B6 Autochthonous Late Jurassic algal associations Waschberg Zone / Lower Austria

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Geological setting

Both the Tithonian Ernstbrunn Limestone and the marly Klentnice Formation (Oxfordian to Lower Tithonian) represent the oldest members exposed above ground of the highly faulted Waschberg Zone, which continues into Czechia as Zdanice Unit.

The Waschberg Zone lies between the Molasse Zone in the west where it is overthrusted and the northern part of the Vienna basin in the east. The Waschberg Zone - Ernstbrunner - Klippen Zone (TOLLMANN 1985) begins at the Waschberg near Stockerau, which is NW of Vienna and continues into the north - eastern direction towards Ernstbrunn, Staatz and Falkenstein and the Czech border.

During Alpine orogeny, at the Miocene Styrian phase (TOLLMANN 1966) parts of the meanwhile buried sediments were pressed up to the surface forming the characteristic hilly landscape with rootless klippen. As a result of this the dipping of the beds may be rather different.

Stop 9

Locality

Dörfles V Quarry (Locus typicus of *Griphoporella ehrenbergi* BACHMAYER 1941, *Petrascula piai* BACHMAYER 1941, *Cayeuxia doerflesiana* KAMPTNER 1951)

Topography (fig.1)

The outcrop is one of five old quarries near Dörfles, a little village northwest of Ernstbrunn. Four of these quarries (Dörfles I - IV) are inside the deer - park Ernstbrunn.

The site can be found at the topographical map ÖK 50 MISTELBACH. Coming the street B6 from Vienna to Ernstbrunn, you may follow the green sign "Wildpark", which means deer - park. At the end of the little village Dörfles in the forest you find the entrance of the deer - park, which is surrounded by a fence. For visiting the site, follow the road uphill quite beside the fence. At the top of the hill, you will see Dörfles III & IV behind the fence. Continue straight ahead, and then take the way to the right where you will find Dörfles V Quarry.

Stratum

Ernstbrunn Limestone. First mentioned by BOUE (1830) as "calcaire d' ernstbrunn".

Age

ZEISS & BACHMAYER (1989) working on ammonites and REHANEK (1987) using calpionellids found out that the Ernstbrunn Limestone starts in the middle Middle Tithonian and continues to the top of the lower Upper Tithonian.

Facies

This outcrop gives an impression of the tectonics in the highly faulted Waschberg Zone. There is an overthrust within the Ernstbrunn Limestone in the middle of the quarry, separated by greenish marls from the Paleogene.The dipping of the beds is about 50 to 60° to the south-east (HOFMANN 1990).

The section starts with a packstone facies (pl.1, fig.4) at the bottom, containing a rich flora of dasyclads with a re-

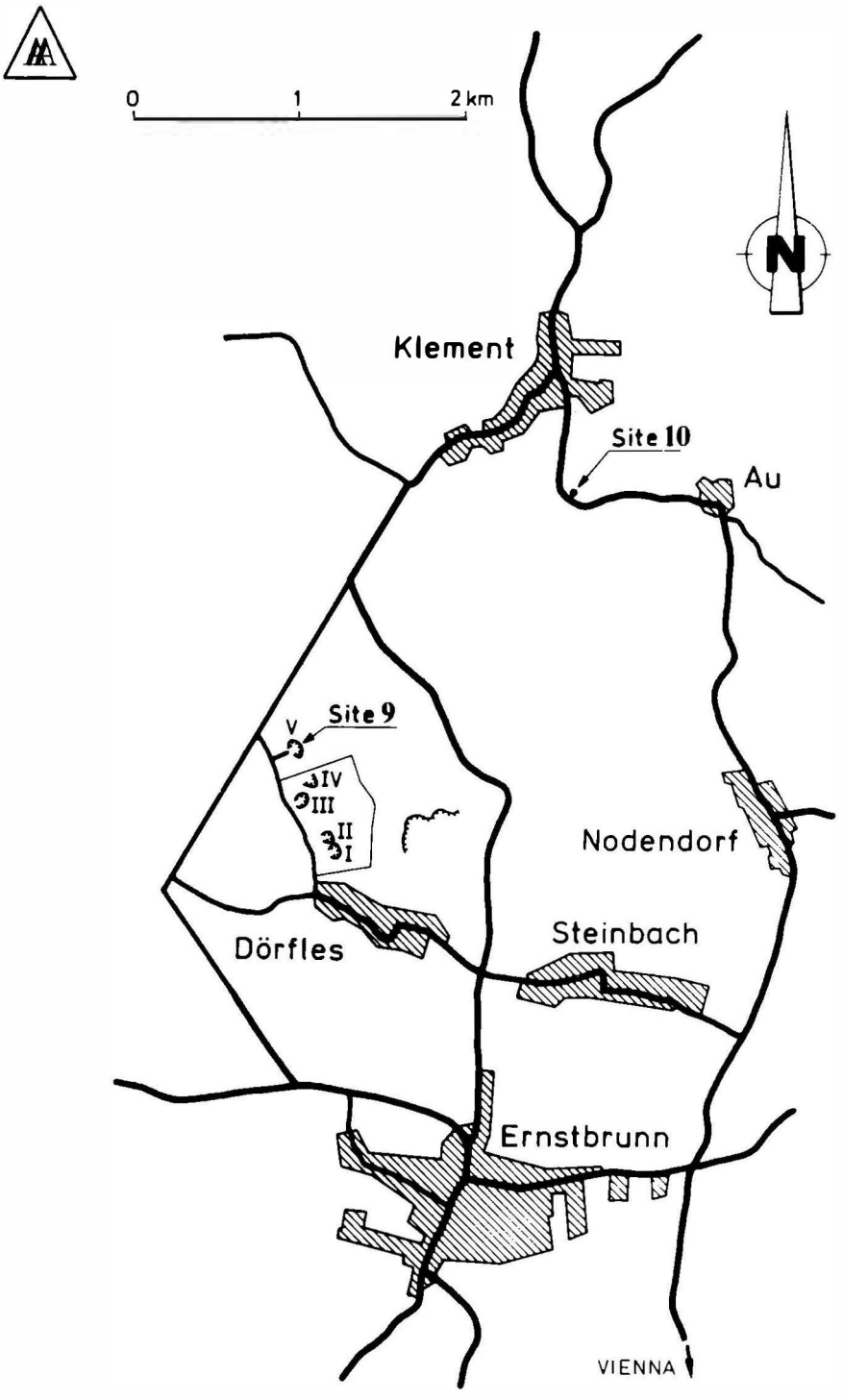


Fig. 1: Map of locations in the Waschberg Zone.

markable form of *Heteroporella* sp. (pl.1, figs.1,3), followed by a socalled Diceras facies. This facies shows *Diceras* sp. together with *Nerinea* sp., a very common association of the Ernstbrunn Limestone (BACHMAYER 1948). The *Diceras* facies ends with an oncoidal packstone facies with *Lithocodium*- and *Bacinella*- coated biogens, reaching a diameter of 1 centimeter (pl.1, fig.2). In the upper part of the section there is a dominance of *Lithocodium* and *Bacinella* covering the sediment.

Fauna and flora
Diceras sp., *Nerinea* sp., *Purpuroidea* sp., corals, foraminifera *(Nautiloculina oolithica, Conicospirilina basiliensis, Trocholina* sp., *Neotrocholina friburgensis, Pseudocyclammina lituus)*.

Algae
Arabicodium sp., Cayeuxia sp., Permocalculus sp.

Dasyclads *Salpingoporella annulata* CAROZZI,
S. pygmaea (GÜMBEL),
Macroporella praturloni (DRAGASTAN),
Heteroporella sp.,
H. aff. *lusitanica* (RAMALHO),
Campbelliella striata (CAROZZI),
Neoteutloporella socialis (PRATURLON),
Linoporella capriotica OPPENHEIM,
L. ? svilajensis SOKAC & VELIC,
Clypeina jurassica FAVRE & RICHARD,
C. solkani CONRAD & RADOICIC,
Triploporella sp.,
Petrascula sp.,
Actinoporella podolica ALTH.

Environment
The Ernstbrunn Limestone in the area around Dörfles was deposited in a shallow tropical lagoon. In the Late Jurassic this area belonged to the inner part of a carbonate platform (ELIAS & ELIASOVA 1986). Wackestone facies points to a quiet regime, whereas grainstone facies indicates some water agitation. There is no evidence for inter/supratidal or brackish influences.

Stop 10

Locality
Roadcut Klement 64

Topography
This outcrop is at the road from Au to Klement (topographical map ÖK 50 MISTELBACH; fig. 1).

Stratum
Klentnice Formation (ABEL 1899)

Age
Usually the age of the Klentnice Formation is determined as Tithonian (BACHMAYER 1957), even older by some authors. ELIAS & ELIASOVA (1984) found evidence for Oxfordian age in the Czech part.

Facies
This oncoidal facies is just one of the varieties of the Klentnice Formation. JÜTTNER (1933) described nine different facies types of this formation. One facies type is the so-called "Algenknollenkalk" which was mentioned a few years before by GLÄSSNER (1931). In a remark GLÄSSNER states, that he has sent .one sample of the brownish to bluish - greyish "Algenknollenkalk" which he found east of Klement to J. PIA who determined *Girvanella* sp. and some small fragments of *Solenopora* sp. After ELIAS (1992: 183) the Ernstbrunn

Limestone lower boundary on the contact to the Klentnice Formation is often obscured by alternation of Klentnice type rocks, (e.g. "biscuits" - oncolitic, green, grey bioclastic limestones) and breccias of Ernstbrunn Limestone type. Out of this, it can be assumed that this outcrop belongs to the upper part of the Klentnice formation, which changes laterally and vertically into the Ernstbrunn Limestone.

This brownish limestone - a kind of siliciclastic (pl.2, fig.2) oncoidal packstone with a grid-like grey weathering surface, is of marine origin (echinoderm fragments). Oncoids are grainsupported, the average size of the oncoids is about one cm, a few are slightly larger (up to 3 centimeters). The nucleus is mostly a bioclast, in many cases a mollusc fragment. The multilayered cortex of the oncoid is predominantly built by "stromatolitic" crusts of cyanophycean algae and sessile foraminifera. According to RIDING (1977) these oncoids may be attributed to the group of non-skeletal stromatolites, because of lacking preserved microorganisms (calcareous thalli). Although the general shape of the oncoids is rather round, the cortex does not show concentric laminae (pl. 2 figs.1-3).

The internal structure of the cortex reveals a picture of columnar microstromatolites or microdomes (KRAJEWSKI 1983) and sparitic radial vugs separating the organo-sedimentary sequences. In the lower part the microstromatolites grow independently, whereas in the upper part they may sometimes be linked together by overgrowing crusts. Declining laminae of the microstromatolites towards the sparitic vug may be interpreted as of primary sedimentary origin. The "stromatolitic" crusts consist of horizontally alternating brown layers with a few very fine filaments and light sparitic layers. Sometimes small sedimentary particles (quartz) are found within the light sparitic layers. This is an evidence for trapping activity, as it is typical for stromatolites.
The sparitic vugs may be filled with the sorrounding siliciclastic sediment, ore some strongly recrystallized organism fragments.

Fauna and flora
From this outcrop no macrofossils are recorded. In another site, where the same facies is exposed, in an oncoid one specimen of a brachiopod (*Terebratula* sp.) was found. In general, the Klentnice Formation is rich of echinoderms, sponges, a few ammonites and various molluscs. Oysters are frequently observed.

Environment
Echinoderm remains and foraminifera are indicating a normal marine milieu. The concentric shape of the oncoids may be due to some moderate agitation, the growth of columnar "stromatolites" around shell fragments shows, that they had enough time for building, occasioanally they were turned round, probably by slight submarine currents. There are no evidences for intensive wave agitation, but signs of mechanical erosion. Hence it is assumed, that these oncoids originate from a subtidal area below intensive wave activity.

References Stops 9 - 10:
see references chapter A2.

Plate 1

Microfacies of the
Ernstbrunn Limestone in Dörfles V Qaurry.

Fig. 1: Longitudinal section of *Heteroporella* sp. Note the alternating whorls of fertile and sterile branches. x34.

Fig. 2: *Lithocodium - Bacinella* oncoid. The nucleus is a gastropod fragment. x10.

Fig. 3: Horizontal section of *Heteroporella* sp. with ten fertile club shaped branches. In the sporangia there are questionable of spores. x44.

Fig. 4: Algal packstone with fragments of *Salpingoporella annulata* CAROZZI, *Heteroporella* sp. and cyanophycean algae. x9.

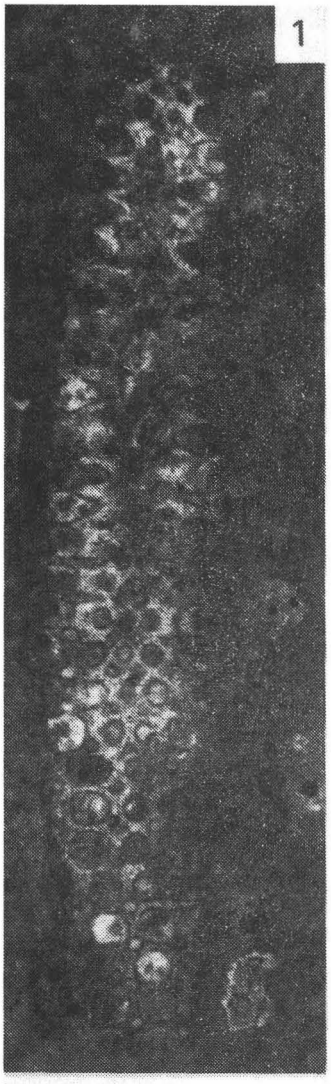
Plate 2

Microfacies of the Klentnice
Formation at roadcut Klement 64.

Fig. 1: Oncoid with microstromatolites (microdomes) built by cyanophceans, encrusting foraminifers and serpulids. x 7,3.

Fig. 2: Detail of a large oncoid, showing various shapes of microstromatolites and serpulid gastropods in a fine-grained siliciclastic sediment. x 7,3.

Fig. 3: Detail of a large oncoid (fig. 1). Radial, sparitic vug with strongly recristallized remains of encrusting organisms (? ostracods) and fine-grained sediment. The declining laminae of the microstromatolites towards the sparitic vug may be interpreted as of primary sedimentary orign. x19.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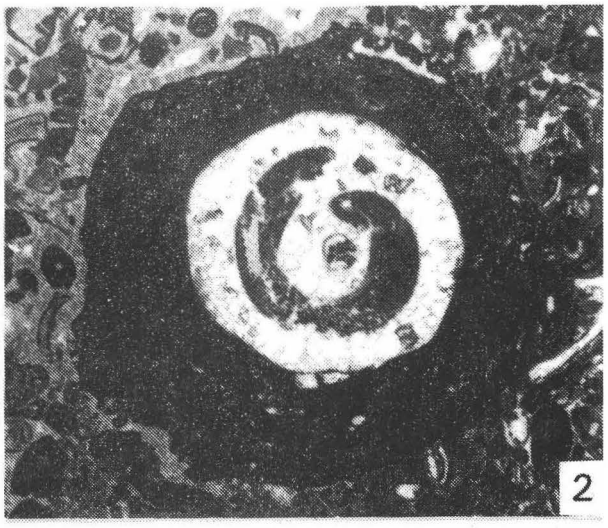
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