

## Occurrence of the Toarcian genus *Urkutites* GÉCZY (Ammonitina, Hildoceratinae) in the Apennines (Italy)

Stefano SASSAROLI<sup>1</sup> & Federico VENTURI<sup>2</sup>

<sup>1</sup>Via. S. Michele 33, 60030 Rosora, Italy. E-mail: dtocsa@tin.it; stefano.sassaroli@alice.it

<sup>2</sup>Dipartimento di Scienze della Terra, Università degli Studi di Perugia, Piazza Università, 06100 Perugia, Italy.  
E-mail: venturi@unipg.it; federicoventuri2013@gmail.com

---

### Abstract

Ammonite specimens of the rare Toarcian genus *Urkutites* GÉCZY, 1967 were found in some outcrops of the Apennines (Italy). The genus was originally designated by GÉCZY on the basis of two specimens discovered in the Bakony Mts (Hungary), but some British authors believed it to be a synonym of *Hildoceras*. The discovery of specimens of the type species (*Urkutites boeckhi* GÉCZY) in the Apennines and of the new taxon *Urkutites italicus* n. sp. (described herein) allows confirming *Urkutites* as a valid taxon. The genus ranges between the upper Serpentinus Zone (Udicosta Zone of the Apennines local zonation) and the lower Bifrons Zone when Mediterranean Tethys Hildoceratinae flourished. Some palaeobiogeographical and taxonomical implications are briefly discussed. A faunal exchange between the Transdanubian Range (Hungary) and the Apennines occurred, and the origination of *Urkutites* seems to confirm a remarkable diversity of Hildoceratinae after the record of the TOAE (Toarcian Oceanic Anoxic Event).

**Keywords:** Toarcian biostratigraphy, Tethys, Apennines, Hildoceratinae, *Urkutites*

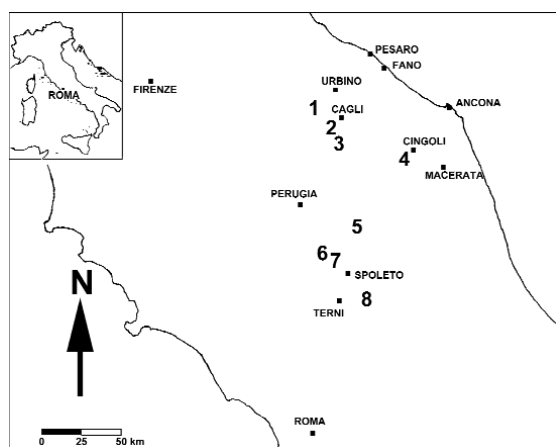
---

### Introduction

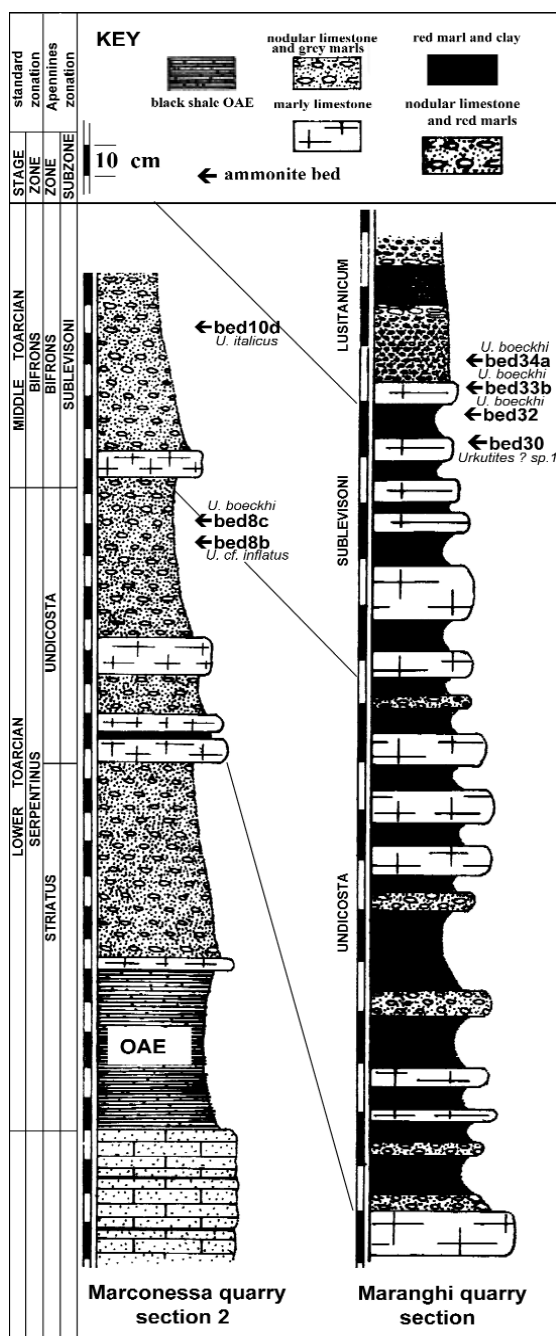
Genus *Urkutites* was established by GÉCZY in 1967 on the basis of two small specimens found in the Bakony Mts (Hungary). It includes two species, *U. boeckhi* GÉCZY, 1967 which is the type species of the genus and *U. inflatus* GÉCZY, 1967. DONOVAN et al. (1981) supposed *Urkutites* to be a synonym of *Hildoceras*, a view shared by HOWARTH (1992, 2013) despite considerable differences in morphology and stratigraphic range from *Hildoceras* characterized by a spiral groove (type species: *H. bifrons* [BRUGUIÈRE 1789]). Later GÉCZY et al. (2008) figured a specimen of *Urkutites* from the Gerecse Mts (Hungary). Examples of this rare Toarcian genus were also found in Apennine outcrops by VENTURI (2004) and VENTURI et al. (2010). A small specimen collected from the Apennines by VENTURI was also figured by LACROIX (2011). Furthermore, other *Urkutites* specimens collected from the Apennines are for the first time described and figured herein. These new data seem to confirm that *Urkutites* is really a proper taxon that noticeably differs from lower Toarcian *Hildaites* and middle Toarcian *Hildoceras* as well as from other Toarcian Hildoceratinae such as *Cingolites* and *Orthildaites*. We propose here the validation of *Urkutites*.

### Source of material

The *Urkutites* samples studied here came from several sections of the Umbrian–Marchean Apennines: Marconessa quarry (Cingoli, Macerata), Maranghi quarry (Burano River Valley, Pesaro), Gorgo a Cerbara (Pesaro), Valdorbina (Perugia), Civitella Mt. (Perugia), Aspra Mt. (Terni), Pozzale and Cima Panco (Martani Mts, Perugia) (Figs 1–3). Some specimens were collected bed-by-bed; others were collected *ex situ* from debris. These sites expose the typical Jurassic succession of the Apennines and notably the Toarcian formations of basin and seamount, known as Rosso Ammonitico Umbro–Marchigiano (RAUM) and Bugarone Formation that are characterized by nodular limestone and red or grey marl, respectively. In the studied sections, the Toarcian starts with the rock record of the TOAE (Toarcian Oceanic Anoxic Event), *i.e.* by black shale or variegated clay rich in organic matter. The lithology and the biostratigraphic framework of these sections were discussed by VENTURI (1975), CRESTA et al. (1989), NINI et al. (1996), SASSAROLI & VENTURI (2005, 2010, 2012). Data about other sections are only partially published (BILOTTA et al. 2010) or remain still unpublished. All specimens figured here are stored in the VENTURI collection at The Earth Sciences Department, Perugia University.



←Figure 1. Location map of sections: 1) Gorgo a Cerbara (Pesaro) IGM, sheet 116-IV-NE; 2) Maranghi quarry (Burano Valley, Pesaro) IGM sheet 116-IV-SE; 3) Valdorbis (Perugia) IGM sheet 116-II-NO; 4) Marconessa quarry (Cingoli, Macerata) IGM sheet 124-I-NO; 5) Civitella Mt. (Perugia), IGM sheet 131-I-NO; 6) Pozzale (Martani Mts, Perugia) IGM sheet 131-III-NE; 7) Cima Panco (Martani Mts, Perugia) IGM sheet 131-III-SE; 8) Aspra Mt. (Terni), IGM sheet 131-II-SO



←Figure 2. Stratigraphic logs of the Marconessa quarry, section 2, and Maranghi quarry. The zonation refers to the West Mediterranean Tethyan standard (ELMI et al. 1994, 1997; PAGE 2003) and the local Apennine zonation after SASSAROLI & VENTURI (2010, 2012). Arrows mark the beds which yielded *Urkutites boeckhi*, *Urkutites* cf. *inflatus*, *Urkutites italicus* n. sp. and *Urkutites* ? sp. 1. See SASSAROLI & VENTURI (2010, 2012) for a bed-by-bed ammonite biostratigraphic account of the Marconessa quarry. See also BILOTTA et al. (2010) for a bed-by-bed ammonite biostratigraphic partial account of the Maranghi quarry (many data remain still unpublished)

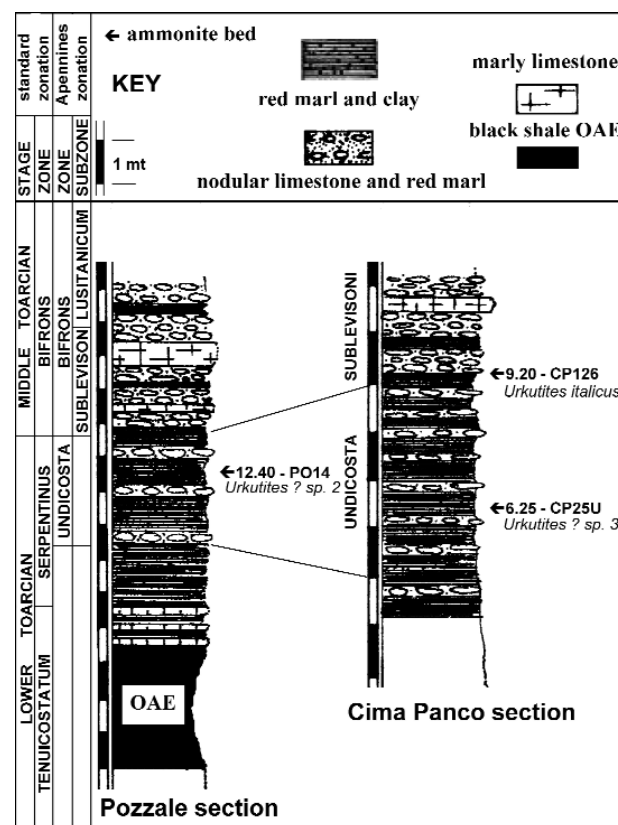


Figure 3. Stratigraphic logs of the Pozzale section and Cima Panco section (Martani Mts). The zonation refers to the West Mediterranean Tethyan standard (ELMI et al. 1994, 1997; PAGE 2003) and the local Apennine zonation after SASSAROLI & VENTURI (2010, 2012). Arrows mark the beds which yielded *Urkutites italicus* n. sp., *Urkutites* ? sp. 2 and *Urkutites* ? sp. 3. See NINI et al. (1996) for a bed-by-bed ammonite biostratigraphic account of these sections

## Systematic palaeontology

Order Ammonoidea ZITTEL, 1884  
 Suborder Ammonitina HYATT, 1889  
 Superfamily Hildocerataceae HYATT, 1867  
 Family Hildoceratidae HYATT, 1867

### Subfamily Hildoceratinae HYATT, 1867

**Diagnosis:** Evolute to moderately evolute, planulate, more or less compressed shell. The whorl-section varies from elliptical to subtrapezoidal or from subrectangular to subquadrate. The keeled venter varies from elliptical to oval, from tabulate to bisulcate or else to tricarinate–bisulcate. The ornamentation varies also showing ribs from fine to coarse; they can be single, bifurcating, rarely trifurcating and sometimes paired or bundled with sinuous, sigmo-falcoid or strongly angled falcate and rarely almost rectiradiate appearance; tubercles or bullae sometimes occur. The ammonitic suture is simple.

**Remarks:** At present this subfamily includes the following genera: *Hildoceras* HYATT, 1867; *Hildaïtes* BUCKMAN, 1921; *Orthildaïtes* BUCKMAN, 1923; *Urkutites* GÉCZY, 1967; *Cingolites* SASSAROLI & VENTURI, 2010. All these genera occur in the Apennines.

### Genus *Urkutites* GÉCZY, 1967

**Type species:** *Urkutites boeckhi* GÉCZY, 1967.

**Remarks:** In the original diagnosis based on two small specimens, GÉCZY wrote that this genus is characterized by narrow and tricarinate venter, vague tubercles near the umbilical wall and slightly concave backwards ribs in the medial-distal segment. Furthermore, in his differential diagnosis GÉCZY wrote that *Urkutites* differs from *Hildoceras* by narrower venter, by the presence of tubercles and the absence of the typical lateral spiral groove. He also specified that *Urkutites* differs from *Hildaïtes* by flat or inflated whorl-section, and by smoothness of ornamentation in the rib proximal segment. This diagnosis seems to suggest *Urkutites* to be an intermediate taxon between early Toarcian *Hildaïtes* and middle Toarcian *Hildoceras*.

HOWARTH (1992: 178) wrote that *Urkutites* “is close to, and possibly conspecific with *Hildoceras lusitanicum* [...] *Urkutites* is therefore a synonym of *Hildoceras*”. Nevertheless, the specimens figured by HOWARTH as *H. lusitanicum* show single ribs starting from the umbilical wall. Neither tubercles nor bundled and paired ribs, which are diagnostic characters of *Urkutites*, are detected on the British examples of *Hildoceras*. Therefore, the close resemblance between *Urkutites* and *Hildoceras* is not proved. Furthermore, some *H. lusitanicum* specimens figured by HOWARTH show a moderate spiral groove, which is absent on *Urkutites*, whereas all specimens figured by BÉCAUD (2006) and LACROIX (2011) as *H. lusitanicum* show a remarkable spiral groove. Actually, the solitary and poorly preserved specimen of *H. lusitanicum* figured by MEISTER as holotype (1913, pl.12, fig. 3) shows a moderate spiral groove and

single ribs. Indeed, some species of *Hildoceras* do not show any spiral groove, such as the early *Hildoceras* from the lower Bifrons Zone which were firstly discovered in Italian outcrops, namely *H. sublevisoni* FUCINI, 1922 and *H. caterinii* MERLA, 1932. However, these Mediterranean Tethys ammonites have strong, backward-angled and single ribs and remarkably differ in many other characters from *Urkutites*.

**Amended diagnosis:** The Apenninic specimens treated here show a greater variability than the Hungarian specimens, so we provide an improved diagnosis.

Evolute or moderately evolute platycone shell, subtrapezoidal to high subrectangular whorl-section and flattened, compressed or inflated sides. From narrow to moderately wide, tricarinate-bisulcate venter that may become tabulate in the outermost whorl mainly on the body chamber, with shallow furrows. Septate, usually thin and low keel, which may be also stronger and higher. Rursiradiate or falcoid, usually fine and dense, but sometimes stronger and sparser ribs on the outer whorl, bifurcating or sometimes trifurcating, paired or bundled with dimples or coupled with gentle tubercles or bullae originating near the umbilical wall. The suture is as simple as that of the Hildoceratinae.

**Differential diagnosis:** *Urkutites* differs from *Hildoceras* chiefly by bifurcating-trifurcating ribs, which are paired with gentle tubercles or bullae, by absence of the spiral groove and by narrower venter; it differs from *Hildaïtes* chiefly by rursiradiate and gently tuberculate ribs faded in the proximal segment, by very flattened sides with lower umbilical wall; it differs sharply from *Cingolites* and *Orthildaïtes* mainly by fine, dense, rursiradiate, bifurcating-trifurcating and bundled ribs. *Urkutites* shows a resemblance in some features of the whorl-section, venter and sculpture to later *Hildaïtes* with Mediterranean Tethyan dispersal such as the forms of the group of *Hildaïtes undicosta* (MERLA, 1932). Therefore, a derivation of *Urkutites* from late *Hildaïtes* is likely.

**Occurrence:** From the top of the Serpentinus Zone (ELMI et al. 1994, 1997, i.e. upper Undicosta Zone of the local Apennine zonation, as stated by SASSAROLI & VENTURI 2010, 2012) to lower Bifrons Zone.

### *Urkutites boeckhi* GÉCZY, 1967 (Pl. 1, figs 1–7; Pl. 2, figs 1–2)

1967 *Urkutites boeckhi* n. sp.; GÉCZY, p. 124, pl. 2, fig. 1 (holotype – type species).

2004 *Urkutites* cf. *boeckhi* GÉCZY; VENTURI, fig. 2A.

2004 *Urkutites* sp. indet.; VENTURI, fig. 2B.

2008 *Urkutites* sp.; GÉCZY et al., p. 38, pl. 1, figs 18–19.

2010 *Urkutites* sp. indet.; VENTURI et al., p. 315.

2010 *Urkutites boeckhi* GÉCZY; VENTURI et al., p. 315.

**Material:** Seven large or small sized specimens, two of them collected from bed 8c of the Marconessa quarry section (MSA881U, MSA298U), the others collected from beds 32, 33b and 34a of the Maranghi quarry section (BU9U, BU11U, BU12U, BU13U and BU14U).

**Measurements:** see Table 1.

Table 1. Measurements of the figured specimens

Specimen	D	U	Wb	Wh
<i>Urkutites boeckhi</i> GÉCZY				
MSA881U	88	45	15.8	29.9
MSA298U			7.2	11.3
BU9U	37.5	15.7	9.5	13.8
BU10U	51.8	22.4	11.6	17.4
BU11U	–	–	8.9	13.2
BU12U	41	13	9.3	14.3
BU13U	54	23.5	11	18
BU14U	67	30	13.5	21
<i>Urkutites cf. inflatus</i> GÉCZY				
MSA229U	46	20.7	12.3	15.2
VU33	38	16.5	11	13.2
<i>Urkutites italicus</i> n. sp.				
MSA375U	63.5	28.3	20.1	13.6
CP126	50.2	22	11	16.5
GCTU	49	21	11.5	16
AU7	49	25	10.5	15
<i>Urkutites</i> ? sp. 1				
BU15U	39.9	21	11.5	11.5
<i>Urkutites</i> ? sp. 2				
PO14	52	22	11	16
<i>Urkutites</i> ? sp. 3				
CP25U	57	24	13	19
CIV12	51	20.5	11.5	17.5

Key: D= whorl diameter; U= umbilical width; Wh= whorl height; Wb= whorl breadth.

Original diagnosis: According to GÉCZY (1967), the holotype is characterized by a subtrapezoidal whorl-section with flattened sides; tricarinate-bisulcate and narrow venter with shallow furrows; almost vertical and very low umbilical wall with very rounded edge. The ornamentation contains slightly rursiradiate, short and fine ribs, which are almost faded (subdued) near the umbilicus, where from the beginning of the last whorl vague tubercles appear. The suture is very simple. The holotype is refigured here (Pl. 1, fig. 2a–e).

Description of the Apenninic specimens: The variously sized Apenninic specimens observed at different growth stages show many features not yet described. All specimens have an evolute platycone shell and a subtrapezoidal whorl-section with flattened sides. The narrow and tricarinate-bisulcate venter has a thin and low keel. The umbilical wall is low and vertical with rounded edge. Both specimen BU12U and the small phragmocone fragment MSA298U show faded and paired ribs in the proximal segment which on the umbilical wall form gentle tubercles (like small knots). Specimens BU9U, BU10U and BU11U show fine, dense and rursiradiate ribs paired from the umbilical wall, where gentle tubercles and dimples also appear. The larger specimens BU13U and BU14U show the paired ribs typically faded in the proximal segment; on the outer whorl the venter becomes wider with shallow furrows. The large specimen MSA881U, like example BU14U, shows fine and dense paired ribs on the inner whorls, which become sparser and stronger on the outer whorl, mainly in

the phragmocone where gentle tubercles appear near the umbilical wall. On the inner whorls the venter is narrower and it becomes wider on the outer whorl, where a tricarinate-bisulcate venter with shallow furrows and a thin and low keel can be observed.

Amended diagnosis: Subtrapezoidal whorl-section with flattened sides; tricarinate-bisulcate and narrow venter on the inner whorls, which becomes wider with shallow furrows on the outer whorls. The keel is thin and low. The umbilical wall is low and vertical with rounded edge. The ornamentation has paired ribs starting from the umbilical wall, where gentle tubercles and sometimes dimples appear. The more or less rursiradiate ribs are finer and denser on the inner whorls; they become stronger and sparser on the outer whorls (moderate rib-density), where they are faded in the proximal segment and forming a typical almost smooth area with gentle tubercles and sometimes dimples which are faintly visible or to become also in full view. The suture line is typical of the hildoceratids: the L lobe is long and narrow, the E lobe usually shorter than the L, the A lobe is less developed; the umbilical lobes vary from long to small, almost dentiform.

Ammonite assemblage: Marconessa quarry, section 2, bed 8c: *Hildaites intermedius* (GUÉX); *Hildaites* sp. indet.; *Cingolites clavatus* SASSAROLI et VENTURI; *Cingolites picens* SASSAROLI et VENTURI; *Orthildaites* gr. *douvillei* (HAUG); *Polyplectus pluricostatus* (HAAS); *Harpoceras* sp. indet.; *Nodicoeloceras* sp. indet.; *Lytoceras* spp.; *Phylloceras* spp.; *Calliphylloceras* spp. (see SASSAROLI & VENTURI 2010, Tab.1). Maranghi quarry section, bed 32: *Hildoceras* gr. *lusitanicum* MEISTER; *Hildoceras* gr. *graecum* RENZ; *Hildoceras* gr. *acarnanicum* MITZOPOULOS; *Phymatoceras* gr. *elegans* (MERLA); *Pseudomercaticeras* sp. indet.; *Gallitellia* sp. indet.; *Harpoceras* cf. *cirrilobatum* (KOTTEK); *Polyplectus* sp. indet.; *Phylloceras* spp.; *Calliphylloceras* spp.; bed 33b: *Hildoceras acarnanicum* MITZOPOULOS; *Hildoceras crassum* MITZOPOULOS; *Cingolites* cf. *stefaninii* (MERLA); *Pseudomercaticeras* sp. indet.; *Mercaticeras* gr. *rursicostatum* MERLA; *Gallitellia* sp. indet.; *Lytoceras knetasi* MITZOPOULOS; *Nodicoeloceras vorticellum* (SIMPSON); *Nodicoeloceras* sp. indet.; *Zugodactylites* sp. indet.; *Polyplectus discoides* (ZIETEN); *Phylloceras* spp.; bed 34a: *Hildoceras* gr. *acarnanicum*; *Hildoceras* sp. indet.; *Phymatoceras* sp. indet.; *Zugodactylites* sp. indet.; *Nodicoeloceras* sp. indet.; *Harpoceras* gr. *mediterraneum* PINNA; *Harpoceras* cf. *cirrilobatum* (KOTTEK); *Mercaticeras* cf. *rursicostatum*; *Pseudomercaticeras* sp. indet.; *Lytoceras* sp. indet.

Occurrence: From the top of the Undicosta Zone to the lower Bifrons Zone.

*Urkutites cf. inflatus* GÉCZY, 1967  
(Pl. 2, figs 4–5)

Material: Two small sized specimens, one coming from Marconessa quarry section, bed 8b (MSA299U), and the other from Valdorbia section, bed 2b (VU33).

Measurements: see Table 1.

Description of the Apenninic specimens: Both specimens show an evolute platycone shell, a subtrapezoidal whorl-section, a narrow venter with raised thin keel. The sloped umbilical wall has a rounded edge. The specimen MSA299U shows an inflated whorl-section, while specimen VU33 shows flattened sides. The ornamentation shows usually bifurcating, rarely trifurcating ribs sometimes starting from gentle elongated bullae placed near the umbilical edge, where sometimes dimples appear. The rib origination is fine, although ribs become stronger in the distal segment. The moderately falcoid ribs are not much rursiradial and they are scarcely projected on the shoulder. The suture is as simple as that of the Hildoceratinae with a well-developed L lobe, a shorter E lobe, a less developed A lobe and variable umbilical lobes from long to small, almost dentiform.

Remarks: According to GÉCZY's (1967) original description of the holotype (refigured here, Pl. 2, fig. 3a–d), *U. inflatus* shows a lanceolate whorl-section, which is inflated near the umbilicus and more flattened near the rounded shoulder. Steep umbilical wall with rounded edge. The narrow venter has a low keel and shallow furrows. The ornamentation shows bullae that emerge from the umbilical wall and terminate at the lower quarter of the whorl-side, where fine ribs appear and become progressively stronger toward the shoulder. The suture line is simple. The Apenninic specimen MSA299U shows the same inflated whorl-section and ornamentation as the holotype, but it differs by the absence of furrows. Noticeably, this specimen has an earlier stratigraphic occurrence. The other specimen VU33 shows the same feebly bisulcate venter and ornamentation as the holotype, but it differs by compressed, not inflated sides.

Ammonite assemblage: Marconessa quarry, section 2, bed 8b: *Hildaites forte* (BUCKMAN); *Hildaites crassus* (GUEX); *Cingolites clavatus* SASSAROLI et VENTURI; *Cingolites picens* SASSAROLI et VENTURI; *Orthildaites* gr. *douvillei* (HAUG); *Harpoceras* sp. indet.; *Nodicoeloceras* sp. indet.; *Mesodactylites* sp. indet.; *Lytoceras* spp.; *Phylloceras* spp.; *Calliphylloceras* spp. (see SASSAROLI & VENTURI 2010, Tab. 1). Valdorbia section, bed 2b: *Hildoceras sublevisoni* FUCINI; *Phymatoceras* gr. *elegans* (MERLA); *Pseudomercaticeras* sp. indet.; *Mercaticeras rursicostatum* MERLA; *Polyplectus pluricostatus* (HAAS); *Harpoceras* sp. indet.; *Nodicoeloceras* sp. indet.; *Mesodactylites* sp. indet. (see CRESTA et al. 1989, fig. 37).

Occurrence: From the top of the Undicosta Zone to the lower Bifrons Zone (Sublevisoni Subzone).

### *Urkutites italicus* n. sp.

(Pl. 3, figs 1–4)

1996 *Urkutites* sp. 1; NINI et al., pl.1, fig. 6 (refigured here, Pl. 3, fig. 3a–c).

2010 *Urkutites* cf. *boeckhi* GÉCZY; VENTURI et al., p. 315.

2011 *Urkutites boeckhi* GÉCZY; LACROIX, pl. 78, fig. 3.

Material: Four specimens of medium size coming from the Marconessa quarry, bed 10d (MSA375U), Gorgo a

Cerbara (GC7), Cima Panco, bed 9.00–9.20 (CP126) and Aspra Mt. (AU7).

Derivatio nominis: It was discovered in Italy (Apennines).

Holotype: A medium sized and wholly septate phragmocone MSA375U coming from the Marconessa quarry (Cingoli, Macerata), bed 10d. It is figured here at Pl. 3, fig. 1a–f.

Stratum typicum: Nodular limestone and grey marl of the Bugarone Formation.

Holotype measurements (mm): D=63.5, U=28.3, Wh=20.1, Wb=13.6, U/D=0.45, Wb/Wh 0.68.

Diagnosis: Moderately evolute platycone shell, subrectangular whorl-section with flattened and compressed sides, high and sloped umbilical wall with rounded edge. Wide and moderately bisulcate (almost tabulate) venter, that bears a raised and strong keel and shallow furrows. Fine ornamentation with falcoid ribs, which are bifurcating or rarely trifurcating, starting from gentle bullae placed on the umbilical wall. High rib-density. The ammonitic suture is simple.

Holotype description: The moderately evolute platycone shell shows a little overlapping of the whorl-coiling, a subrectangular whorl-section with flattened, very compressed sides. The venter is wide, from feebly bisulcate with shallow furrows on the inner whorls to almost tabulate on the outer whorl. The septate keel is raised and coarse. The ornamentation shows fine and dense ribs; they are falcoid starting from gentle bullae placed on the umbilical wall and ending moderately projected on the shoulder. Occasionally, the ribs origination forms bundles. High rib-density: 60 ribs on the last whorl of the phragmocone. The suture is simple: the L lobe is short and broad, the E lobe is shorter than the L, the A lobe is short, the U<sub>2</sub> lobe is well-developed, and the U<sub>3</sub> lobe is dentiform.

Paratype measurements: see Table 1.

Paratypes: All three paratypes are close to the holotype. The well preserved example GC7U shows all typical characters of the species, as well as the other two paratypes CP126 and AU7: moderately evolute shell, subrectangular whorl side with flattened sides; broad and tabulate venter with raised keel; fine, dense, bifurcating-trifurcating and falcoid ribs with gentle bullae and bundles. The sutures of the paratypes show also a close resemblance to that of the holotype: the L lobe is short and broad, the E lobe is shorter than the L, the A lobe is short, the U<sub>2</sub> lobe is well-developed, and the U<sub>3</sub> lobe is dentiform.

Differential diagnosis: *Urkutites italicus* differs from *Urkutites inflatus* by moderately evolute compressed shell, by subtrapezoidal, high and flattened, and very compressed whorl-section, by almost tabulate venter, and by more falcoid, finer and denser ribs. *Urkutites italicus* differs from *Urkutites boeckhi* by moderately evolute shell, by tabulate and wider venter with raised keel, by finer and falcoid ribs with higher rib-density, and by weak bullae without smooth area in the proximal segment. (See Table 2 for comparison between main distinguishing features of the three *Urkutites* species).

Table 2. Comparison between main distinguishing features of *Urkutites* taxa

	<i>U. boeckhi</i>		<i>U. inflatus</i>	<i>U. italicus</i>
Shell	evolute platycone		evolute platycone	moderately evolute platycone
Whorl Section	subtrapezoidal		subtrapezoidal	subrectangular
	flattened		lanceolate inflated	flattened very compressed
Venter	tricarinate-bisulcate narrow to wider shallow furrows		bisulcate narrow, shallow furrows	wide, bisulcate with shallow furrows to tabulate
Keel	thin, low		thin, raised	strong, raised
Umbilical	Edge	Wall		
		low, vertical rounded	steep, inflated rounded	high, slope rounded
Ornamentation	rursiradiate, bifurcating ribs, fine to stronger, dense to sparser, faded, gentle tubercles or dimples		bifurcating-trifurcating, falcoid ribs, fine, sparse, bullae or dimples	bifurcating-trifurcating, falcoid ribs, fine, dense, bullae or bundles

Ammonite assemblage: Marconessa quarry, section 2, bed 10d: *Hildoceras* gr. *caterinii* MERLA; *Hildoceras sublevisoni* FUCINI; *Hildoceras acarnanicum* MITZOPOULOS; *Phymatoceras* cf. *elegans* (MERLA); *Mercaticeras rursicostatum* MERLA; *Polypilectus pluricostatus* (HAAS); *Harporoceras* sp. indet.; *Nodicoeloceras* gr. *angelonii* (RAMACCIONI); *Mesodactylites* sp. indet.; *Lytoceras* spp.; *Phylloceras* spp.; *Calliphylloceras* spp. (see SASSAROLI & VENTURI 2010, Tab. 1). Cima Panco section, bed 9.00–9.20: *Hildoceras sublevisoni*; *Hildoceras laticosta* (BELLINI); *Phymatoceras* gr. *elegans*; *Pseudomercaticeras venzoi* PINNA, 1963 (see NINI et al. 1996, text-fig. 5).

Occurrence: lower Bifrons Zone (Sublevisoni Subzone).

*Urkutites* ? sp. 1  
(Pl. 3, fig. 5)

Material: One small and very well preserved specimen with the body chamber, coming from Maranghi quarry, bed 30 (BU15U).

Measurements: See Table 1.

Description: Very evolute platycone shell with subquadrate whorl-section and flattened sides. The narrow venter is tricarinate-bisulcate with deep furrows and a strong keel. The umbilical wall is low on the phragmocone almost without edge; it is high and almost vertical with rounded edge on the body chamber. The ornamentation shows ribs starting paired from the umbilical wall. The bifurcating ribs show coarse and elongated tubercles near the umbilical

wall; they are moderately fine and dense, rursiradiate, angled backward, and scarcely projected toward the shoulder. On the body chamber some ribs are single. The suture line is as simple as that of the Hildoceratinae; the L lobe is long, the E lobe is as long as the L, the A lobe is dentiform, the umbilical lobes are well-developed.

Remarks: This specimen differs from *Urkutites boeckhi* by more evolute shell, by subquadrate whorl-section, by deep furrows and a strong keel, by coarser tubercles and strongly backward-angled, rursiradiate ribs; from *Urkutites inflatus* by subquadrate section with flattened sides and by coarser ornamentation; from *Urkutites italicus* by subquadrate whorl-section with tricarinate-bisulcate venter and the coarser sculpture with rursiradiate, not falcoid ribs. Further data are needed for an exact taxonomic determination.

Ammonite assemblage: Maranghi quarry section, bed 30: *Hildoceras* cf. *sublevisoni* FUCINI, *Hildoceras* sp. indet.; *Phymatoceras* gr. *elegans* (MERLA); *Mercaticeras rursicostatum* MERLA; *Gallitellia tenuicostata* VENTURI; *Gallitellia* sp. indet.; *Polypilectus* sp. indet.; *Nodicoeloceras vorticellum* (SIMPSON); *Phylloceras* spp.; *Calliphylloceras* spp.

Occurrence: Bifrons Zone, Sublevisoni Subzone.

*Urkutites* ? sp. 2  
(Pl. 2, fig. 6)

Material: One well preserved specimen of medium size with a body chamber portion. It was collected from Pozzale section, bed 12.40 (PO14).

Measurements: see Table 1.

Description: Evolute platycone shell with little whorl overlap, flattened sides and narrow, gently bisulcate, almost tabulate venter. The keel is strong and moderately raised. The ornamentation shows fine, biconcave and sometimes bundled ribs on the innermost whorls. The ribs usually start single from the very low and sloped umbilical wall. The suture is simple with E lobe shorter than the L, a dentiform A lobe and well-developed umbilical lobes.

Remarks: The specimen is very interesting for its close resemblance in some traits to *Urkutites italicus* and for its earlier stratigraphic occurrence than that of *Urkutites*. However, it differs from other *Urkutites* by biconcave, finer and not faded ribs. Neither tubercles nor bullae appear. The data are not enough for an exact taxonomic determination.

Ammonite assemblage: Pozzale section, bed 12.40: *Hildaites undicosta* (MERLA); *Martanites prorsiradiatus* VENTURI; *Phylloceras* spp. (see NINI et al. 1996).

Occurrence: upper Undicosta Zone.

*Urkutites* ? sp. 3  
(Pl. 2, fig. 7; Pl. 3, fig. 6)

Material: Two specimens of medium size which preserve the body chamber, coming from Cima Panco section (CP25U) and Civitella Mt. section (CIV12).

Measurements: See Table 1.

Description: Evolute platycone shell with little whorl overlap, subrectangular whorl-section, flattened sides or

gently convex, narrow and tabulate venter with thin keel. Low and vertical umbilical wall. The ornamentation shows fine and biconcave ribs that become strongly projected, almost falcoid on the body chamber. The ribs are coupled on the phragmocone, starting from gentle tubercles placed on the umbilical wall; they are single on the body chamber, starting from tubercles. The suture is simple with a large L lobe, a shorter E lobe, a well-developed U<sub>2</sub> lobe, a dentiform U<sub>3</sub> lobe, and a small A lobe.

**Remarks:** These specimens differ from *Urkutites* by biconcave, not faded ribs. Unfortunately, the ribs are not preserved on the innermost whorls. The specimens may be transitional forms between *Hildaites* and *Urkutites* and they are also very interesting for the earlier stratigraphic occurrence. However, the data are not enough for an exact taxonomic determination.

**Ammonite assemblage:** Cima Panco section, bed 6.25: *Hildaites undicosta* (MERLA); *Hildaites crassus* (GUEX); *Hildaites eremitensis* VENTURI; *Hildaites* sp. indet.; *Polyplectus pluricostatus* (HAAS); *Phylloceras* spp. (see NINI et al. 1996). Civitella Mt. (Val Lupo) section 4, bed 0.3: *Hildoceras sublevisoni* FUCINI; *Phylloceras* spp.; *Calliphylloceras* spp. (see VENTURI 1975).

**Occurrence:** Undicosta Zone to Sublevisoni Subzone (Bifrons Zone).

## Discussions and conclusions

DONOVAN et al. (1981) and HOWARTH (1992, 2013) supposed *Urkutites* to be a synonym of *Hildoceras*. Nevertheless, the new stratigraphic and morphological data provided in this study are enough to conclude that *Urkutites* is a valid taxon. In fact, we found several *Urkutites* specimens in some sections of the Apennines, namely the type species *U. boeckhi*, *U. cf. inflatus* and *U. italicus* n. sp., which clearly show well-defined differences from other Lower–Middle Toarcian Hildoceratinae. We also extend the stratigraphic range of this genus from the upper Serpentinus Zone to the lower Bifrons Zone. Furthermore, we found

specimens whose taxonomy is uncertain because of data scarcity or because they show transitional traits between *Hildaites* (group *H. undicosta*) and *Urkutites*. Some of them are also interesting for the stratigraphic occurrence, being collected near the top of the Lower Toarcian (Undicosta Zone). Probably, they are the product of evolution at work.

The genus *Urkutites* enriched the taxonomical range of the Hildoceratinae, which also includes *Hildaites*, *Orthildaites*, *Cingolites* and *Hildoceras*. Its stratigraphic occurrence is significant for the taxonomy and phylogeny of the Toarcian ammonites, because early representatives of this genus occur from the Serpentinus Zone (*i.e.* Undicosta Zone of the local Apennine zonation, see SASSAROLI & VENTURI 2010, 2012) to the lower Bifrons Zone, when Hildoceratinae taxa found in the Apennines outcrops show a considerable variability in morphology, whose range needs further studies.

The known palaeogeographical distribution of *Urkutites* includes the Bakony Mts and the Gerecse Mts (Transdanubian Range, Hungary) and the Apennines (Italy). The genus has never been recorded elsewhere, possibly because it was commonly regarded as a synonym of *Hildoceras*. The palaeogeographical dispersal pattern of *Urkutites* confirms that the Hungarian sites of the Transdanubian Range (GÉCZY 1984a, VÖRÖS & GALÁČZ 1998) and the Apennines sites were parts of the West Tethyan Mediterranean Palaeoprovince (PAGE 1996, 2003, 2004, 2008). Other typical West Tethyan Mediterranean ammonite taxa were also found in Hungary, such as *Rarenodia*, *Praerycites*, *Mercaticeras*, *Cingolites* (GÉCZY 1984b, GÉCZY et al. 2008, KOVÁCS 2012 and personal communication). This fauna seems to suggest a remarkable faunal exchange between the Apennines and the Transdanubian Range basins in the Lower–Middle Toarcian.

## Acknowledgements

We are grateful to Zoltán KOVÁCS (Liszt Academy, Budapest, Hungary) for his help and suggestions.

## References

- BÉCAUD, M. 2006: Les Harpoceratinae, Hildoceratinae et Paroniceratinae du Toarcien de la Vendée et des Deux-Sèvres (France). — *Documents des Laboratoires de Géologie de la Faculté des Sciences de Lyon* **162**, 1–245.
- BILOTTA, M., VENTURI, F. & SASSAROLI, S. 2010: Ammonite faunas, OAE and the Pliensbachian–Toarcian boundary (Early Jurassic) in the Apennines. — *Lethaia* **43/3**, 357–380.
- CRESTA, S., PALLINI, G. & VENTURI, F. 1989: Jurassic Ammonite assemblages in the Valdorbia section. — In: CRESTA, S., MONECHI, S. & PARISI, G. (eds). Mesozoic–Cenozoic Stratigraphy in the Umbria–Marche Area. Geological Field Trips in the Umbria–Marche Apennines (Italy). — *Memorie Descrittive della Carta Geologica d'Italia* **39**, 89–102.
- DONOVAN, D. T., CALLOMON, J. H. & HOWARTH, M. K. 1981: Classification of Jurassic Ammonitina. — In: HOUSE, M. R. & SENIOR, J. R. (eds): *The Ammonoidea. Systematics Association Spec. Vol.* **18**, 101–155, Academic Press, London.
- ELMI, S., GABILLY, J., MOUTERDE, R., RULLEAU, L. & ROCHA, R. B. 1994: L'étage Toarcien de l'Europe et de la Téthys: divisions et corrélation. — *Geobios M. S.* **17**, 149–159.
- ELMI, S., RULLEAU, L., GABILLY, J. & MOUTERDE, R. 1997: Toarcien. — In: CARIU, E. & HANTZPERGUE, P. (eds). Biostratigraphie du Jurassique ouest-européen et méditerranéen. — *Bulletin du Centre Recherche Elf. Exploration et Production, Mémoires* **17**, 25–36.

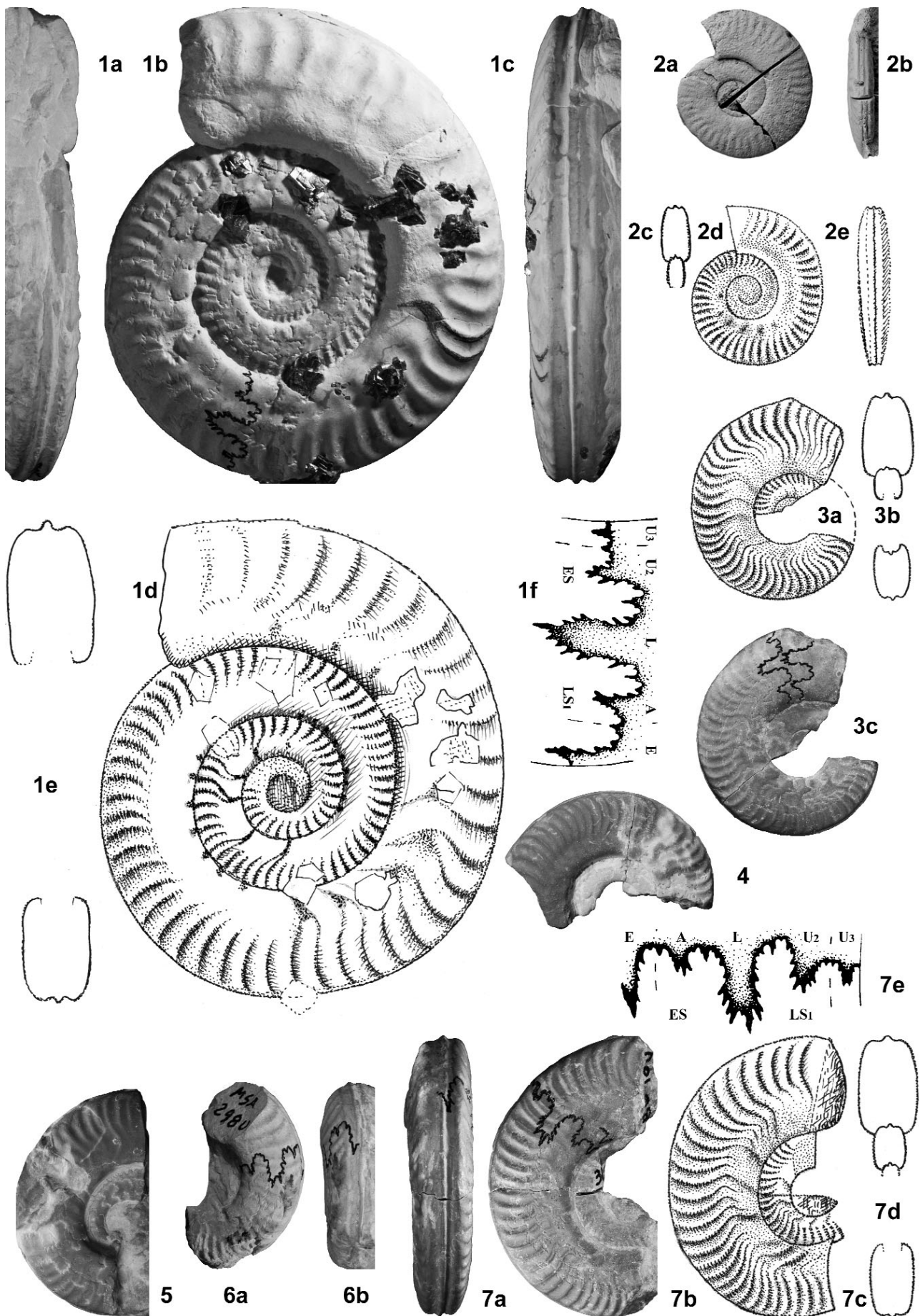
- GÉCZY, B. 1967: Upper Liassic ammonites from Úrkút, Bakony Mountains, Transdanubia, Hungary. — *Annales Universitatis Scientiarum Budapestinensis de Rolando Eötvös nominatae, Sectio Geologica* **10** (1966), 115–160.
- GÉCZY, B. 1984a: Jurassic Ammonite provinces of Europe. — *Acta Geologica Hungarica* **27/1–2**, 67–73.
- GÉCZY, B. 1984b: Provincialism of Jurassic Ammonites: examples from Hungarian faunas. — *Acta Geologica Hungarica* **27/3–4**, 379–389.
- GÉCZY, B., KOVÁCS, Z. & SZENTE, I. 2008: Remarks on the Toarcian–Aalenian fossil assemblage of the Kis-Teke Hill, Gerecse Mts (Hungary). — *Hantkeniana* **6**, 33–55.
- HOWARTH, M. K. 1992: The Ammonite Family Hildoceratidae in the Lower Jurassic of Britain. — *Monograph of the Palaeontographical Society*, London, Part **I**, 1–106 (1992), Part **II**, 107–200 (1993).
- HOWARTH, M. K. 2013: *Treatise OnLine, Number 57, Part L, revised, Volume 3B, Chapter 4: Psiloceratoidea, Eoderoceratoidea, Hildoceratoidea*. Paleontological Institute, The Kansas University, Lawrence KA, p. 1–141.
- KOVÁCS, Z. 2012: Lower Toarcian Ammonitida fauna and biostratigraphy of the Gerecse Mountains (Hungary). — *Fragmenta Palaeontologica Hungarica* **29**, 1–48.
- LACROIX, P. 2011: *Les Hildoceratinae du Lias moyen et supérieur des domaines NW européen et téthysien. Une Histoire de Famille*. — Edité par Pierre Lacroix, Paris, 659 p.
- MEISTER, E. 1913: Zur Kenntnis der Ammonitenfauna des portugiesischen Lias. — *Zeitschrift der deutschen geologischen Gesellschaft* **65**, 518–586.
- NINI, C., NOCCHI, M. & VENTURI, F. 1996: The Toarcian marly-calcareous succession in the M. Martani area (Northern Apennines): Lithostratigraphy, biostratigraphy, paleoecology and effects of Tethysian events on the depositional environment. — *Bollettino della Società Paleontologica Italiana* **35/3**, 281–319.
- PAGE, K. N. 1996: Mesozoic Ammonoids in Space and Time. — In: LANDMAN, N., TANABE, K. & DAVIS, R. C. (eds): *Ammonoid Paleobiology*. Plenum Press, New York, 755–794.
- PAGE, K. N. 2003: The Lower Jurassic of Europe: its subdivision and correlation. — *Geological Survey of Denmark and Greenland Bulletin* **1**, 23–59.
- PAGE, K. N. 2004: A Sequence of Biohorizons for the Subboreal Province. Lower Toarcian in Northern Britain and their Correlation with a Submediterranean standard. — *Rivista Italiana di Paleontologia e Stratigrafia* **110/1**, 109–114.
- PAGE, K. N. 2008: The evolution and geography of Jurassic ammonoids. — *Proceeding of the Geologists' Association* **119**, 35–57.
- SASSAROLI, S. & VENTURI, F. 2005: The genus *Pseudolillia* (Maubeuge, 1949) (Ammonitina, Grammoceratinae) in the upper Toarcian of the Central Apennines (Cingoli, Macerata, Italy). — *Bollettino della Società Paleontologica Italiana* **44/3**, 231–236.
- SASSAROLI, S. & VENTURI, F. 2010: *Cingolites* n. gen., a new lower Toarcian Hildoceratinae (Ammonitina) from the Marche Apennines (Cingoli, Macerata, Italy). — *Bollettino della Società Paleontologica Italiana* **49/2**, 97–118.
- SASSAROLI, S. & VENTURI, F. 2012: Early Toarcian (post-OAE) Hildoceratinae (Ammonitina) fauna from the Marche Apennines (Italy). — *Revue de Paléobiologie* **31/1**, 85–114.
- VENTURI, F. 1975: Rapporti filitici e stratigrafici dei generi toarciani *Mercaticeras*, *Brodieia*, *Hildoceras*, *Phymatoceras*, *Chartronia* dell'Appennino Centrale. — *Rivista Italiana di Paleontologia e Stratigrafia* **81/2**, 195–246.
- VENTURI, F. 2004: Ammoniti (Ammonitina) del genere *Urkutites* nel 'Rosso Ammonitico' umbro-marchigiano. — *Bollettino di Mineralogia e Paleontologia* **8**, 14–16.
- VENTURI, F., REA, G., SILVESTRINI, G. & BILOTTA, M. 2010: *Ammoniti. Un viaggio geologico nelle montagne appenniniche*. — Porzi Editoriali, Perugia, 367 p.
- VÖRÖS, A. & GALÁČZ, A. 1998: Jurassic palaeogeography of the Transdanubian Central Range (Hungary). — *Rivista Italiana di Paleontologia e Stratigrafia* **104/1**, 69–84.

## Plate 1

- Figure 1a–f. *Urkutites boeckhi* GÉCZY, 1967 — MSA881U, Marconessa quarry, section 2, bed 8c. [1d. whorl-section (×1); 1e. drawing (×1); 1f. suture line (×2)].
- Figure 2a–e. *Urkutites boeckhi* GÉCZY, 1967 — holotype, refigured by courtesy of Zoltán Kovács. [2c. whorl-section (×1); drawing (×1); drawing ventral view (×1)].
- Figure 3a–c. *Urkutites boeckhi* GÉCZY, 1967 — BU9U, Maranghi quarry section, bed 32. [3a. drawing (×1); 3b. whorl-section (×1)]
- Figure 4. *Urkutites boeckhi* GÉCZY, 1967 — BU11U, Maranghi quarry section, bed 33b.
- Figure 5. *Urkutites boeckhi* GÉCZY, 1967 — BU12U, Maranghi quarry section, bed 32.
- Figure 6a–b. *Urkutites boeckhi* GÉCZY, 1967 — MSA298U, Marconessa quarry, section 2, bed 8c.
- Figure 7a–e. *Urkutites boeckhi* GÉCZY, 1967 — BU10U, Maranghi quarry section, bed 34a. [7c. drawing (×1); 7d. whorl-section (×1); suture line (×2)]

All photographs in natural size.





## Plate 2

Figure 1a–e. *Urkutites boeckhi* GÉCZY, 1967 — BU14U, Maranghi quarry, collected *ex-situ* from detritus of the Bifrons Zone (Sublevisoni Subzone). [1d. whorl-section (×1); 1e. drawing (×1)].

Figure 2a–c. *Urkutites boeckhi* GÉCZY, 1967 — BU13U, Maranghi quarry, collected *ex-situ* from detritus of the Bifrons Zone (Sublevisoni Subzone). [2c. drawing (×1); 2d. whorl-section (×1); 2e. suture line (×2)].

Figure 3a–d. *Urkutites inflatus* GÉCZY, 1967 — holotype, refigured by courtesy of Zoltán KOVÁCS. [3c. whorl-section (×1.2); drawing (×1.2)]

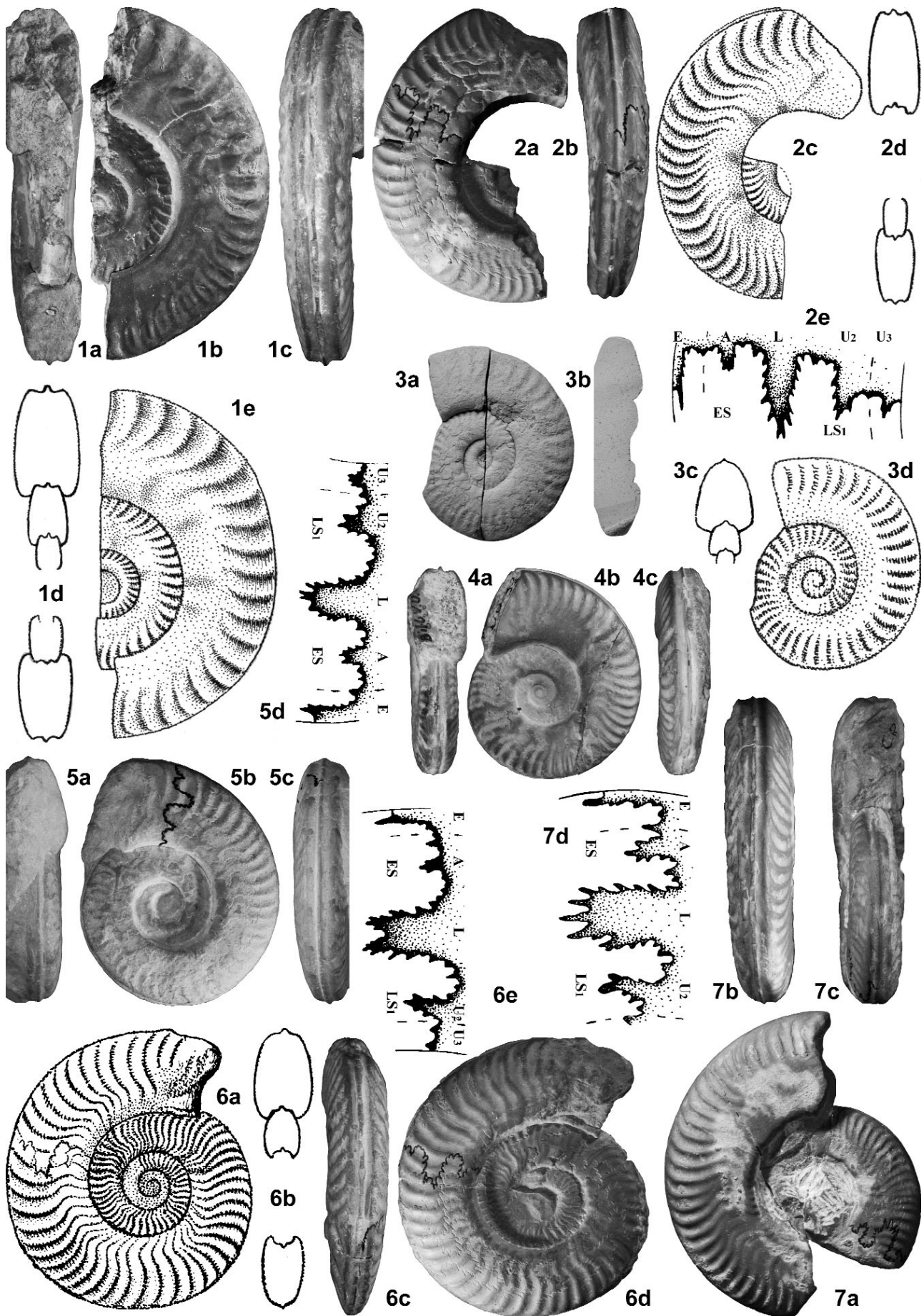
Figure 4a–c. *Urkutites* cf. *inflatus* GÉCZY, 1967 — VU33, Valdorbia section, bed 2b.

Figure 5a–d. *Urkutites* cf. *inflatus* GÉCZY, 1967 — MSA299U, Marconessa quarry, section 2, bed 8b. [5d. suture line (×2.5)]

Figure 6a–e. *Urkutites* ? sp. 2 — PO14, Pozzale section, bed 12.40, [6a. drawing (×1); 6b. whorl-section (× 1); 6e suture line (×2.5)].

Figure 7a–d. *Urkutites* ? sp. 3 — CO25U, Cima Panco section, bed 6.25 [7d. suture line (×3)].

All photographs in natural size.



### Plate 3

Figure 1a–f. *Urkutites italicus* n. sp. — holotype MSA875U, Marconessa quarry, section 2, bed 10d [1d. whorl-section (×1); 1e. drawing (×1); 1f. suture line (×3)].

Figure 2a–f. *Urkutites italicus* n. sp. — paratype GC7U, Gorgo a Cerbara section, collected *ex-situ* from detritus of the Bifrons Zone, Sublevisoni Subzone. [1d. whorl-section (×1); 1e. drawing (×1); 1f. suture line (×3)].

Figure 3a–c. *Urkutites italicus* n. sp. — paratype CP126, Cima Panco section, bed 9.00-9.20 [3b. whorl-section (×1); 3c. drawing (×1)].

Figure 4. *Urkutites italicus* n. sp. — paratype AU7, Monte Aspra, collected *ex-situ* from detritus of the Bifrons Zone, Sublevisoni Subzone.

Figure 5a–f. *Urkutites* ? sp. 1 — BU15U, Maranghi quarry section, bed 30 [5d. whorl-section (×1); 5e. drawing (×1); 5f. suture line (×4)].

Figure 6a–b. *Urkutites* ? sp. 3 — CIV12, Civitella Mt., section 4, bed 0.3.

All photographs in natural size.

