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Genus *Eckhardites* Mitta (Cardioceratidae, Ammonoidea) from the Lower Callovian of the Subboreal Jurassic

V. V. Mitta

Paleontological Institute, Russian Academy of Sciences, Profsoyuznaya 123, Moscow, 117997 Russia
e-mail: mitta@paleo.ru

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Abstract—The genus *Eckhardites* Mitta 1999, with the type species *Macrocephalites pavlowi* Smorodina, 1928 is discussed and its diagnosis and assignment to the family Cardioceratidae are substantiated. *Eckhardites* is compared to the genus *Macrocephalites* Zittel (family Sphaeroceratidae), to which some workers presently assign the type species of *Eckhardites*. Three species of *Eckhardites* are recorded from the basal Callovian *elatmae* Zone of the Russian Platform, one of which (*E. menzeli* (Mönnig)) was originally described from the synchronous beds in Germany. A new species *E. dietli* sp. nov. is described.

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Key words: genus *Eckhardites*, Cardioceratidae, Ammonoidea, Lower Callovian, subboreal Jurassic.

INTRODUCTION

Several years ago (Mitta, 2000) described the genus *Eckhardites* Mitta, 1999 with the type species *Macrocephalites pavlowi* Smorodina and containing two other species identified in open nomenclature (*Eckhardites* sp. and *E.* aff. *menzeli* (Mönnig)) in the family Cardioceratidae Siemiradzki, 1891. However, some workers did not accept this genus and continued assigning the type species and its close allies to the genus *Macrocephalites*, following N.S. Smorodina who worked at the beginning of the 20th century. In addition, recently, *Eckhardites* has also been recorded in various sections and horizons of the Lower Callovian of European Russia. Therefore, it has become necessary to reexamine this genus, especially its differences from *Macrocephalites*.

In 1928, Smorodina described a new species *Macrocephalites pavlowi*, based on three specimens (from the Unzha River basin in the Kostroma Province, collected by M.I. Sokolov and M.A. Veidenbaum; from the Sura River basin in the Nizhnii Novgorod Region, collected by A.P. Pavlov) in a paper on the genus *Chamoussetia* (Cadoceratinae, Cardioceratidae) and discussed its relationships with the closely related taxa. At the end of the 20th century I discovered and refigured two of Smorodina's syntypes in the collections of the Vernadsky State Geological Museum, in Moscow (Mitta and Starodubtseva, 1998, pl. 1, fig. 1; pl. 2, figs. 1, 2). A third syntype, which had not been previously figured, was discovered later (Mitta, 2000, pl. 7, fig. 2). The reexamination of the type series and other material, including specimens collected by myself, allowed the conclusion that this species belongs to a new genus in the family Cardioceratidae (Mitta, 1999), which received the name *Eckhardites*.

Gulyaev (1999) described several specimens of *Eckhardites* (from Ivkino on the Unzha River in the Kostroma Region and from Prosek-Isady on the Volga River in the Nizhnii Novgorod Region) as *Macrocephalites (Macrocephalites) pavlowi* Smorodina and *M. (M.)* ex gr. *jacquoti* Douvillé. Later (Gulyaev, 2001) some of the specimens were refigured. *M. prosekensis* Gulyaev (= nom. nov. pro *Macrocephalites (M.)* ex gr. *jacquoti* sensu Gulyaev, 1999, pl. 1, fig. 1). was established based on a specimen less than 50 mm in diameter. Later, Gulyaev (2007) figured but did not describe three specimens of *E. pavlowi* from Churkina on the Pizhma River (Pechora River basin) as *Macrocephalites (M.) pavlowi, M. (M.)* cf./aff. *jacquoti* and *M. (M.) prosekensis.*

Gulyaev did not discuss *Eckhardites* in the above papers, but recently in their joint papers, Kiselev and Rogov (2007a, 2007b) discussed matters regarding this genus. The above workers have no doubts concerning the validity of the lineage *Macrocephalites jacquoti* ⟶ *M.* cf./aff. *jacquoti* ⟶ *M. prosekensis* ⟶ *M. pavlowi*, and they propose the first species as an index species of the basal faunal horizon of the Callovian on the Russian Platform. The state of preservation of their material is poor (which was also acknowledged by the authors themselves) and in most cases does not allow specific identification. Therefore I reidentify *"Macrocephalites jacquoti"* (Kiselev and Rogov, 2007b, pl. 2, figs. 3–7) as *Eckhardites* sp. juv., whereas *"M. prosekensis"* (Kiselev and Rogov, 2007b, pl. 5, fig. 2), apparently belongs to *E. pavlowi.*

The confusion displayed above shows that a comparative study of *Eckhardites* and *Macrocephalites* is necessary to resolve difficulties in identifications of genera and families in this group. In the Callovian of

the Russian Platform, representatives of the genus *Macrocephalites* are found across a large territory, but are rare. Representatives of *Macrocephalites* from central Russia were previously considered by me (Mitta, 1998; 2000). The Lower Callovian beds in this region definitely contain *M. pila* (Nikitin, 1885), *M. verus* Buckman, 1922, *M. zickendrathi* Mitta, 1998 (including *M. volgensis* Gulyaev, 1999, as a junior subjective synonym), and, apparently, *M. krylowi* (Milachewitsch, 1879) (the holotype of the latter species is lost). Several other forms are described in open nomenclature. All these ammonoids are readily distinguished from *Eckhardites* by the shell shape and ornamentation. Therefore, for comparison, it is suitable to consider *Macrocephalites jacquoti*, which, in my opinion, has been erroneously recorded from the Russian Platform.

The name *Ammonites jacquoti* was proposed by Douvillé (1878, p. 570; cit. after Callomon, 1971) for *Ammonites macrocephalus compressus* Quenst. (Quenstedt, 1849, p. 182, pl. 15, fig. 1; the lectotype was refigured by Thierry (1978, pl. 27, fig. 1). The type series comes from Southern Germany (Swabia). I had an opportunity to study the extensive material on this species from the Swabian Alps (Swäbische Alb) in the Stuttgart Museum of Natural History. G. Dietl kindly gave me for examination several specimens of *M. jacquoti* from the "Macrocephalen-Oolith" (faunal horizon *keppleri*) from the Albstadt–Pfeffingen Section. In addition, an amateur paleontologist N. Wannenmacher donated an excellent collection of juvenile specimens of this species from the Bisingen–Thanheim locality in the valley of the Klingenbach River (see Dietl, 1981 for the section description). Like the previous, the latter collection comes from the main bed of "Macrocephalen-Oolith." This allowed the comparison of the Swabian and Central Russian material.

DISCUSSION

In Jurassic ammonites, differences of the generic rank and more so of the familial rank are usually well pronounced at early stages, at a diameter of 15–20 mm. At this ontogenetic stage, *M. jacquoti* is characterized by strongly inflated whorls with a rounded cross-section with a wide venter (see Pl. 6, figs. 1–3; pl. 7, fig. 2). The whorl height is slightly less (at Dm less than 15 mm) or equal to the whorl width (Dm = 5–25 mm). With age, (Pl. 7, figs. 1, 4) the shell becomes less inflated, with the height exceeding the width by 20% at the most. At early stages, the umbilicus is moderately narrow, becoming narrower as the shell grows. The table below shows shell dimensions in mm and their ratios (material with abbreviation SMNS belongs to the Stuttgart Museum of Natural History, whereas collection no. 5029 is housed in the Paleontological Institute, Russian Academy of Sciences):

Specimen no.	Dm	WH	WW	Du	WH/Dm	WW/Dm	Du/Dm
SMNS 62500	154	93	75	16	0.6	0.49	0.1
	127	71	58	15	0.56	0.46	0.12
SMNS 67152	64	35	29.5	7	0.55	0.46	0.11
5029/074	45	23	23	9	0.51	0.51	0.2
	32	17	17	7	0.53	0.53	0.22
5029/072	25	12	14	5	0.48	0.56	0.2
5029/067	21	10	10	4	0.48	0.48	0.19
5029/066	20	10	11	4	0.5	0.55	0.2
5029/078	20	11	10	3	0.55	0.5	0.15
	14	6	8	2	0.43	0.57	0.14
5029/065	17	8	10	3	0.47	0.59	0.18

The ornamentation at early stages is represented by relief, mainly bifurcating ribs, equally high along their entire length, which run radially across the flanks, and are slightly bent orad on the venter. The bifurcation point lies in the lower third–middle zone of the flanks. AS the shell grows, the ribs become weaker, but are usually well pronounced almost until the end of the phragmocone (Fig. 1), which on average reaches 175 mm in diameter (see Dietl and Gygi, 1998, pl. 3). Usually, in *Macrocephalites*, the adult shell with the body chamber occupies 0.8 of the whorl, reaching 200 mm or more in diameter. The aperture in these forms is simple, with a small ventral projection. G. Schweigert (pers. comm.) informed me that the collection of the Stuttgart Museum of Natural History contains a specimen of *M. jacquoti* from the locality Albstadt–Pfeffingen, 240 mm in diameter, with a complete body chamber, occupying about 0.8 of the whorl and without a well-developed preapertural constriction.

At a diameter 15–35 mm, *Eckhardites* (see dimensions below, in the description of a new species) are characterized by flattened or moderately wide whorls, with high, arrow-shaped cross section, and with a narrow venter (Pl. 6, fig. 6; pl. 7, figs. 4–6). The whorl height is considerably greater than its width (by 40–50%). As the shell grows, the whorls become wider, and some species have a weakly inflated body chamber. The umbilicus is narrow or moderately narrow.

At early stages, the ornamentation is represented by relatively thin ribs, arranged in bunches of 3–5 branches, running across the flanks with a strong inclination orad. At Dm > 15–25 mm the ribs in the umbilical zone and most of the flanks are smoothened. Thus, in the last 1.5–2 whorls of the phragmocone, the ribs are observed mainly in the ventrolateral region. The body chamber can be smooth, possessing only growth lines (Pl. 7, fig. 5) or, quite the opposite, may have sharp ventral ribs (Mitta, 2000, pl. 8, fig. 1). The ultimate phragmocone diameter is about 100 mm; whereas adult specimens with a complete body chamber of 0.5–0.6 of the whorl reach on average 115–175 mm in diameter. In macroconchs, the aperture is simple, but with a narrow

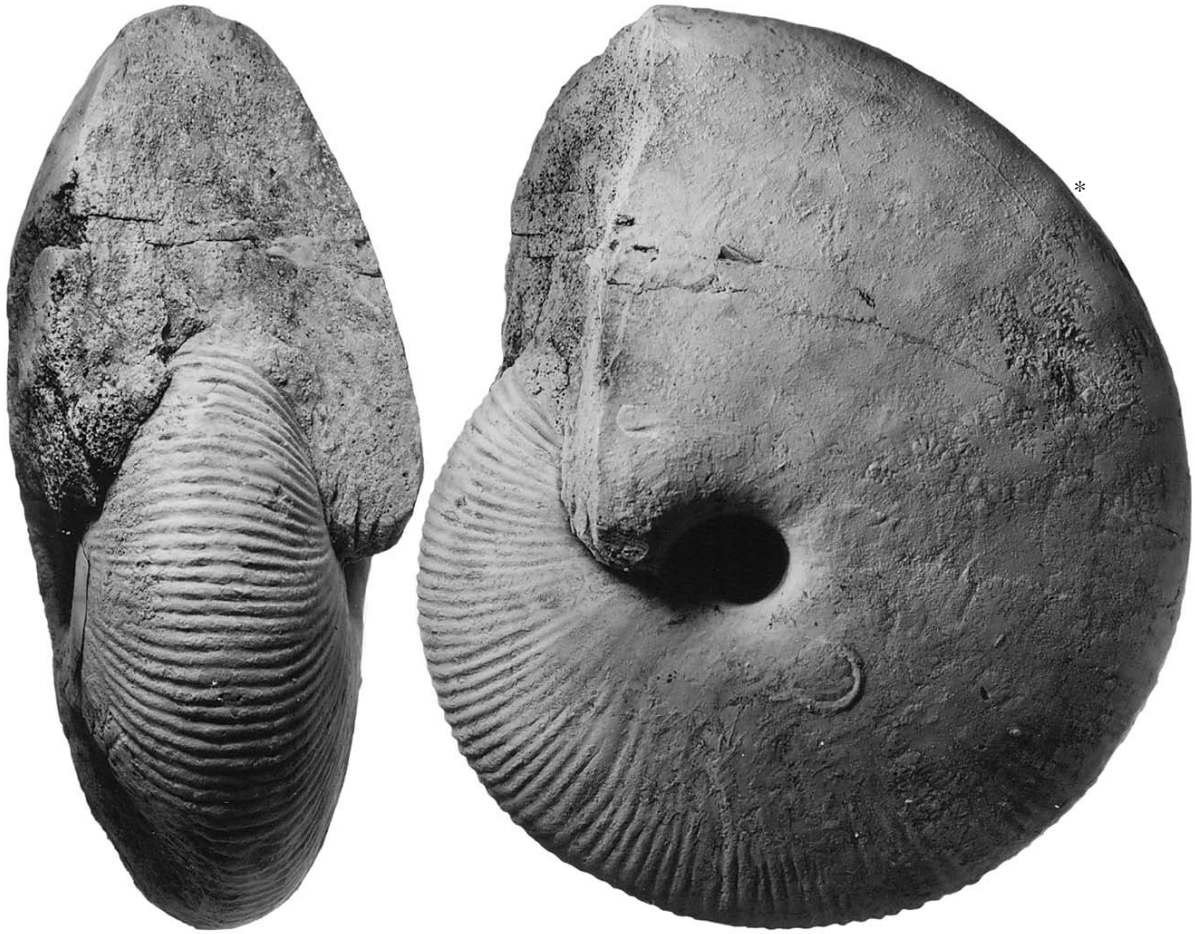


Fig. 1. *Macrocephalites jacquoti* H. Douvillé, macroconch. Stuttgart Museum of Natural History, specimen no. 62500, diameter 167 mm; Southern Germany, Albstadt–Pfeffingen; "Macrocephalen-Oolith," Lower Callovian, *Macrocephalites herveyi* Zone, *Kepplerites keppleri* Subzone, *Kepplerites keppleri* faunal horizon. The asterisk marks the beginning of the body chamber.

ventral projection (rostrum) characteristic of cardioceratids with an oxyconic shell (Pl. 6, fig. 9). In addition, the molds show a wide and deep preapertural constriction. This feature is typical of arctocephalitins and cadoceratins and is absent or weakly developed in macrocephalitins. Thus, species of *Eckhardites* are readily distinguished from *Macrocephalites jacquoti* at all growth stages studied and these differences are especially strongly observed in juvenile whorls. The whorl width to height ratio at the early stages is stable in the samples for each genus (the tables contain dimensions of five or six specimens of a similar (small) diameter). The inner whorls of the macroconchs of the cardioceratid subfamily Cadoceratinae, *Rondiceras milaschevici* (Nikitin) (Pl. 6, fig. 7) and *Chamoussetia buckmani* Callomon et Wright (Pl. 6, fig. 8), are shown for comparison. Evidently, *Eckhardites* are morphologically more similar to these ammonites, which also have compressed whorls with a high, arrow-shaped cross section, than to *Macrocephalites*.

The representatives of the Middle Jurassic cardioceratids, with a mostly inflated, cadiconic shell, display a prominent trend toward the oxyconic shell. In the subfamily Cadoceratinae, two cases of iteration are recorded that led to the development of lateral (dead-end) lineages, with an oxyconic shell (the Early Callovian genus *Chamoussetia* and Late Callovian genus *Platychamoussetia*). Only in the Late Jurassic (Oxfordian and Kimmeridgian), Cardioceratidae acquired permanently an oxyconic shell with a ventral keel. However, even earlier than that, in the Bathonian, Arctocephalitinae (genus *Arcticoceras*, whose representatives were also assigned 100 years ago to *Macrocephalites*) had a suboxyconic shell. Apparently, the genus *Eckhardites* evolved from arctocephalitins; and this was one of the first attempts to acquire an oxyconic shell. A comparative study showed that *Eckhardites* are not identical to *Macrocephalites*, whereas the similarity of the shell shape and ornamentation at some ontogenetic stages may be explained by homeomorphy and/or remote relationship (macrocephalitins and arctocepha-

litins) supposedly derived from the common ancestor (sphaeroceratins) (Donovan et al., 1981).

Mönnig (1995) used drawings of ammonoid sutures as evidence that *"Chamoussetia" menzeli* belongs to Cardioceratidae. Kiselev and Rogov (2007b, p. 59), referring to Lominadze (1967), believe that the outline of the external portion of the suture is very similar in different stephanoceratacean and often depends more on the whorl cross-section than on taxonomic affinity. Indeed in the above monograph text-fig. 29 shows sutural outlines of the Central Russian species *Sigaloceras enodatum* (Nikitin) from Shevyrev (1960) and very similar sutural outline of the Northern Caucasian "*Macrocephalites tcherekensis*" Lominadze, which are used as evidence that Kosmoceratidae evolved from Macrocephalitidae (sic!). However, the description of the latter species based on a single specimen and its illustrations (Lominadze, 1967, text-fig. 36—whorl cross-section; pl. 13, fig. 1—lateral view) leaves considerable doubt that the holotype belongs to *Macrocephalites*. Lominadze indicated that the age of "*Macrocephalites tcherekensis*" was Callovian. "*Erymnoceras doliforme* (Rom.), *Hecticoceras multicostatum* Tsyt., *Kosmoceras jason* Rein., *Phylloceras flabellatum* Neum." were found together with the holotype (Lominadze, 1967, p. 109), and this dates this occurrence as Middle Callovian. In his next monograph, Lominadze (1982, p. 226) recorded *Macrocephalites tcherekensis* from the Lower Callovian in association with *Cadoceras elatmae, Kepplerites gowerianus, Sigaloceras enodatum*, index species for all three Lower Callovian zones. Later, Lominadze and Sakharov (1985) recorded *Macrocephalites* only from the lower zones of the Callovian of the Northern Caucasus. I have already suggested that the so-called Callovian beds in the Northern Caucasus are in fact partly Upper Bathonian (Mitta, 2003; 2004). Apparently, "*Macrocephalites tcherekensis*" is a representative of *Kepplerites* (which, like *Sigaloceras* belongs to the family Kosmoceratidae) from the Upper Bathonian. This explains the similarity of the sutures.

Kiselev and Rogov (2007a, 2007b) proposed *Macrocephalites jacquoti* as an index species of the basal faunal horizon of the Callovian of the Russian Platform based on the fact that this species had been proposed as an index species for West Tethys (Westermann and Callomon, 1988). However, even if this species was present in the Callovian of Central Russia, it cannot serve as an index of such a stratigraphic subdivision as a faunal horizon. *M. jacquoti* is found in several horizons of the Callovian, and in the upper zone of the Bathonian of Germany (Dietl, 1994). Therefore, a different name for the index species of the basal Callovian horizon (and subzone) is used by the majority of workers, namely *Kepplerites keppleri* (Oppel) (Dietl and Callomon, 1988; Callomon and Dietl, 2000), including the Russian Platform (Mitta and Starodubtseva, 1998; etc.).

Below there are descriptions of the ammonite taxa.

SYSTEMATIC PALEONTOLOGY

Family Cardioceratidae Siemiradzki, 1891

Subfamily Arctocephalitinae Meledina, 1968

Genus *Eckhardites* Mitta, 1999

Eckhardites: Mitta and Starodubtseva, 1998, p. 6 (nom. nud.); Mitta, 1999, p. 132; Mitta, 2000, p. 33.

Type species. *Macrocephalites pavlowi* Smorodina. The lectotype is housed in the Vernadsky State Geological Museum of the Russian Academy of Sciences, specimen no. VI-55/1; Smorodina, 1928, pl. 3, figs. 1, 2—a reduced image of a phragmocone; a specimen is figured with a body chamber and referred to by Mitta and Starodubtseva, 1998, pl. 1, fig. 1; pl. 2, fig. 1; Kostroma Region, bank of the Unzha River near the village of Manturovo; Lower Callovian, *elatmae* Zone, ? *Cadoceras tschernyschewi* faunal horizon.

Diagnosis. Shell medium-sized, up to 150–180 mm in diameter, with compressed moderately wide whorls or weakly inflated. Whorls triangular in cross section, with weakly convex flanks and narrow venter. Umbilicus narrow and moderately narrow, with a vertical wall and a rounded shoulder. Body chamber occupies up to 0.6 whorls, in adult specimens a deep and wide preapertural constriction is present on the mold. Aperture is simple, with a pronounced rostrum.

Ornamentation. The ornamentation is represented by thin dense ribs at a diameter less than 20 mm sometimes slightly thickened in the lower part of the flanks as wrinkles, collected in bunches of two to five branches. Beginning from the diameter of 20–30 mm the flanks are mostly covered by striated ribs, and only in the upper third of the flanks (later in ontogeny only in the upper quarter of the flanks) there are relatively thin "ventral" ribs going across the venter with a slight inclination orad. On the body chamber, the ventral ribs may be transformed into coarse placation-ribs, or become completely smoothened.

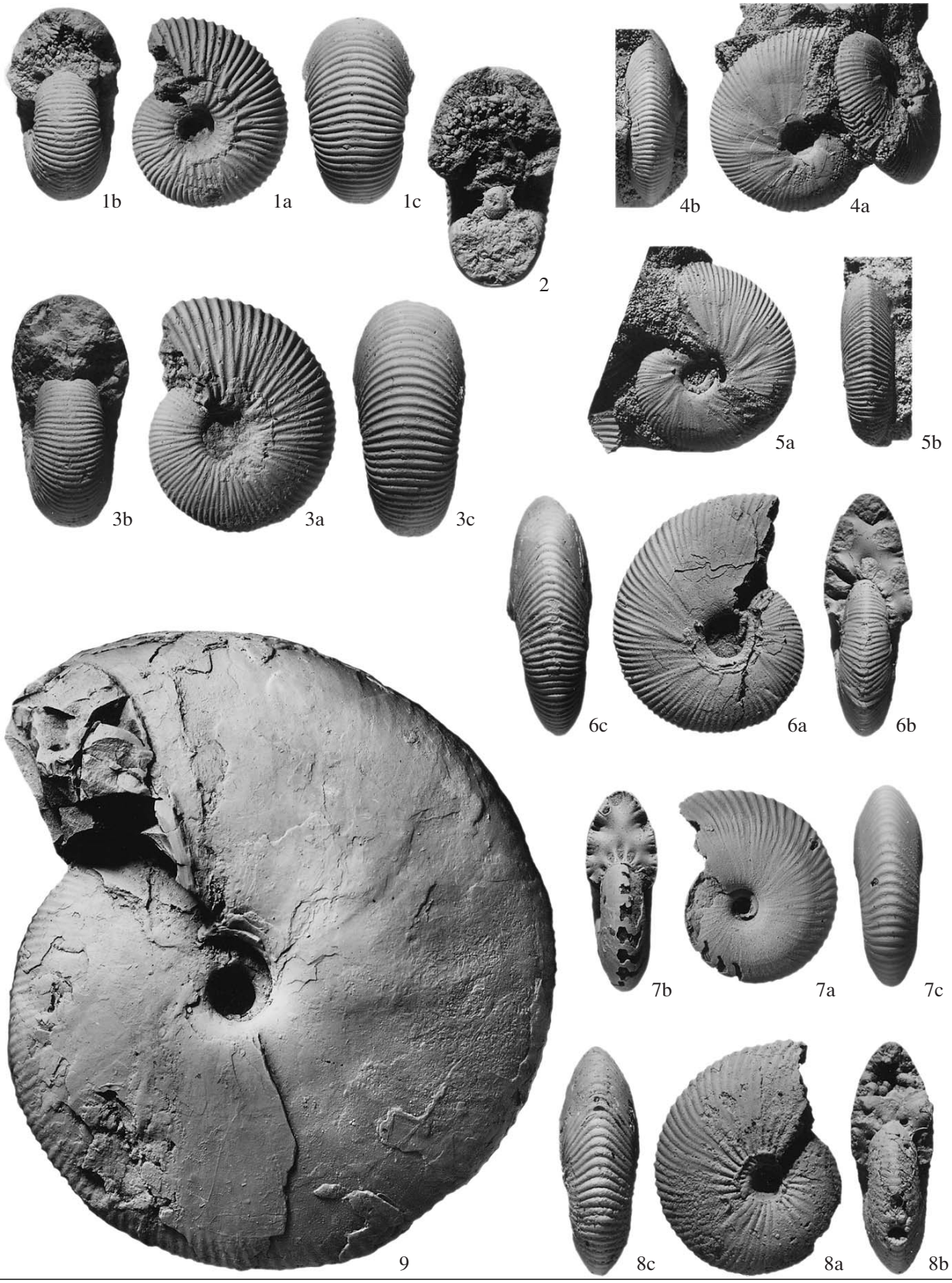
Species composition. Apart from the type species, *E. menzeli* Mönnig and *E. dietli* sp. nov.

Comparison. The shell shape and ornamentation of *Eckhardites* resemble Early Callovian, but younger *Chamoussetia*. *Eckhardites* is distinguished from this genus, which evolved from *Cadoceras* (via *Cadochamoussetia*), by the less narrow venter, "wrinkled" ornamentation at early stages, earlier smoothening of primary ribs and longer secondary ribs.

The similarity with the Early Bathonian *Arcticoceras* is revealed in the shape of the shell, which in *Eckhardites* has a narrower venter. There are considerable differences in the ornamentation, i.e., phragmocones of *Arcticoceras* are covered by prominent, mainly bifurcating ribs, and only on the body chamber, which usually lacks ribs, some *Arcticoceras* possess ventral placation-ribs.

Remarks. Three species of the genus are successive members of the phyletic lineage, which begins from *E. menzeli* and finishes with *E. dietli.* The imme-

Plate 6



diate ancestors of the genus are not known, but the shell morphology and ontogeny of ornamentation suggest that *Eckhardites* belongs to the Cardioceratidae and most likely represents a relict branch of the Bathonian arctocephalitins.

The similarity of *Eckhardites* with a North American *Warrenoceras* Frebold, 1963, previously recorded by Mitta (2000), is observed only at some ontogenetic stages, because the representatives of the latter genus possess much wider and more strongly inflated juvenile whorls.

***Eckhardites dietli* Mitta, sp. nov.**

Plate 6, fig. 4, 5; Plate 7, figs. 5, 6

Eckhardites sp.: Mitta, 2000, p. 36, pl. 5, fig. 2.

Etymology. In honor of G. Dietl, ammonoid worker and expert in Jurassic biostratigraphy.

Holotype. PIN, no. 5029/075; Kostroma Region, bank of the Unzha River near the town of Makar'ev; Lower Callovian, *Cadoceras elatmae* Zone, *subpatruus* subzone, *Cadoceras stupachenkoi* faunal horizon.

Description. The shell is up to 140 mm in diameter, with moderately wide whorls, high triangular in cross section, with flanks and narrow venter. Juvenile whorls (about 20 mm in diameter) compressed, with the whorl height almost twice its width. The umbilicus is moderately narrow; the umbilical wall is rounded with a rounded constriction. The body chamber occupied 0.6 whorls. No specimens with a preserved aperture are known.

Ornamentation. The ornamentation in the juveniles is represented by thin, undivided ribs, collected in bunches of three to five branches. The primary ribs occasionally look like wrinkles developed in the mid-flanks and in the lower regions of the flanks, but not reaching the umbilical shoulder. At a diameter of over 15 mm, both "wrinkles" and regular ribs in the lower flanks become smoothened. Later in the ontogeny, only short ventral ribs are present on the phragmocone, and the flanks are covered by striated ornamentation. Threadlike structures are occasionally observed between the growth striae, which represent rudiments of the initial ribs. The body chamber of adult specimens does not have ventral ribs

Dimensions in mm and ratios:

Specimen no.	Dm	WH	WW	Du	WH/Dm	WW/Dm	Du/Dm
Holotype 5029/075	137	69	48	17	0.5	0.35	0.12
	75	47	28	10	0.63	0.37	0.13
	57	34	20	8	0.6	0.35	0.14
5029/076	35	18	10	5	0.51	0.29	0.14
5029/079	21	11	7	4	0.52	0.33	0.19
5029/080	21	11	6.5	4	0.52	0.31	0.19
5029/081	21	10.5	6	4	0.5	0.29	0.19
5029/077	19	10	6	4	0.53	0.32	0.21
5029/082	18	10	5	3	0.56	0.28	0.17
5029/068-1	16	9	6	3	0.56	0.38	0.19
5029/068-2	15	9	5	3	0.6	0.33	0.2

Variability. Specimens in my disposal show stability in the shell shape and ornamentation. The microconchs (Pl. 6, fig. 5) are distinguished from the macroconchs with a similar diameter by a very narrow, keeled venter, relatively wider umbilicus and ornamentation present on the body chamber.

Comparison. Phragmocones of this species are very similar to those in *E. menzeli* in the compressed whorls, with a narrow venter and very short ribs developed only in the upper part of the flanks and on the venter. The new species is distinguished by the completely smooth body chamber in adult specimens.

Explanation of Plate 6

All figures, except Fig. 9, ×2 magnification; Fig. 9 is of natural size.

Figs. 1–3. *Macrocephalites* ex gr. *jacquoti* H. Douvillé, inner whorls: (1) specimen PIN, no. 5029/065, (1a) lateral view, (1b) apertural view, (1c) ventral view; (2) specimen PIN, no. 5029/066, cross-section; (3) specimen PIN, no. 5029/067, (3a) lateral view, (3b) apertural view, (3c) ventral view; Southern Germany, Bisingen–Thanheim; "Macrocephalen-Oolith", Lower Callovian, *Macrocephalites herveyi* Zone, *Kepplerites keppleri* Subzone, *Kepplerites keppleri* faunal horizon. Collected by N. Wannenmacher.

Figs. 4 and 5. *Eckhardites dietli* sp. nov.: (4) paratype, specimen PIN, no. 5029/068, juvenile macroconch (?) with a body chamber, (4a) lateral view, (4b) ventral view; (5) paratype from the same piece of rock, juvenile microconch (?) with a body chamber, (5a) lateral view, (5b) ventral view; Kostroma Region, bank of the Unzha River near the town of Makar'ev; Lower Callovian, *Cadoceras elatmae* Zone, *subpatruus* Subzone, *Cadoceras stupachenkoi* faunal horizon. Collected by V.V. Mitta.

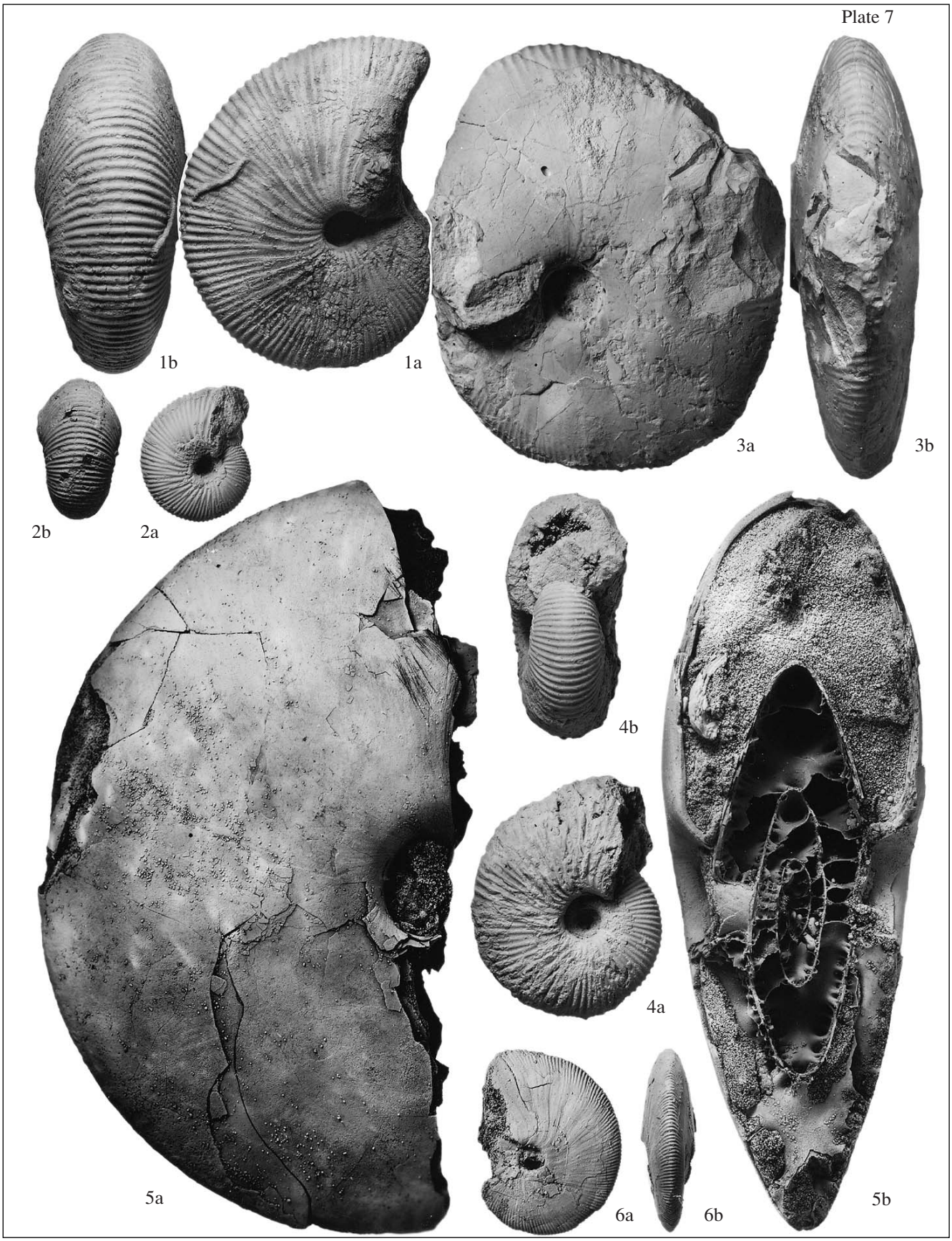
Fig. 6. *Eckhardites pavlowi* (Smorodina), topotype, specimen PIN, no. 5029/069, (6a) inner whorls, lateral view, (6b) apertural view, (6c) ventral view. Kostroma Region, bank of the Unzha River near the village of Manturovo; Lower Callovian, *Cadoceras elatmae* Zone, *elatmae* subzone, *Cadoceras elatmae* faunal horizon. Collected by V.V. Mitta.

Fig. 7. *Rondiceras milaschevici* (Nikitin), specimen PIN, no. 5029/070, (7a) inner whorls, lateral view, (7b) apertural view, (7c) ventral view; Kostroma Region, bank of the Unzha River downstream of the village of Yartsevo; Middle Callovian, *Rondiceras milaschevici* Zone, *milaschevici* faunal horizon. Collected by V.V. Mitta.

Fig. 8. *Chamoussetia buckmani* Callomon et Wright, specimen PIN, no. 5029/071, (8a) inner whorls, lateral view, (8b) apertural view, (8c) ventral view. Kostroma Region, bank of the Unzha River near the village of Vasil'kovo (formerly Svinaya noga); Lower Callovian, *Kepplerites gowerianus* Zone, *gowerianus* faunal horizon. Collected by V.V. Mitta.

Fig. 9. *Eckhardites menzeli* (Mönnig), specimen AC 1021, shell with a complete body chamber and preserved aperture, lateral view; Chuvashia, quarry near the village of Poretskoe; Lower Callovian, *Cadoceras elatmae* Zone, *elatmae* Subzone, *Cadoceras falsum* faunal horizon. Collected by A.V. Stupachenko.

Plate 7



Explanation of Plate 7

All figures are of natural size.

Fig. 1. *Macrocephalites jacquoti* H. Douvillé, macroconch (?). Stuttgart Museum of Natural History, specimen no. 67152; (1a) phragmocone, lateral view, (1b) ventral view. Southern Germany, Albstadt–Pfeffingen; "Macrocephalen-Oolith", basal part of Bed 5; Lower Callovian, *Macrocephalites herveyi* Zone, *Kepplerites keppleri* Subzone, *Kepplerites keppleri* faunal horizon. Collected by G. Dietl.

Figs. 2 and 4. *Macrocephalites* ex gr. *jacquoti* H. Douvillé: (2) specimen PIN, no. 5029/072, (2a) inner whorls, lateral view, (2b) ventral view; (4) specimen PIN, no. 5029/074, (4a) phragmocone, lateral view, (4b) apertural view; Southern Germany, Bisingen–Thanheim; "Macrocephalen-Oolith", Lower Callovian, *Macrocephalites herveyi* Zone, *Kepplerites keppleri* Subzone, *Kepplerites keppleri* faunal horizon. Collected by N. Wannenmacher.

Fig. 3. *Eckhardites menzeli* (Mönnig), plaster cast of the holotype, specimen PIN, no. 5029/073; (3a) lateral view, (3b) ventral view. Donated by E. Mönnig.

Figs. 5 and 6. *Eckhardites dietli* sp. nov.: (5) holotype PIN, no. 5029/075, (5a) body chamber, lateral view, (5b) apertural view; (6) paratype PIN, no. 5029/076, juvenile specimen with a body chamber, (6a) lateral view, (6b) ventral view; Kostroma Region, bank of Unzha River near the town of Makar'ev; Lower Callovian, *Cadoceras elatmae* Zone, *subpatruus* Subzone, *Cadoceras stupachenkoi* faunal horizon. Collected by V.V. Mitta.

R e m a r k s. Previously, Mitta (2000) suggested that these ammonites represent a separate species. Now we have sufficient specimens to substantiate a new species. *E. dietli* is not a direct relative of *E. pavlowi* and apparently the last representative of this genus.

M a t e r i a l. Twelve variously preserved specimens from the type locality.

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