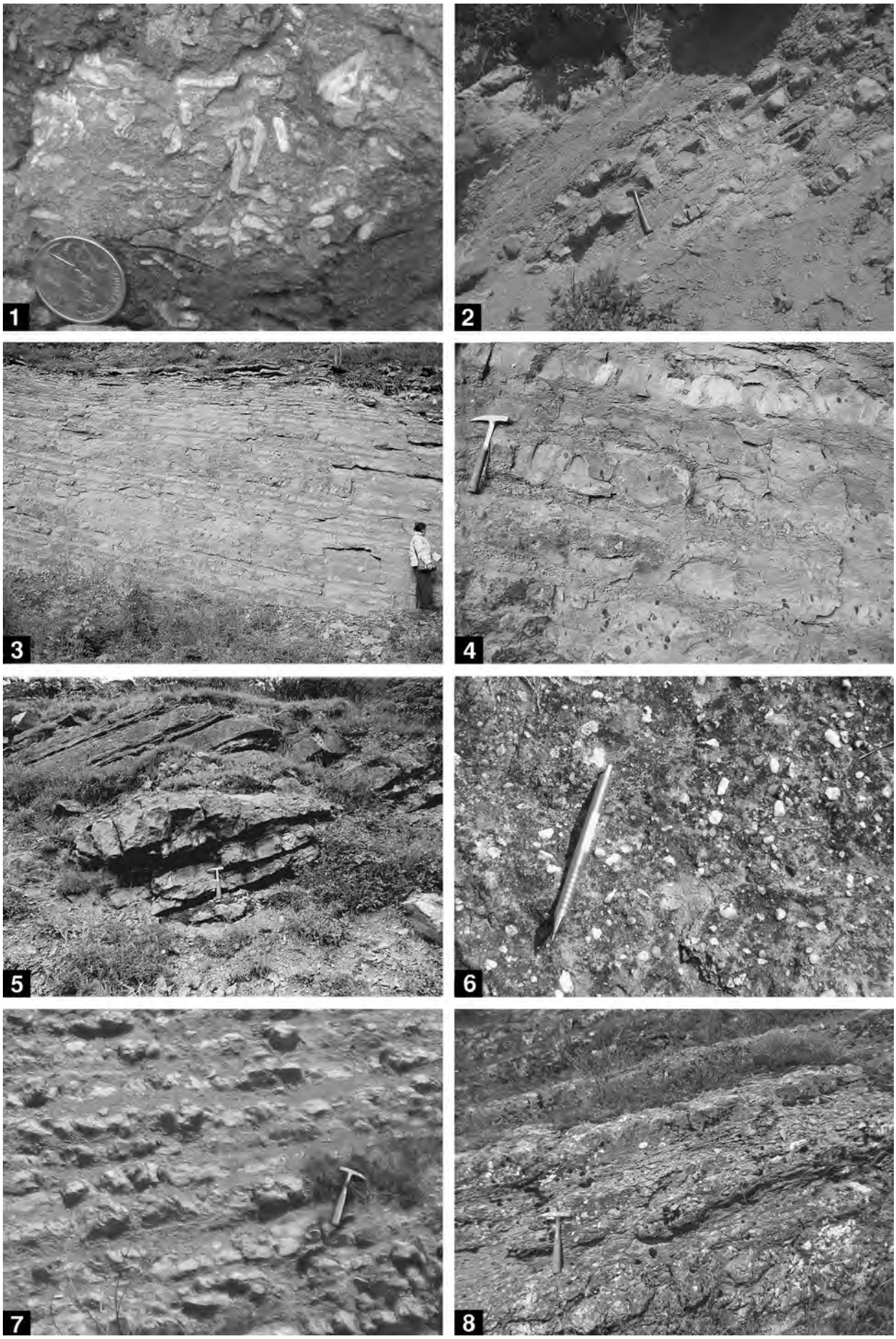
Material. Two articulated specimens from Senokos (RGF BR 79/84, 79/ 85); 15 articulated specimens from Bogorodica (RGF BR 80/63, 80/64, 80/65, 80/66, 80/67, 80/68, 80/70, 80/71, 80/72, 80/73, 80/74, 80/75, 80/76, 80/80, 80/87); 2 articulated specimens from Radejna (RGF BR 94/17, 94/18); 8 articulated specimens from Velika Lukanja (RGF BR 98/65, 98/66, 98/67, 98/68, 98/69, 68/70, 98/71, 98/72); 1 articulated specimen from Rgotina (RGF BR 99/7); 8 articulated specimens from Petrlaš (RGF BR 101/4, 101/5, 101/6, 101/7, 101/9, 101/15, 101/16, 101/23).
Measurements (in mm).

	L	H	H/L
RGF BR 80/73	44.1	27.6	0.62
RGF BR 80/76	39.2	25.7	0.65
RGF BR 80/94	41.2	17.2	0.42

Description. Shell medium in size, equivalved and inequilateral, with strongly inflated valves; transversely elongated. Anterior margin convex, anterodorsal margin slightly concave; ventral margin long and slightly convex. Umbones little prominent, situated one-third to one-fourth of shell length from, rarely even close to the anterior end. The surface of the shell is covered with irregular growth lines.
Remarks. It is generally known that species of the cosmopolitan genus *Pleuromya*, which reached its maximum development in the Jurassic of Europe, are very difficult to differentiate. As a consequence, numerous names exist in the literature. Clearly, the genus is in urgent need of revision.

PANDEY et al. (1996) mentioned transitional forms between *P. uniformis* (J. SOWERBY) and *P. alduini* (BRONGIART) from the Jurassic of western India, but in the absence of available data on entire populations, these

Plate 20. Examples of facies from the Lower Jurassic of eastern Serbia. Fig. 1. Bioclastic limestones with algae, Pesača section.
Fig. 2. Alternation of bioclastic and micritic limestones and marly bioclastic limestones, Velika Lukanja section.
Figs. 3. Alternation of bioclastic limestones and silty-sandy bioclastic limestones, Bogorodica section.
Fig. 4. Detail of Fig. 3.
Fig. 5. Alternation of bioclastic limestones and silty-sandy limestones, Rosomač section.
Fig. 6. Sandy crinoidal limestones with quartz pabbles, Senokos section.
Fig. 7. Alternation of sandy bioclastic limestones and marly bioclastic limestones, Rgotina section.
Fig. 8. Alternation of micritic peloidal limestones and bioclastic marls of the Petrlaš section.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authors identified all specimens as *P. uniformis*. Similarly, all specimens from eastern Serbia that include many transitional forms between the two species are assigned to *P. uniformis*.

Duff (1978) noted the high variability of the species, which increases the difficulty to classify populations from different stratigraphic levels into particular species or subspecies.

P. unioides Goldfuss (e.g., Chapius & Dewalque 1853: 153, pl. 20, fig. 3; Cohen 1931: 76, pl. 2, fig. 27; Radulović 1982: 319, pl. 6, fig. 4) is often mentioned in the literature to differ from *P. uniformis* even though lacking diagnostic features. It is regarded as being different probably due to its different stratigraphic position, *P. unioides* dated as Lower Jurassic and *P. uniformis* as Middle and Upper Jurassic (Aalenian-Oxfordian).

Occurrence. Pliensbachian of Senokos, Bogorodica, Radejna, Velika Lukanja, Rgotina, and Petrlaš.

Pleuromya cf. *uniformis* (J. Sowerby, 1813)

Pl. 16, Figs. 7, 8

Material. Two poorly preserved articulated specimens from Rosomač and Rgotina (RGF BR 81/16, 99/25).

Measurements (in mm).

	L	H	H/L
RGF BR 81/16	81.2	42.6	0.52

Remarks. Specimens similar to *Pleuromya uniformis* in external features, such as shell shape, inflation, and position of umbo, but differing in being somewhat larger, may be gerontic forms of this species. The main reasons for leaving them in open nomenclature are their size, which is unusual for the species, and damage, which obscured the ornamentation pattern.

Occurrence. Pliensbachian of Rosomač and Rgotina.

Acknowledgements

I wish to acknowledge all persons in the Institut für Paläontologie der Universität Würzburg for the hospitality and kindness they showed to me during my stay in Würzburg.

I am particularly grateful to my supervisor Prof. Dr. Franz T. Fürsich for taxonomic advice, useful suggestions and thorough review. My sincere thanks to Dr. M. Heinze for the time and assistance he gave me. A word of gratitude is due to Dr. W. Werner (Munich) for his kind attention during my visit to the Paläontologisches Museum of München. Prof. Dr. P. Tchoumatchenco and Dr. D. Ivanova (Bulgarian Academy of Science, Sofia) greatly assisted me during my field work. Msc. L. Katsikas (University of Belgrade) corrected the English. The study has been supported by a DAAD (Deutscher Akademischer Austauschdienst) Scholarship in 2007 and by the Ministry of Education and Science of the Republic of Serbia (Project 176015).

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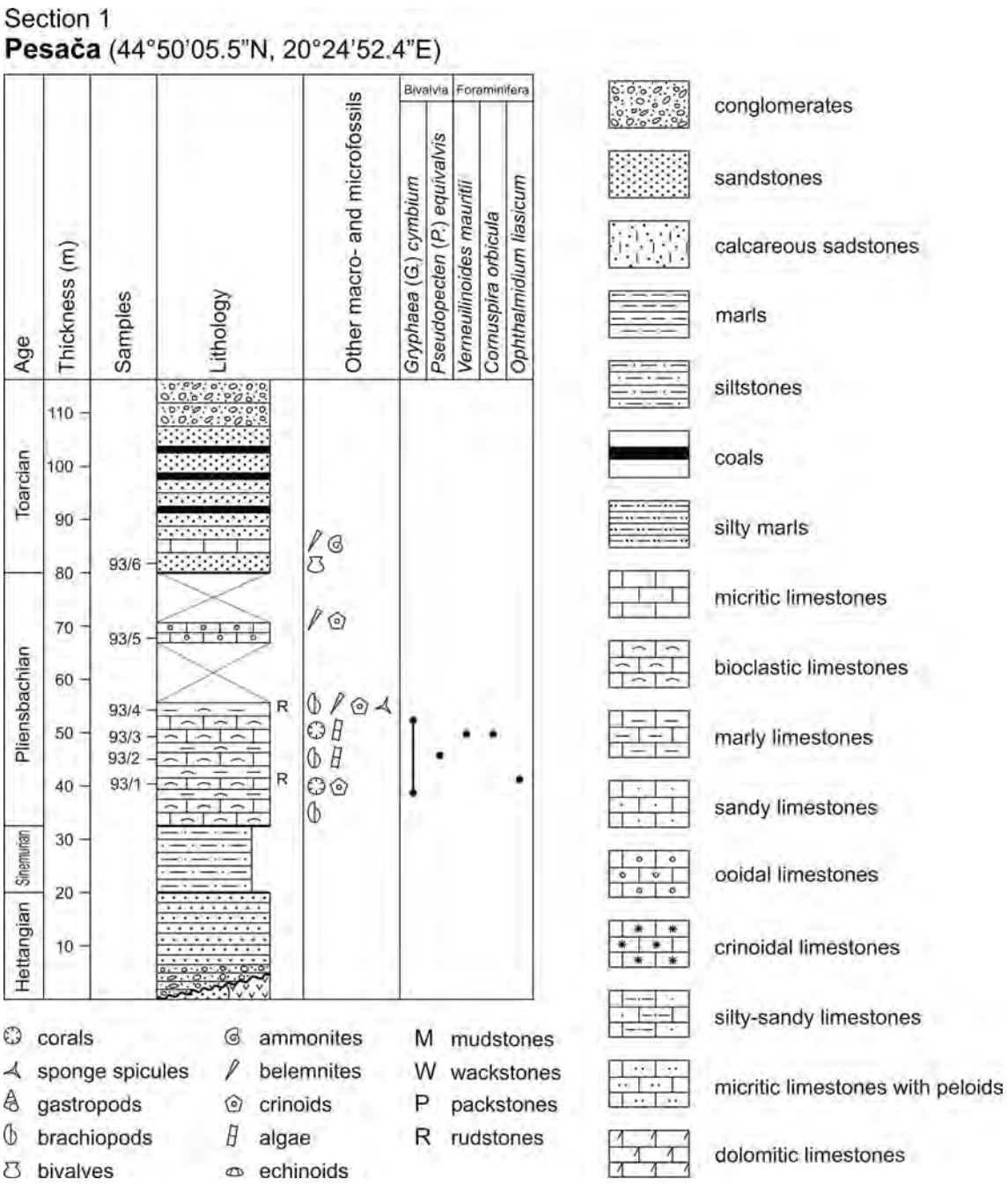
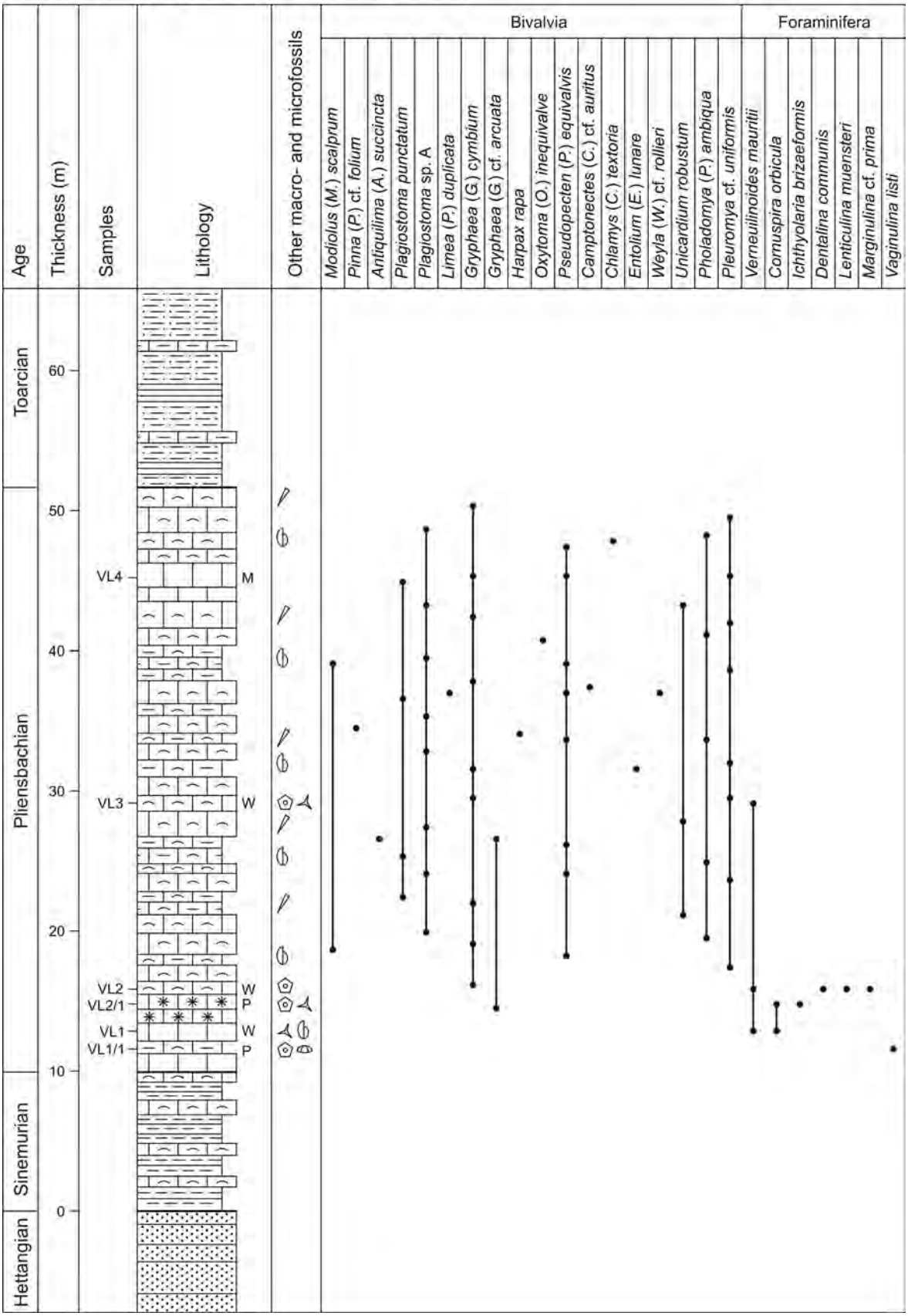
Appendix

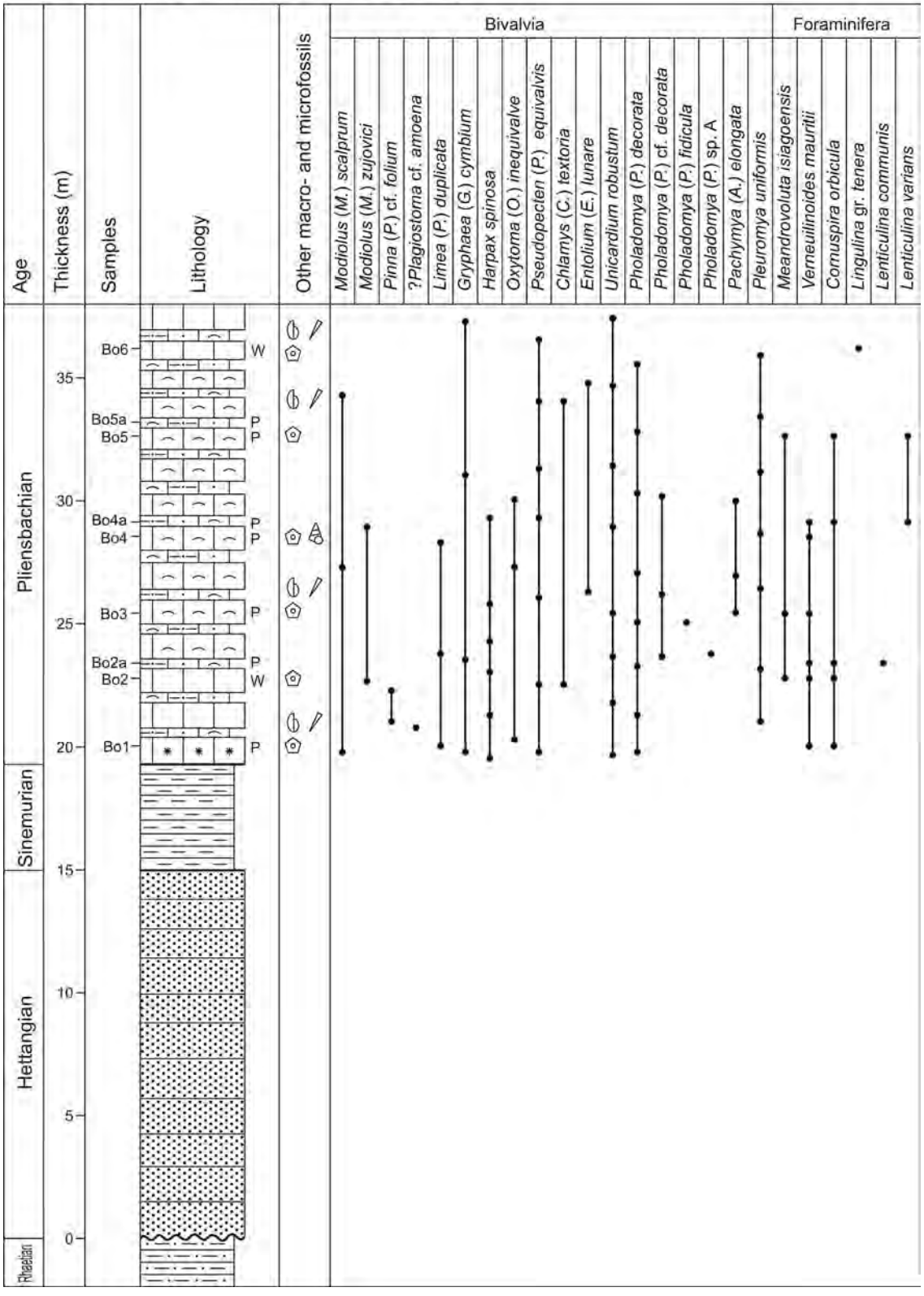
Stratigraphic columns and distribution charts of the bivalve and foraminifera taxa. For the geographic position of the sections see Text-fig. 1.



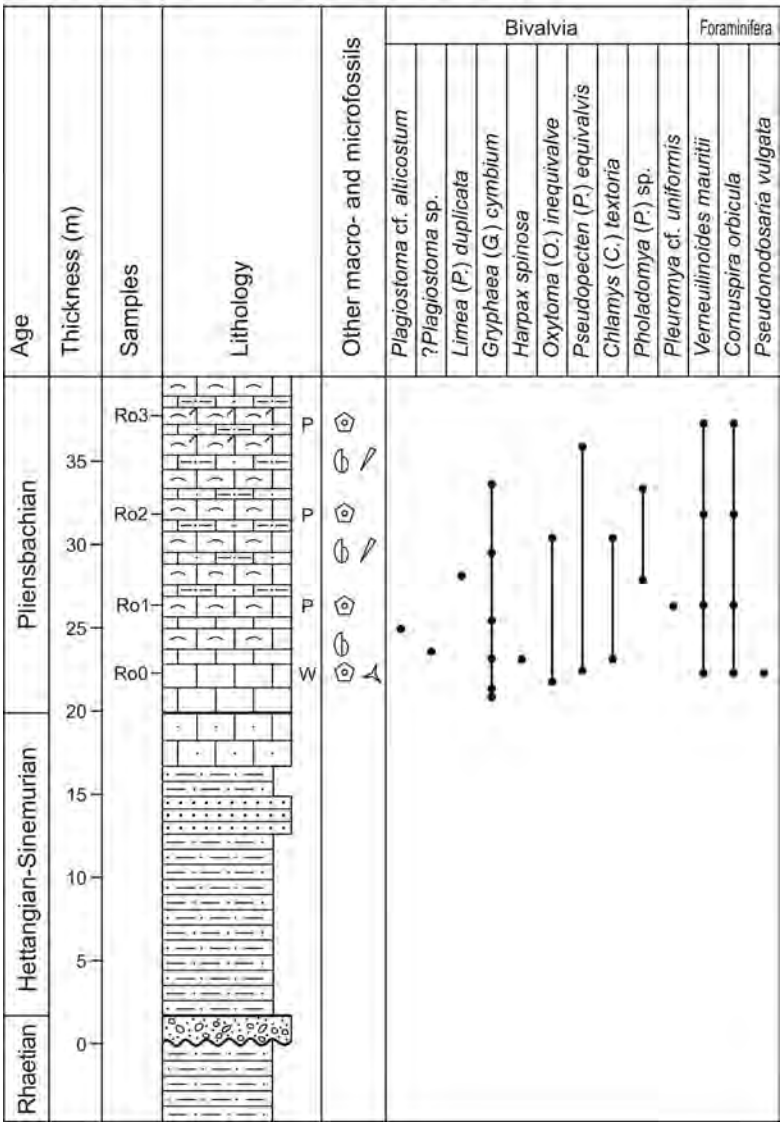
Section 2
Velika Lukanja (43°14'05.0"N, 22°39'18.9"E)



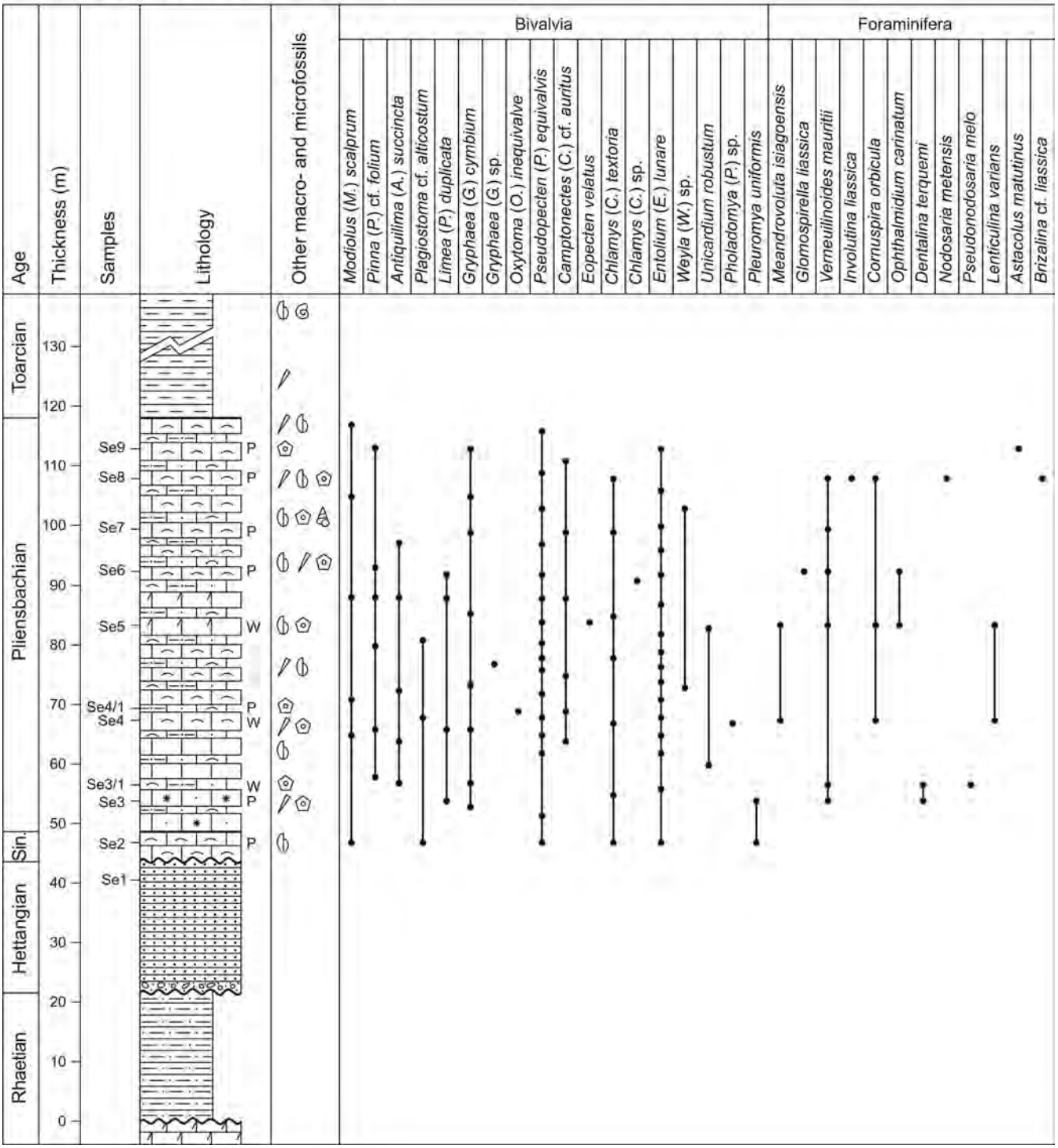
Section 3
Bogorodica (43°10'32.7"N, 22°49'38.2"E)



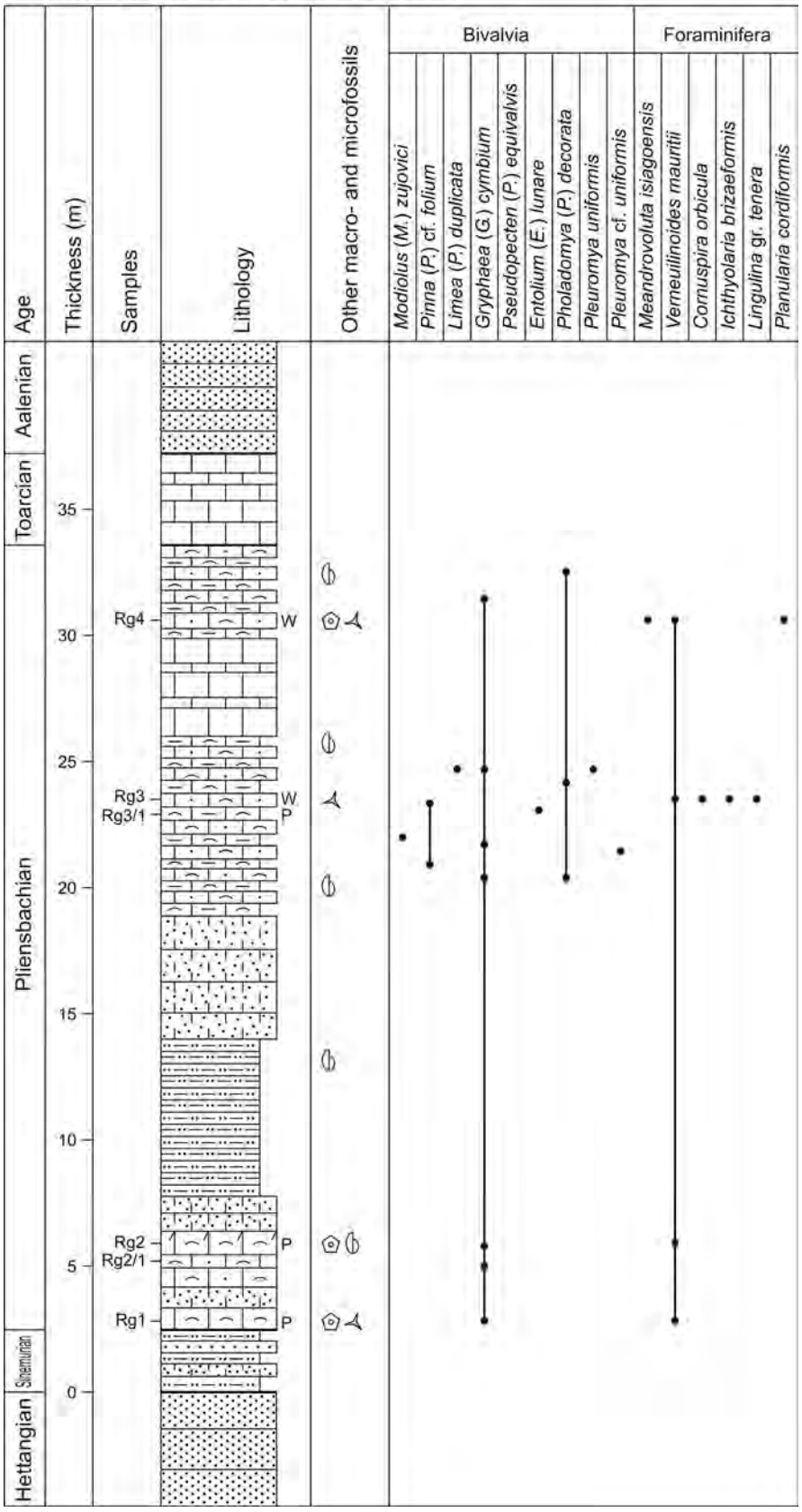
Section 4
Rosomač (43°10'31.3"N, 22°49'37.5"E)



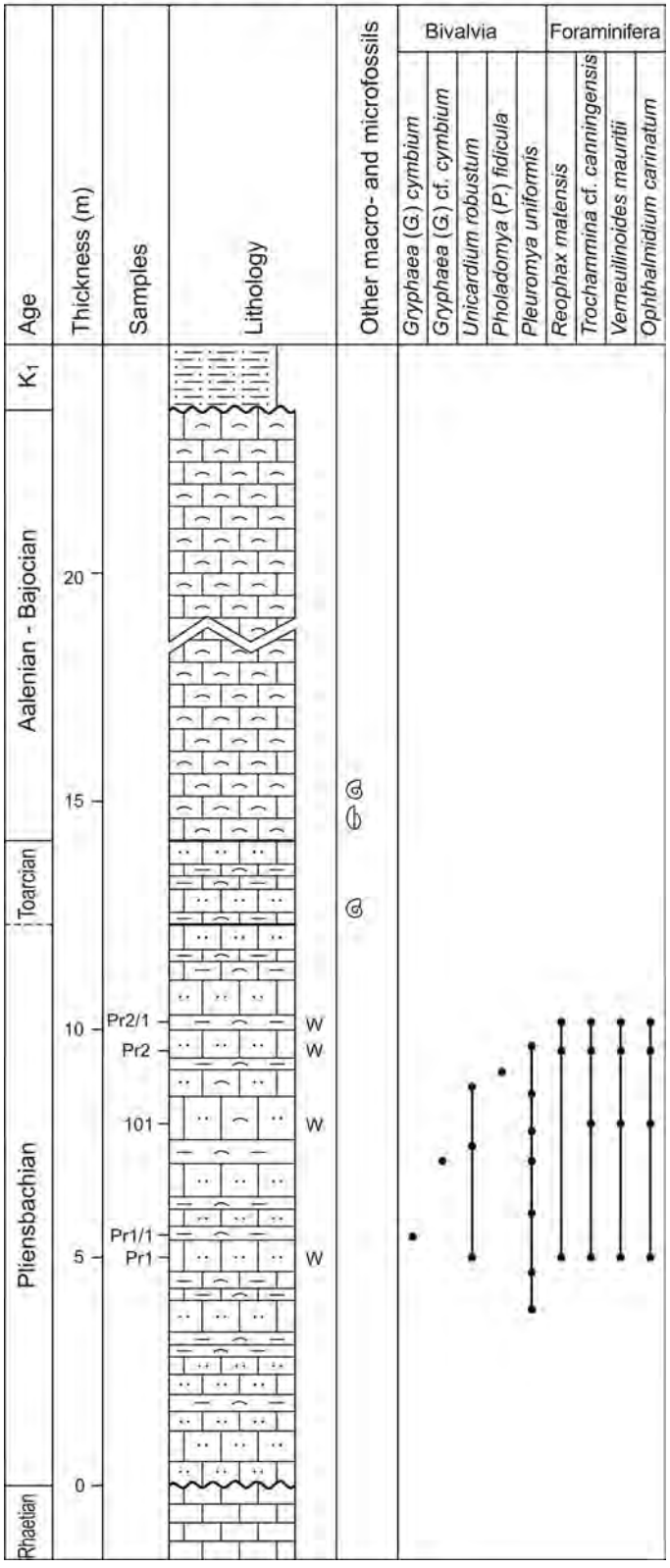
Section 5
Senokos (43°8'39.9"N, 22°38'30.4"E)



Section 6
Rgotina (44°01'02.7"N, 22°15'22.2"E)



Section 7
Petrlaš (43°03'50.3"N, 22°47'24.6"E)



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