

Excursions Part 2: Czech Republic

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An overview of the stratigraphic sequences of Devonian units of the Czech Republic is provided on pages 62 and 63. In general, both tables are re-drawn with minor changes after CHLUPÁČ & HLADIL (1994). Devonian deposits are divided into 9 areas: Barrandian (17 units), Central Bohemian "Islet Zone" (Rožmitál "Islet": 3 units; Sedlčany-Krásná Hora "Islet": 4 units), Chrudim Lower Palaeozoic (1 unit), Železný Brod Crystalline Area (4 units), Basement of the Bohemian Cretaceous Basin (3 units), Tišnov Development at the western border of the Boskovice Furrow (7 units), Drahany Development (Hrubý Jeseník Mountains: 5 units; Šternberk-Horní Benešov Belt: 5 units; Drahany Upland: 5 units), Transitional Development of the Konice-Mladeč Belt and the Němčice Belt (6 units) and the Moravian Karst Development (3 units). More than 60 units are included in the Devonian Table of the Czech Republic, but due to the complex development of some areas many more are discussed by different authors.

One of the best studied areas is the Barrandian (CHLUPÁČ et al. 1998). Formations of this area are known world-wide. Excepting that some of them are GSSP's, others define type sections for global extinction events recognized in the Barrandian area for the first time (e.g. Daleje Event, Basal Choteč Event or Kačák Event).

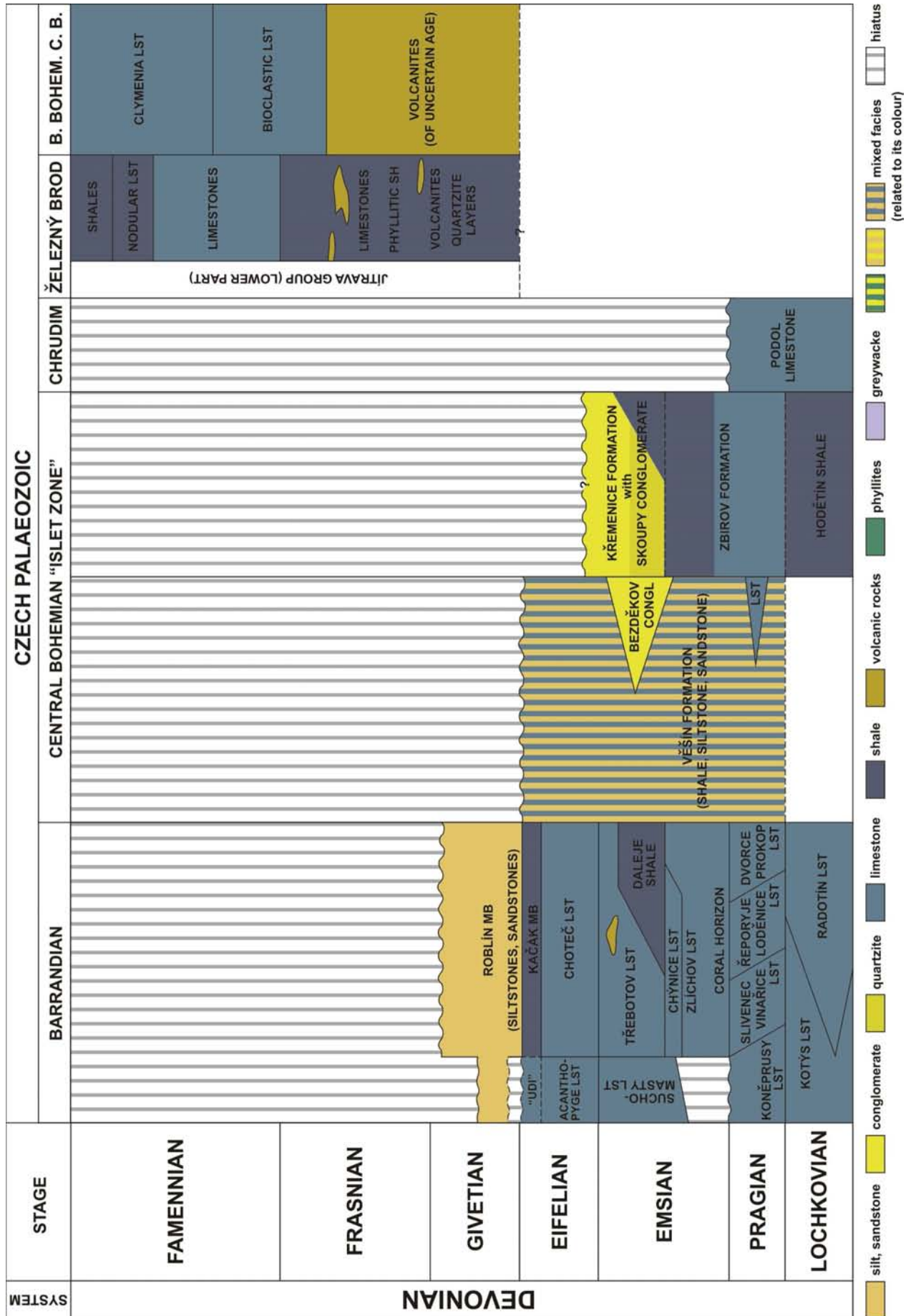
The excursion points chosen here represent sections reflecting shallow marine correlatives across the Klonk Event, Basal Choteč Event and Kačák Event, which are well known from the pelagic sequence of the Barrandian.

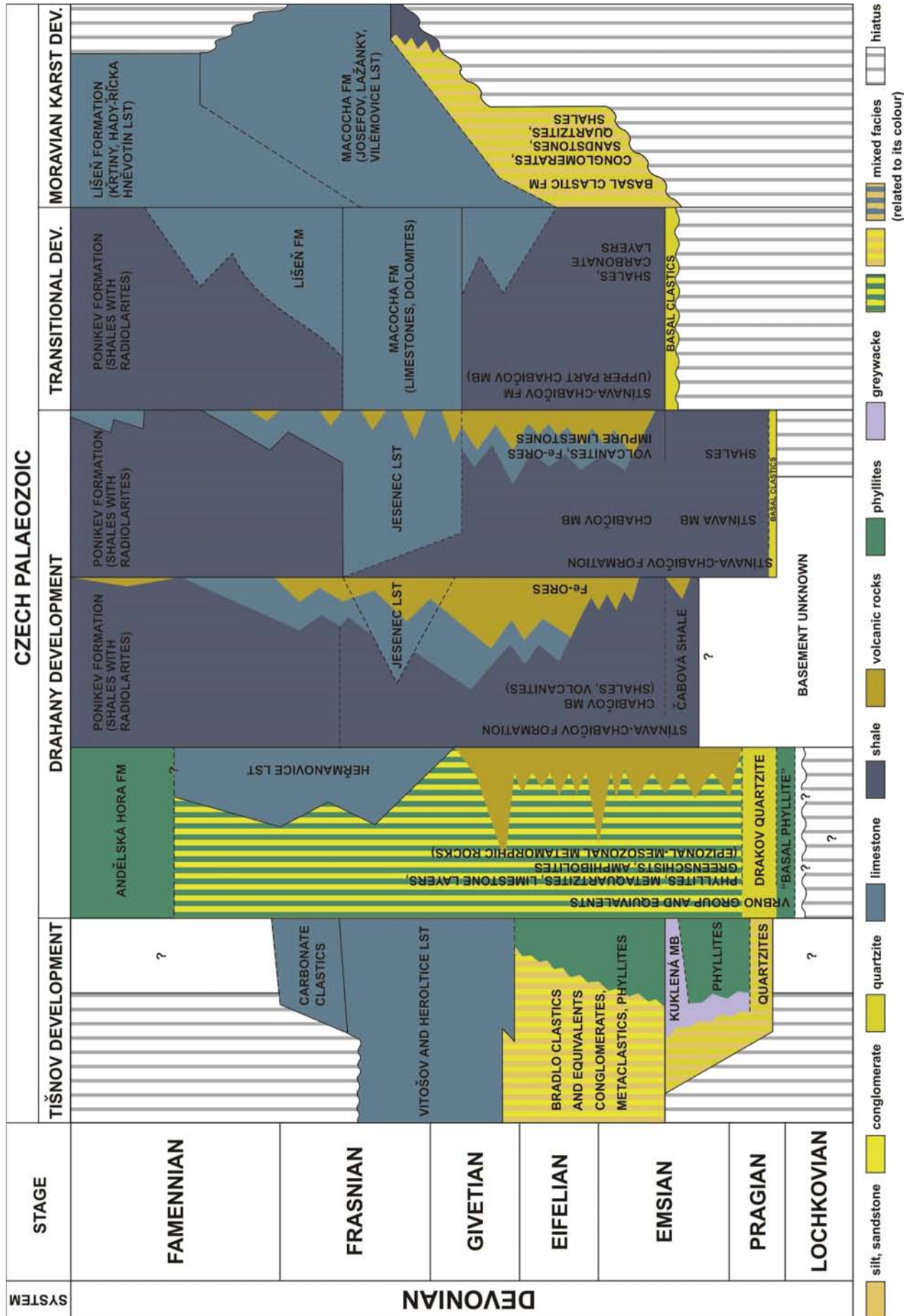
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Abbreviations page 62: B. Bohem. C. B. = Basement of the Bohemian Cretaceous Basin; Chrudim = Chrudim Lower Palaeozoic; Congl = Conglomerate; Lst = Limestone; Mb = Member; Sh = Shale; "UDI" = "Upper Dark Interval"; Železný Brod = Železný Brod Crystalline Area.

Abbreviations page 63: Transitional Dev. Transitional Development; Fm = Formation; Lst = Limestone; Mb = Member; Moravian Karst Dev. = Moravian Karst Development.





Stop 1: Požáry Section (Barrandian, Czech Republic)

One of the abandoned quarries (Požár 1 and Požár 2) lies 1 km east of Praha-Řeporyje on the southern slope of the Daleje Valley. In this quarry (N 50°01'41''/ E 14°19'28'') the Kopanina Formation (Ludlow Series), the Požáry Formation (Přídolí Series) and the Lower Devonian Lochkov Formation (Lochkovian Stage) are exposed. The section was designated as the international basal boundary stratotype of the Přídolí Series at the 27th International Geological Congress in Moscow in 1984. The sequence continues into the Lower Devonian. Additionally to the GSSP of the Přídolí also the Silurian – Devonian boundary is defined here and is located between beds 158/159. In general the Požáry section was intensively studied by KŘÍŽ et al. (1986) and KŘÍŽ (1992). CHLUPÁČ (1953) and CHLUPÁČ et al. (1972) discussed the upper part of the section. Sedimentology and magnetic susceptibility (MS) was studied by KUKAL in KŘÍŽ et al. (1986), ČÁP et al. (2003) and VACEK (2007).

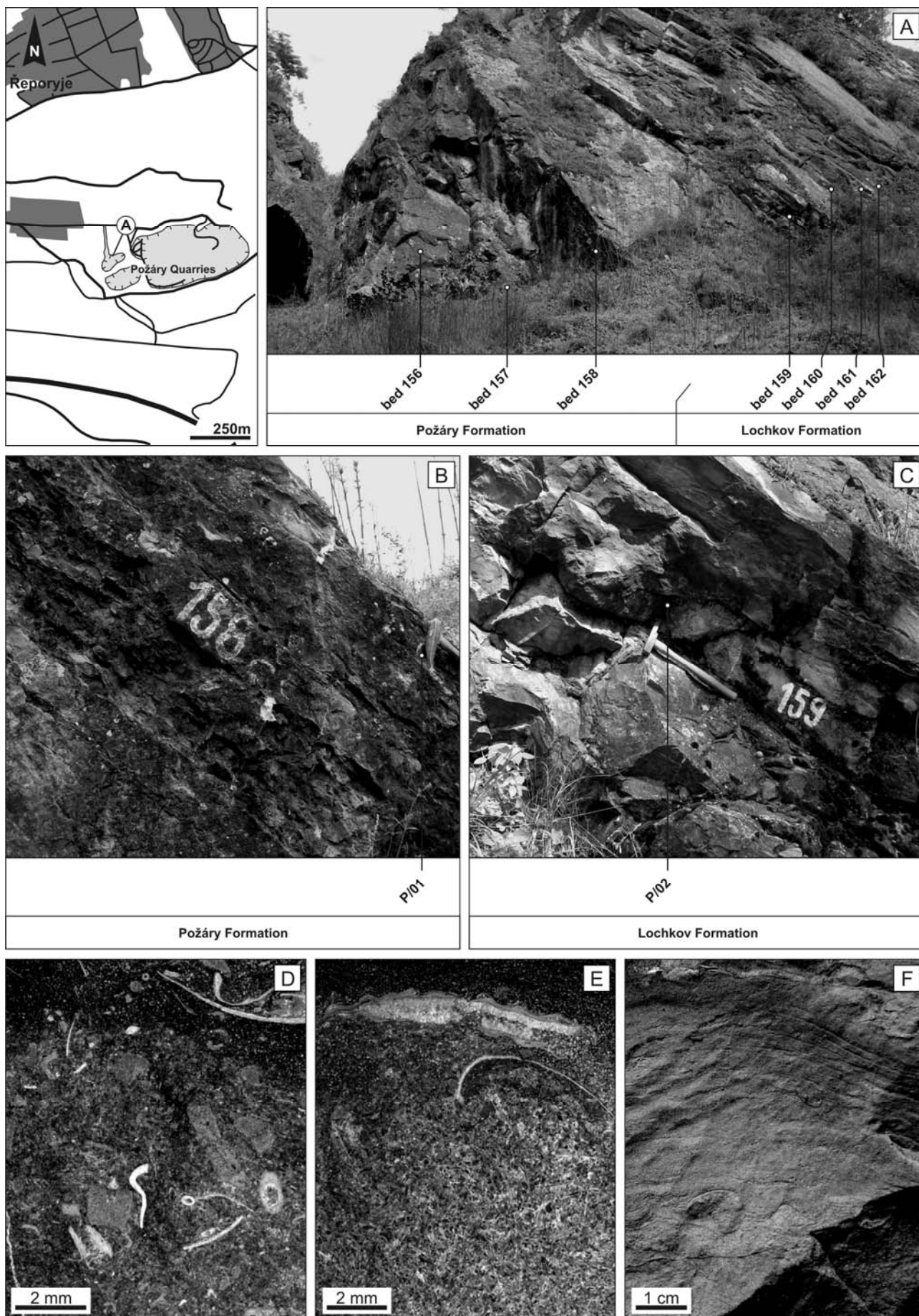
Lithology: The section exposes the Upper Silurian Kopanina and Požáry (=Přídolí) formations and the lower part of the Lochkov Formation (Lower Devonian). Brown tuffitic shales with lenses and concretions of limestones are exposed in the cut in front of the tunnel entrance which already belongs to the Kopanina Formation. Brachiopods like *Septatrypa sapho* and *Bleshidium patellinum* are locally abundant here. This interval is followed by an 1.3 m thick bed (bed 15), which contains common trilobites, e.g. *Metacalymene baylei*, *Encrinuraspis beaumonti*, *Prantlia longula* and *Prionopeltis praecedens*. This bed is overlain by a sequence of brachiopod and cephalopod limestones and grey crinoidal grainstones. The top of the Kopanina Formation consists mainly of thin-bedded, dark grey limestones with shale intercalations. The Požáry Formation starts with dark grey, unsorted, poorly washed bioclastic to biomicritic limestone with shale intercalations. From bed 150 upward, light grey biomicritic to bioclastic limestones form more thick bedded limestones yielding the *Scyphocrinites* – *Dayia bohémica* community. The Silurian – Devonian boundary lies a few meters above within an interval of crinoidal grainstones to packstones at the base of bed 159. This bed resembles the base of the Lochkov Formation which consists of light grey biomicritic to bioclastic massive limestone yielding crinoids and brachiopods.

Biostratigraphy: The base of Přídolí is defined by the first occurrence of the graptolite *Monograptus parultimus* within bed 96 (KŘÍŽ 1992). At the Silurian – Devonian boundary the first occurrence of the conodont index taxon *Icriodus hesperius* (CARLS et al. 2007) is recognised at the base of bed 159 (KŘÍŽ 1992). The trilobite index taxon for the Lower Devonian is *Warburgella rugulosa* which occurs in the bed 162 (KŘÍŽ 1992).

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On the map (A) indicates the position of the Silurian – Devonian boundary in the abandoned Požár Quarry (compare photo (A) right of the map). The S/D boundary (located near the base of bed 159) is equivalent to the boundary of the Požáry Formation (B, D) and the Lochkov Formation (C, E, F).



Stop 2: Červený Quarry (Barrandian, Czech Republic)

Červený Quarry is located in the SW part of the Prague Basin (N 49°54'38'' E 14°04'37''). This quarry provides the best exposure of Suchomasty Limestone (Daleje – Třebotov Formation, upper Emsian – lower most Eifelian), directly overlying the Pragian reef of the Koněprusy Limestone after a hiatus (the largest part of the Zlíchovian is missing). The Suchomasty Limestone itself is overlain by Acanthopyge Limestone (Choteč Formation, Eifelian).

Lithology: For the Suchomasty Limestone a total thickness of about 23 m is measured. The sequence consists of well-bedded, grey and red bioturbated skeletal packstones and grainstones. Among skeletal remains echinoderm ossicles prevail; others are represented by brachiopods, trilobites, gastropods, nautiloids, conodonts and common dacryoconarid tentaculites. Among echinoderms crinoids prevail. Preservation of articulated crinoidal stems and unsorted crinoidal debris in muddy matrix suggests transport over short distances only. The crinoids are represented by genera with small, thick-walled crowns such as *Pisocrinus*, *Parapisocrinus*, *Tiaracrinus* and *Heracrinus* (PROKOP 1987). An increased amount of coarser, mainly crinoidal detritus has been documented in the lowest and upper-most parts of the sequence. A typical feature for Suchomasty Lst (and also the overlying unit) is the presence of stromatactis structures which are concentrated in some layers. According to HAVLÍČEK & KUKAL (1990) the Suchomasty Limestone generally belongs to SMF 8 and 4 sensu WILSON (1975). The above-mentioned authors described the depositional setting as being situated behind the outer platform edge with a water depth estimated at a maximum of a few tens of meters. According to these authors the water was temporarily agitated and temporarily quiet.

The unit of the Acanthopyge Limestone is represented by beds of grey and light grey crinoidal grainstones alternating with the background sediment, which is represented by grey lime-mudstones that can be laminated in some parts, and bioturbated wackestones. According to HAVLÍČEK & KUKAL (1990) this unit belongs to the SMF 8 sensu WILSON (1975). KUKAL in HAVLÍČEK & KUKAL (1990) recognized also SMF 17 on the basis of "peloids, agglutinated peloids, some coated particles and lumps" that were present.

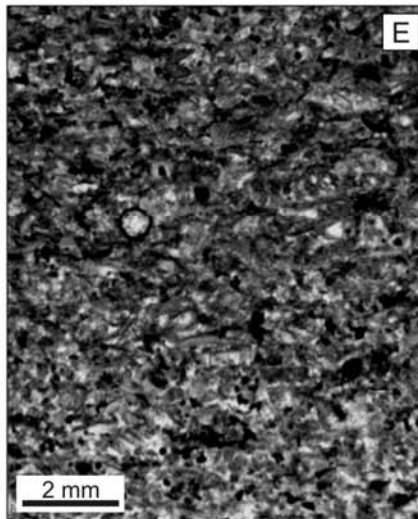
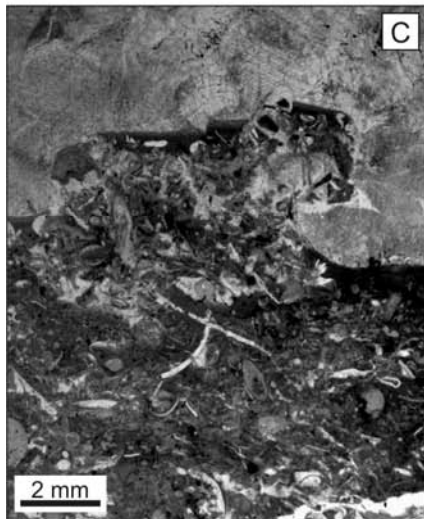
CHLUPÁČ (1983) established the *Acanthopyge* – *Phaetonellus* trilobite assemblage which corresponds to the shallow marine, well-aerated subtidal Benthic Assemblage (BA) 2 (locally 3). HAVLÍČEK in HAVLÍČEK & KUKAL (1990) established the *Karbous* – *Acanthopyge* brachiopod assemblage corresponding to the same BA.

Biostratigraphy: The conodont zones documented in this section are: *laticostatus* Zone (lower-most part of Suchomasty Limestone), *serotinus* Zone, *patulus* Zone, *partitus* Zone and *costatus* Zone. The dacryoconarid zonation is as follows: *Nowakia elegans* Zone (lower-most part of Suchomasty Limestone), *N. cancellata* Zone, *N. richteri* Zone and *N. holynensis* Zone.

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The map (A) indicates the outcropping area (Červený Quarry); A. The arrow-head points to the investigated interval in Červený Quarry; B. sampled interval across the boundary of Suchomasty Lst and Acanthopyge Lst (indicated are samples for thin sections, geochemistry and conodonts); C. water escape structure, Ce/d (thin section); D. crinoidal pack- to grainstone with cast fillings by several generations of layered silt, Ce/g (thin section); E. fine grained peloidal grainstone with crinoidal debris and cross-sections of tentaculites or foraminifers, Ce/w (thin section).



Stop 3: Jirásek Quarry (Barrandian, Czech Republic)

Jirásek Quarry is located somewhat north of Červený Quarry (N 49°54'49'' / E 14°04'33''). In this quarry the upper part of Acanthopyge Limestone is accessible. The overlying unit is represented by the so-called "Upper Dark Interval" sensu HLADIL & KALVODA (1993), which may represent the shallow-water equivalent of Kačák shales in Koněprusy area.

Lithology: The Acanthopyge Limestone is represented here mainly by grey, coarse grained, not well sorted, well washed crinoidal grainstones and rudstones. The uppermost 80 cm of the sequence differs significantly from the underlying unit. It is called "Upper Dark Interval" ("UDI"), and consists of dark grainstones, wackestones and lime-mudstones. HLADIL & KALVODA (1993) studied this section in detail. They proposed that individual beds of the "UDI" (beds 45 A – L) represent gravity flow deposits (calciturbidites). In addition to very common abraded echinoderm clasts also bryozoan, sponges, brachiopods, ostracods and trilobites occur. According to the above-mentioned authors this sequence may represent the shallow water equivalent of the Kačák shale (Srbsko Formation), which occurs in another part of the basin. This assumption is based on the presence of *Nowakia otomari*, Givetian corals and *Polygnathus xylus ensensis*. Both sequences, the Kačák shale and the "UDI", reflect a deepening of the environment in their development. However, the precise correlation is still not clear.

Above the "UDI", poorly washed crinoidal debris together with stromatoporoids and corals was deposited. These gravity flow deposits may represent highstand shedding.

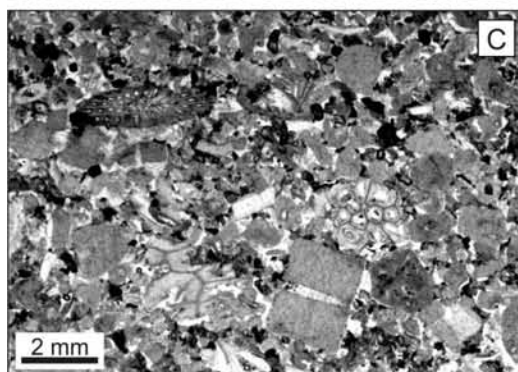
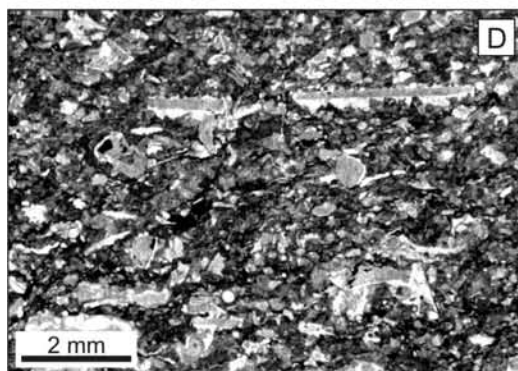
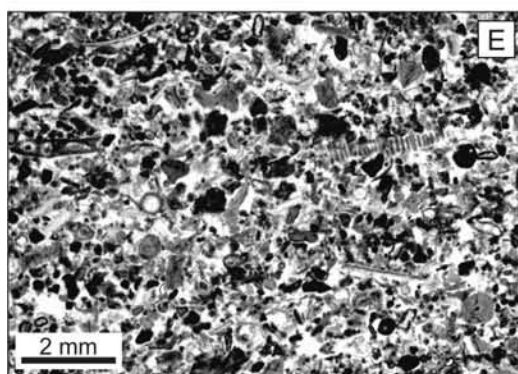
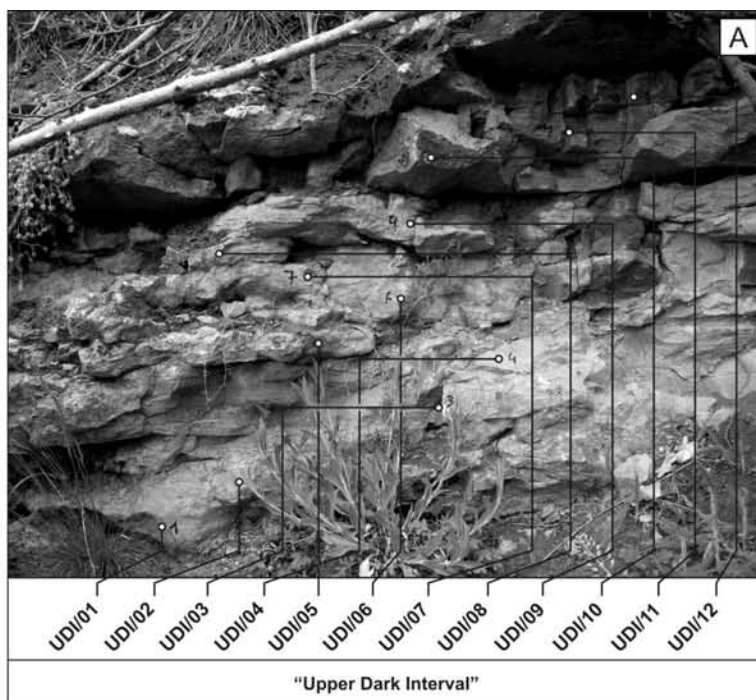
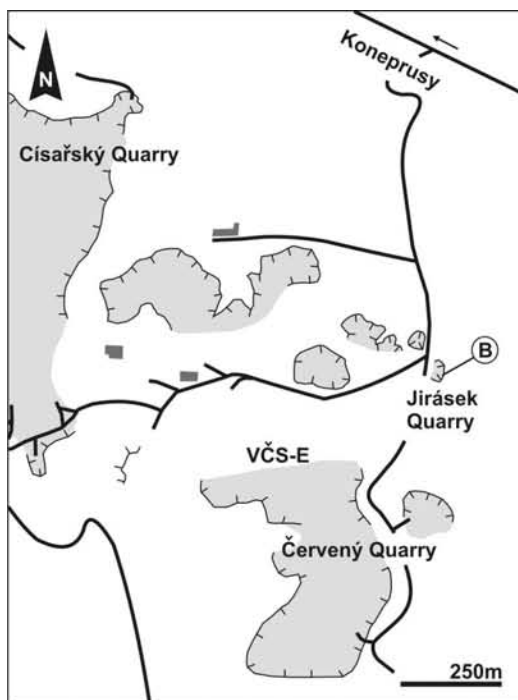
According to HLADIL & KALVODA (1993) the coral and stromatoporoid communities above the "UDI" differ considerably from those of underlying units.

Biostratigraphy: According to HLADIL & KALVODA (1993) and GALLE & HLADIL (1991) the "Upper Dark Interval" corresponds to the *Polygnathus eiflii* Zone. Tentaculite studies (BERKYOVÁ 2004) found *Nowakia pumilio* and *N. otomari* biozones in this interval.

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On the map Jirásek Quarry is indicated by (B) slightly N of Červený Quarry; A. The picture shows the "Upper Dark Interval" and all the samples taken for thin section; B. The unit exposed shows a nearly 3 meters thick sequence and the lithological change from well bedded limestone to the "Upper Dark Interval" (thin section and conodont sample numbers are indicated). C. crinoidal and bryozoan grainstone, Ji/06 (thin section, transmitted light photomicrograph); D. packstone with brachiopods and crinoids and a certain siliciclastic input, UDI/02 (thin section, transmitted light photomicrograph); E. grainstone with tentaculites, crinoids and other fragmented skeletal grains, UDI/11 (thin section, transmitted light photomicrograph).



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