

Extent of the Upper Norian – Rhaetian Slatnik Formation in the Tolmin Nappe, eastern Southern Alps

Razširjenost zgornjenorijske do retijske Slatniške formacije v Tolminskem pokrovu, vzhodne Južne Alpe

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Abstract

In the Norian and Rhaetian the area of present-day Slovenia was divided into the Julian Carbonate Platform on in present north, the Dinaric Carbonate Platform in the present south and the intermediate Slovenian Basin. Main Dolomite or the Dachstein Limestone were deposited, on the platforms whereas the basin was characterized by the Bača Dolomite. The Upper Norian-Rhaetian succession was recently recognized in the northern part of the basin. It was studied in two sections and defined as the Slatnik Formation. Rich conodont and foraminiferal assemblages were additionally studied. Two new sections of the Slatnik Formation are presented in this paper, proving the existence of the formation across the entire northern segment of the basin. The Povdnar section is located in the continuous facies belt westward from the type-locality on Mt. Kobla. When compared to the type-locality and the other previously studied section at Mt. Slatnik, the Povdnar section exhibits more distal basinal development, where hemipelagic limestone prevails, whereas resedimented limestones occur only sporadically. For this reason, a coarsening and thickening upward trend that was recognized in previously investigated sections is poorly expressed in the Povdnar section. The second newly studied section is located on Mt. Javor where the most northwestern succession of the basin is found. In this section, the Slatnik Formation is composed solely of hemipelagic limestone.

Izvleček

V noriju in retiju je bilo območje današnje Slovenije razdeljeno na Julijsko karbonatno platformo na severu, Dinarsko karbonatno platformo na jugu in vmesni Slovenski bazen. Na platformah sta se odlagala glavni dolomit in dachsteinski apnenec, medtem ko bazensko kamninsko zaporedje označuje baški dolomit. Nedavno je bilo v severnem delu bazena nepoznano zaporedje apnencev zgornjenorijske in retijske starosti, ki je bilo opisano pod imenom Slatniška formacija. V tej formaciji je bila raziskana združba konodontov in foraminifer. V pričujočem članku sta predstavljena dva nova stratigrafska profila, ki dokazujeta obstoj Slatniške formacije na celotnem severnem segmentu Slovenskega bazena. Profil Povdnar se nahaja pod previsnimi ostenji pod goro Šoštar v zveznem faciesnem pasu zahodno od tipske lokacije na Kobli. Če ga primerjamo s to lokacijo in z drugim predhodno raziskanim profilom na Slatniku, profil Povdnar razkriva bolj distalen bazenski razvoj, v katerem prevladujejo hemipelagični apnenci tipa mudstone do wackestone z radiolariji, spongijskimi spikulami in lagenidnimi foraminiferami. V teh apnencih so mestoma vidni sinsedimentni zdrs. V profilu je nekaj kalciturbiditnih plasti tipa packstone ali grainstone s peloidi, intraklasti, redkimi radialnimi sferoidi (ooidi?) in bioklasti, med katerimi so bili prepoznani drobci ehinodermov, brahiopodov in mehkužcev, foraminifere, ostrakodi, polži, drobci koral, kalcimikrobov in redke zelene alge. Zaradi tovrstne faciesne združbe, kjer so presedimentirani apnenci zelo redki, je trend večanja zrnivosti in debeljenja plasti, ki je bil prepoznan v predhodno raziskanih profilih, v profilu Povdnar le slabo izražen. Drugi novo raziskani profil se nahaja na hribu Javor, kjer dobimo skrajno severozahodne razvoje Slovenskega bazena. V tem profilu je Slatniška formacija sestavljena izključno iz hemipelagičnih apnencev in tako kaže najbolj distalen značaj.

Introduction

In the Late Triassic, the present-day Slovenia was characterized by the south-lying Dinaric

Carbonate Platform, the intermediate Slovenian Basin, and the north-lying Julian Carbonate Platform with some small-scale intraplatform basins (BUSER, 1986, 1989, 1996; VRABEC et al., 2009).

Peritidal Main Dolomite and/or Dachstein Limestone were deposited on the platforms during the Norian and Rhaetian (BUSER, 1986, 1989; OGORELEC & ROTHE, 1993). The carbonate platforms were bordered by sponge-coral reefs (e.g., FLÜGEL & RAMOVŠ, 1961; BUSER et al., 1982; TURNŠEK & RAMOVŠ, 1987; RAMOVŠ & TURNŠEK, 1991; TURNŠEK & BUSER, 1991; TURNŠEK, 1997; GALE et al., in press).

Until recently, it was believed that in the Slovenian Basin the Norian and Rhaetian stages were marked solely by the Bača Dolomite; i.e. bedded dolomite with chert nodules (KOSSMAT, 1907; BUSER, 1986). The sedimentary and biostratigraphic knowledge of this unit was scarce and speculative due to pervasive late-diagenetic dolomitization. It later became evident that the Bača Dolomite in the northern part of the basin extends only to the Upper Norian and is then succeeded by the Upper Norian–end of Rhaetian Slatnik Formation. The Slatnik Formation consists of alternating hemipelagic and resedimented limestone, and was extensively studied on Mt. Slatnik and Mt. Kobla. (ROŽIČ, 2008; BUSER & OGORELEC, 2008; ROŽIČ et al., 2009; KOLAR-JURKOVŠEK, 2011; GALE et al., 2012). Such a facies association enabled an integration of conodont biostratigraphy with benthic foraminifera derived from the adjacent platform edge (GALE et al., 2012). Additionally, the facies associations of the two studied sections revealed an upwards coarsening and thickening trend that was interpreted as a result of Rhaetian progradation of the adjacent Julian Carbonate Platform, and deepening towards the west was suggested. To confirm such a sedimentary trend, two more sections located to the west were additionally studied, and results are presented herein with the aim to:

- confirm the existence of the Slatnik Formation across the entire northern segment of the Slovenian Basin;
- set a sound biostratigraphic frame, which would allow a correlation with the Mt. Slatnik and Mt. Kobla sections;
- describe sedimentary trends within the formation and to establish a spatial distribution of facies associations in combination with previously studied sections.

Geological setting

The Julian Alps of NW Slovenia are composed of Mesozoic rocks of the Slovenian Basin and Julian Carbonate Platform (BUSER, 1986, 1996; PLACER, 1998, 2008). The Slovenian Basin originated in the Middle Triassic due to the opening of the Meliata/Neotethys Ocean and retained a deeper-marine character until the end of the Mesozoic (BUSER, 1989, 1996; BUSER et al., 2007, 2008; VRABEC et al., 2009). It extended approximately in the E-W direction, wedging out towards the west. The continuation of the Slovenian Basin towards the east remains unresolved due to the thick cover of Tertiary Pannonian Basin deposits (BUSER, 2009). The area of the present-day Julian Alps was likewise disintegrated in the Middle Triassic (e.g., CELARC & GORIČAN, 2007; CELARC et al., 2013a), but topo-

graphic irregularities were sealed by the end of the Middle Triassic (BUSER, 1989; SKABERNE et al., 2003; CELARC et al., 2013a). Shallow-water carbonate sedimentation was re-established on the Julian Carbonate Platform during the Late Triassic and Early Jurassic (e.g., BUSER, 1986, 1989; CIARAPICA & PASSERI, 1990; OGORELEC & ROTHE, 1993; SATTLER & SCHLAF, 1999), except in the northern part, where transitions towards an open-marine environment were described (KOLAR-JURKOVŠEK, 1994; KRZYSTYN et al., 1994; LEIN et al., 1995; SCHLAF, 1996; CELARC et al., 2013b). A second period of intense subsidence occurred at the end of the Early Jurassic and the platform was differentiated into a central submarine plateau known as the Julian High (BUSER, 1986, 1989, 1996; ŠMUC, 2005; ŠMUC & ROŽIČ, 2010), and marginal basins known as the Bovec and Bled basins (COUSIN, 1981; JURKOVŠEK et al., 1990; ŠMUC, 2005; GORIČAN et al., 2012; KUČOČ et al., 2012).

The Julian Carbonate Platform succession nowadays forms the Julian Nappe, the higher of the two main thrust-units of the eastern Southern Alps in Slovenia (Fig. 1a). Simultaneously, the Slovenian Basin sediments outcrop in the Tolmin Nappe, which can be subdivided into three lower-order thrust-units (BUSER, 1986; PLACER, 1998): the lowermost Podmelec Nappe with successions from the southern part of the basin, the intermediate Rut Nappe with successions from the central basin, and the Kobla Nappe with successions from the northern part of the basin, which are most proximal with respect to the Julian Carbonate Platform (ROŽIČ, 2009).

All the studied sections of the Slatnik Formation (Fig. 1b) are located in the Kobla Nappe, which is seen as a continuous Upper Triassic and Jurassic basinal facies belt dominating southern slopes of the Bohinj Mountain Range. The newly studied Povdnar section is named after a nearby farm (Fig. 1d) and was studied in the deeply incised gorge below Mt. Šoštar (1643 m a.s.l.). The correlated, previously studied Kobla section is located 2 km eastward in the same facies belt on Mt. Kobla (1492 m a.s.l.) and the Slatnik section is still further east on Mt. Slatnik (1600 m a.s.l.).

The second newly studied Javor section is located in the southern slopes of Mt. Javor (1361 m a.s.l.), where the westernmost segment of the Kobla Nappe is situated (Fig. 1b,c). In the vicinity of the town of Tolmin, the Kobla Nappe becomes fragmented and is displaced by neotectonic strike-slip faults, and it eventually disappears west of the Tolminka River (BUSER, 1987).

Materials and methods

The described sections were investigated and first sampled in the year 2009. The Povdnar section was revisited in the following two years with an aim to improve conodont sampling. Altogether, 52 samples were collected for conodont studies, i.e., 45 samples in the Povdnar section, and 7 samples in the Javor section. The samples, which had an average weight of 2 kg, were treated in acetic acid followed by heavy liquid separa-

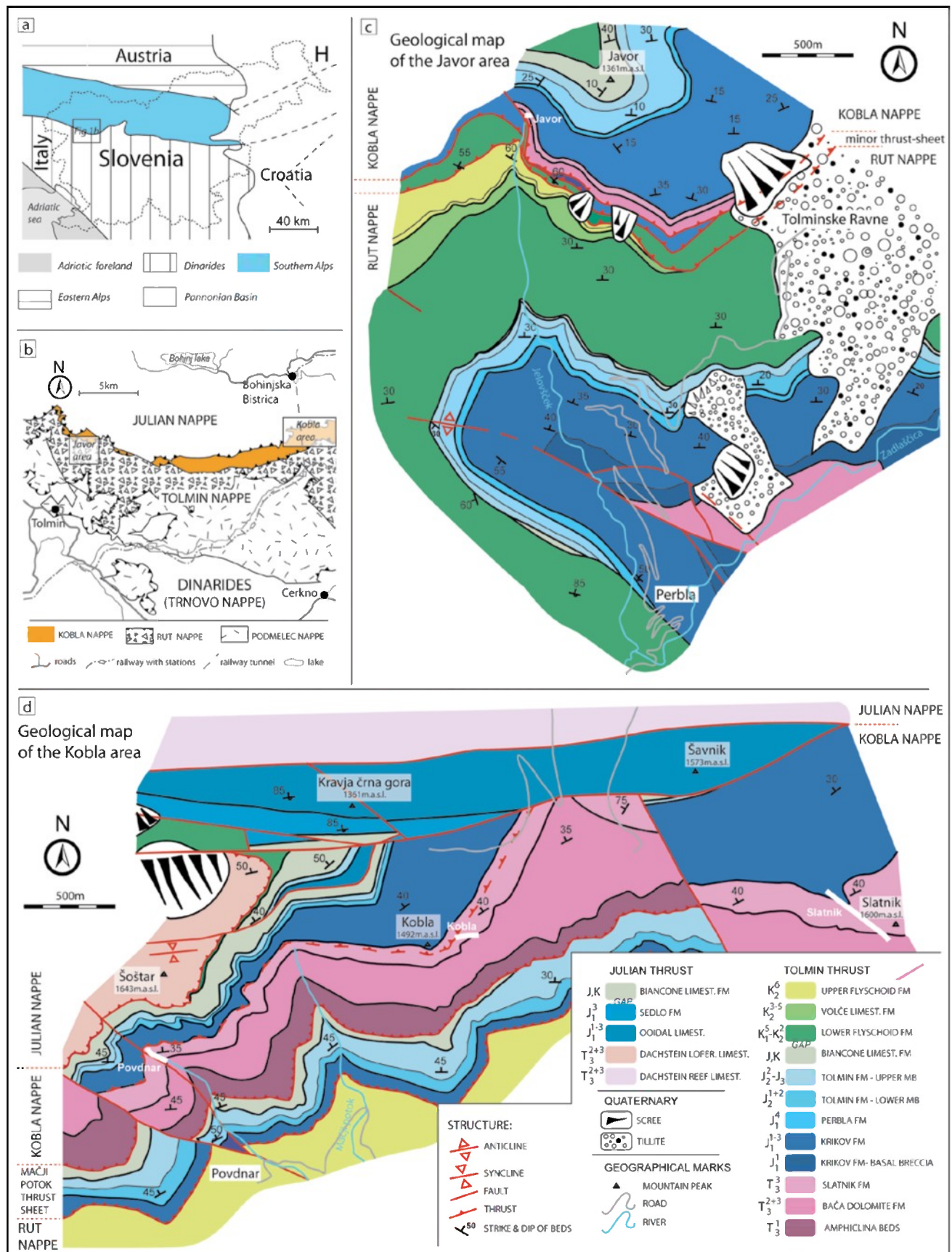


Figure 1. Location and geologic setting of the studied sections: a) General location with marked political boundaries and macro-tectonic units; the boxed area is enlarged in Fig. 1b, b) Structural subunits of the Southern Alps – Dinaric transect in NW Slovenia: succession of the Slovenian Basin composes the Tolmin Nappe, whereas the Slatnik Formation is so far known only from the highest sub-unit, i.e. the Kobla Nappe (modified from BUSER, 1987); boxed areas are enlarged in Figs. 1c and 1d, c) Geological map of the Javor area with location of the studied section, d) Geological map of the Kobla area and previously studied Kobla and Slatnik sections

tion. The recovered microfossil material is housed at the Geological Survey of Slovenia / Geološki zavod Slovenije under repository numbers 4798-4804, 5177-5193, 5199-5214 and 5217-5228.

Eight beds were sampled in the Povdnar section and thin sections 47×28 mm and 75×49 mm in size were prepared. They are stored at the Geological Survey of Slovenia.

The Povdnar section

The Povdnar section (Fig. 1d) is located on the southern slope of Mt. Šoštar (Pl. 1, fig. 1) and starts at an elevation of 1140 m (Fig. 1d; N 46°13'38", E 13°56'49"). The basic geological research of this area was carried out during the construction of the Podbrdo – Bohinjska Bistrica railway tunnel located 2 km east of the section (KOSSMAT, 1907). COUSIN (1981) presented a schematic geological cross-section of Mt. Črna prst in the vicinity. BUSER (1986) described the Carnian Kobla Formation, which is composed of mudstone/siltstone and vari-coloured chert from the base of the investigated facies belt. A Jurassic age for a large part of this succession, which forms a small tectonic thrust-sheet between Kobla and Rut nappes, was recently established (SVETLIČIČ et al., 2011), whereas the uppermost part was mapped as the Amphiclina beds (Fig. 1d).

Description of the section

The Slatnik Formation in the Povdnar section (Fig. 2) starts with a few meters of dolomite, laterally passing into limestone. This transition marks an irregular boundary between the Bača Dolomite and the Slatnik Formation. The Slatnik Formation is completely exposed for 46 m. Medium-thick bedded micritic limestone (mudstone and wackestone with radiolarians, sponge spicules, and lagenide foraminifera) with chert nodules predominates (Pl. 1, figs. 2-4). Parallel lamination and bioturbation were rarely recognized. A good lateral exposure allows recognition of several slump structures. A few slumped intervals are internally disrupted and have a conglomeratic appearance due to rounded intraclasts floating in brownish matrix (Pl. 1, fig. 3).

A few coarser beds are distributed throughout the section. These beds consist of normally or inversely graded fine to very fine packstone and grainstone (Pl. 1, figs. 5, 6) with peloids and intraclasts, bioclasts, and radial spheroids (ooids?). Echinoderm plates, fragments of molluscs, foraminifera, fragments of brachiopods, ostracods, small gastropods, fragmented corals, calcimicrobes and rare green algae were recognized among the bioclasts.

The uppermost part of the Slatnik Formation consists of thin bedded to platy marly limestone with chert nodules, and marlstone. The contact with the overlying Krikov Formation is marked by a minor thrust-fault that was also recognized on the Mt. Kobla, where it was located several meters higher in the stratigraphic column, i.e. already within the Krikov Formation (ROŽIČ, 2008).

Biostratigraphy

The Slatnik Formation was extensively sampled for conodonts and their distribution is shown in detail in Figure 2. The Norian-Rhaetian boundary is set at the Lowest Occurrence of *Misikella posthernsteini* (Kozur & Mock) in the lowermost part of the formation, whereas the highest occurrence of conodonts represents a proxy of the Triassic-Jurassic boundary (see ROŽIČ et al., 2009; GALE et al., 2012). Conodont data are supported by determinations of foraminifera, found in a few packstone layers distributed throughout the formation (see Fig. 2). The complete list of conodont taxa recovered includes: *Epigondolella* ex gr. *E. postera* (Kozur & Mostler), *Misikella buseri* Kolar-Jurkovšek, *Misikella hernsteini* (Mostler), *Misikella posthernsteini* (Kozur & Mock), *Misikella* sp., *Norigondolella steinbergensis* (Mosher), *Oncodella paucidentata* Mostler, *Parvigondolella andrusovi* Kozur & Mock, and *Zieglarioconus rhaeticus* Kozur & Mock.

Among foraminifera, the following taxa were determined (Pl. 1, figs. 7-11): *Tolypammina* sp., *Kaeveria fluegeli* (Zaninetti, Altiner, Dager & Ducret), *Duotaxis birmanica* Zaninetti & Brönnimann in Brönnimann, Whittaker & Zaninetti, *Reophax rudis* Kristan-Tollmann, *Reophax asperus* Cushman & Waters, »*Trochammina*« *almtalensis* Koehn-Zaninetti, *Trocholina crassa* Kristan, *Aulotortus sinuosus* Weynschenk, *Ophthalmidium exiguum* Koehn-Zaninetti, *Ophthalmidium carinatum* (Leischner), *Galeanella tollmanni* (Kristan), *Bispiranella salaji* (Samuel & Borza), *Decapodolina schaeferae* (Zaninetti, Altiner, Dager & Ducret), *Agathammina austroalpina* Kristan-Tollmann & Tollmann, *Variostoma helicta* (Tappan), ?*Variostoma cochlea* Kristan-Tollmann, *Diplostromina subangulata* Kristan-Tollmann, *Austrocolomia canaliculata* (Kristan-Tollmann), *Frondicularia* sp., *Lenticulina* sp., and *Pseudonodosaria* sp.

Sedimentary environment

The Povdnar section is dominated by micritic limestone with typical pelagic elements (i.e., radiolarians). They are thus interpreted as hemipelagic limestone, or partly as distal turbidites with parallel lamination (see TUCKER, 2001). Rare graded packstone likewise accumulated from diluted turbidity flows, carrying material derived from the adjacent carbonate platform, as testified by fragments of corals, calcimicrobes, and green algae. Some foraminiferal species are also typical of the reef environment, for example *K. fluegeli*, *G. tollmanni*, *B. salaji*, and *D. schaeferae* (see GALE, 2012, and references therein). The interfingering of distal turbidite deposits and hemipelagites characterizes basin-plain depositional setting in the model of MULLINS and COOK (1986). Alternatively, due to the presence of slumps, the deposition could take place at the foot of a slightly inclined slope (on a distal outer apron *sensu* MULLINS & COOK, 1986). The slump trigger could be sediment overload or external mechanisms, such as seismic activity (e.g., HANFORD & LOUCKS, 1994).

The Javor section

The measured section (Fig. 2) is located west from Tolminske Ravne at an elevation of approximately 1000 m (N 46°13'58", E 13°45'17"). The first geological data from Mt. Javor are known from the previously mentioned publication of KOSSMAT (1907), where it is part of the geological cross section from Tolmin to the Mt. Grušnica on the Bohinj Range. Deep-water facies from this area were previously reported by COUSIN (1970, 1973, 1981) and BUSER (1987). According to the latter, Mt. Javor preserves the westernmost continuation of the Kobla Nappe. The Jurassic succession from this area was recently described by ROŽIČ (2009), whereas ROŽIČ and ŠMUC (2011) focused on resedimented limestones within the Toarcian Perbla Formation. The presence of the Slatnik Formation in this area was first assumed during geological mapping (ROŽIČ, 2006) and is confirmed by this study.

Description of the section

The section (Figs. 1c and 2) is in fault contact with the underlying strata. Although 20 m of the Bača Dolomite are exposed in the section, only the uppermost 5 m are presented in Figure 2. The transition from the Bača Dolomite to the Slatnik Formation is gradual. The Slatnik Formation is composed of thin- to thick-bedded limestone with chert nodules. Limestone is mudstone to wackestone in texture. Limestone beds are at first separated by thin layers of marlstone. Amalgamation of beds, parallel lamination, and slumps are present. The section ends with a minor steep fault (not presented in Fig. 1c due to small scale).

Biostratigraphy

Due to the sole presence of micritic limestone, this section was sampled only for conodonts. Within the Bača Dolomite Formation *Epigonolella* ex gr. *E. abneptis* (Huckriede), *Epigondolella* ex gr. *E. postera* (Kozur & Mostler), and *Norigondolella steinbergensis* (Mosher) conodont species were determined. Conodonts within the Slatnik Formation belong to *Epigondolella* ex gr. *E. postera* and *N. steinbergensis*.

Sedimentary environment

The Slatnik Formation of the Javor section is composed solely of hemipelagic limestone, which indicates sedimentation on a basin plain (MULLINS & COOK, 1986). Synsedimentary slumping, however, indicates minor inclination of the basin floor.

Correlation and comparison with Mt. Slatnik and Mt. Kobla sections

The conodont and, to a smaller extent, the foraminiferal data prove the Late Norian and Rhaetian age of the sampled beds, affirming their identification as the Slatnik Formation. Especially the Javor section, which is located in the westernmost

exposures of the Kobla Nappe, proves the existence of the Slatnik Formation in the entire extension of this thrust unit. The presence of the Slatnik Formation could thus prove itself a good marker for the possible extent of the Kobla Nappe east of the area covered by the Sheet Tolmin and Videm of the Basic Geological Map (BUSER, 1987), i.e. in the Sheet Kranj (GRAD & FERJANČIČ, 1974) where the structural subdivision is not so clear.

The good exposure of the Povdnar section and the detailed sampling carried out further enable a precise correlation of this section with the previously described Mt. Slatnik and Mt. Kobla sections (Fig. 2). The first correlative marker is the Lowest Occurrence of *M. posthernsteini*, which is currently considered the best criterion for the Norian-Rhaetian boundary (KRYSTYN et al., 2007a; McROBERTS et al., 2008; ROŽIČ et al., 2009; GIOR-DANO et al., 2010; LUCAS, 2010; GALE et al., 2012). The second marker event is the Triassic-Jurassic boundary, which, however, is set at the highest occurrence of conodonts (and also, in the case of Mt. Kobla and Mt. Slatnik sections, the last Triassic foraminifera) and is thus not so reliably determined. Nevertheless, as discussed below, the boundary is additionally marked by the same change in lithology in all three sections.

Another biostratigraphic feature marking the Povdnar section is a notably long presence of *M. posthernsteini* and the lack of the uppermost Rhaetian *Misikella ultima* conodont zone (see KRYSTYN, 2008). When the same feature was recorded in the Mt. Kobla section, H.-J. Gawlick and L. Krystyn (pers. comm.) assumed the presence of stratigraphic gaps in the latest Rhaetian. Their interpretation later found support in sedimentological data, when the by-pass of sediment was proposed (GALE et al., 2012). Described biostratigraphic markers define a narrow time frame, within which the closely situated Mt. Slatnik, Mt. Kobla, and Mt. Povdnar sections are sedimentologically correlated. The facies distribution is marked by a westward increase in the proportion of hemipelagic sedimentation (micritic limestone beds) on account of resedimented limestone, and with thinning and fining of the latter. The thickest bed in Mt. Slatnik section measures well over 3 m and contains boulders of coral limestone large enough to protrude over its upper surface, while rudstone beds of the Mt. Kobla section rarely exceed 1 m in thickness and contain clasts up to 10 cm in size (ROŽIČ et al., 2009). Caliturbidites in the Povdnar section are few, generally widely spaced, and not coarser than fine-grained sandstone. There is no rudstone with platform-derived clasts, only slumped beds containing intraclasts. Such a facies distribution places the Povdnar section among the three sections on the most distal part, the Mt. Kobla section in the more proximal part, and the Mt. Slatnik section in the most proximal part of the basin with respect to the source area of resedimented limestone, i.e. the Julian Carbonate Platform. A more distal position of the Povdnar section in relation to the Mt. Slatnik and Mt. Kobla sections is also responsible for a less clearly expressed thickening and coarsening up-

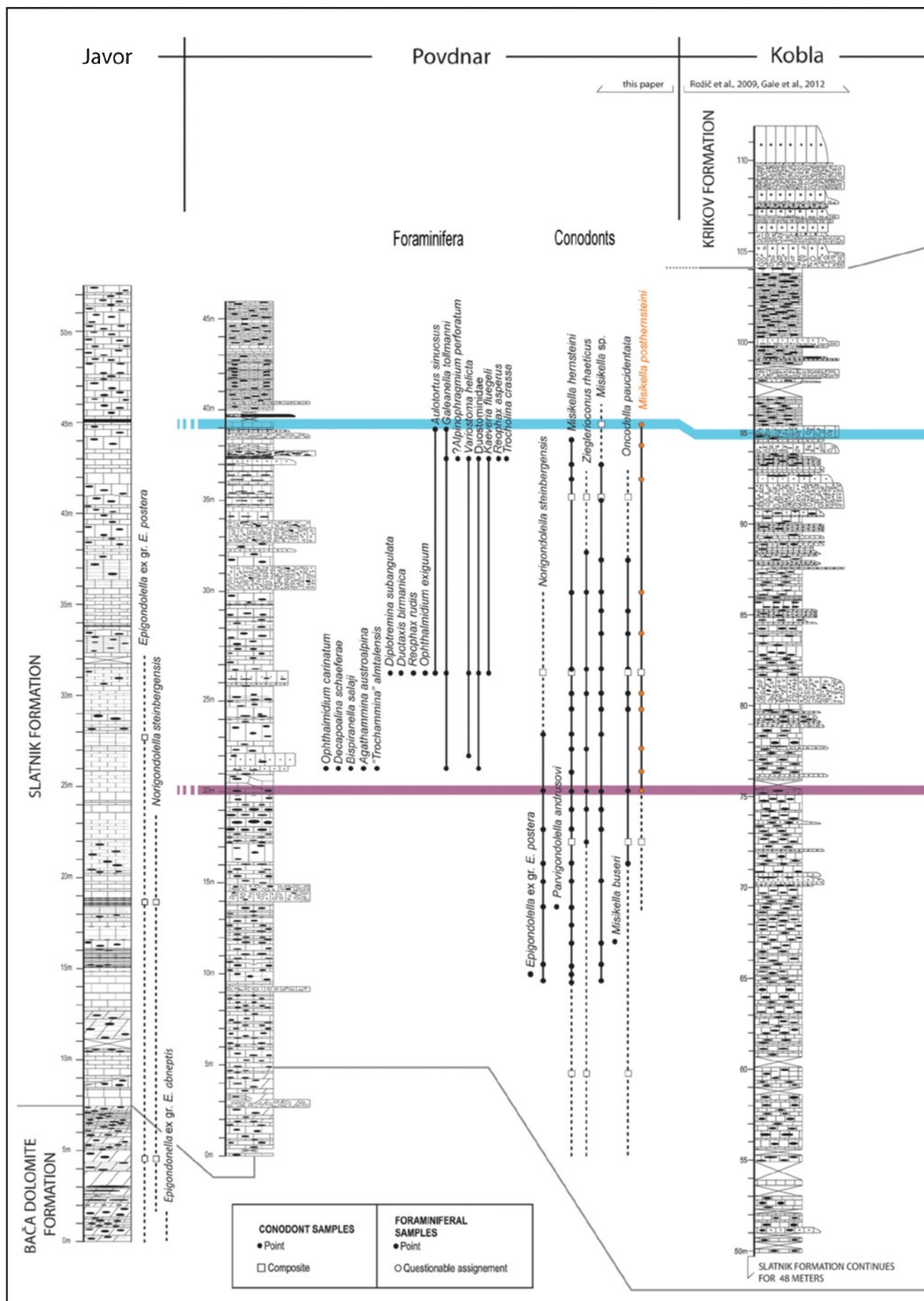
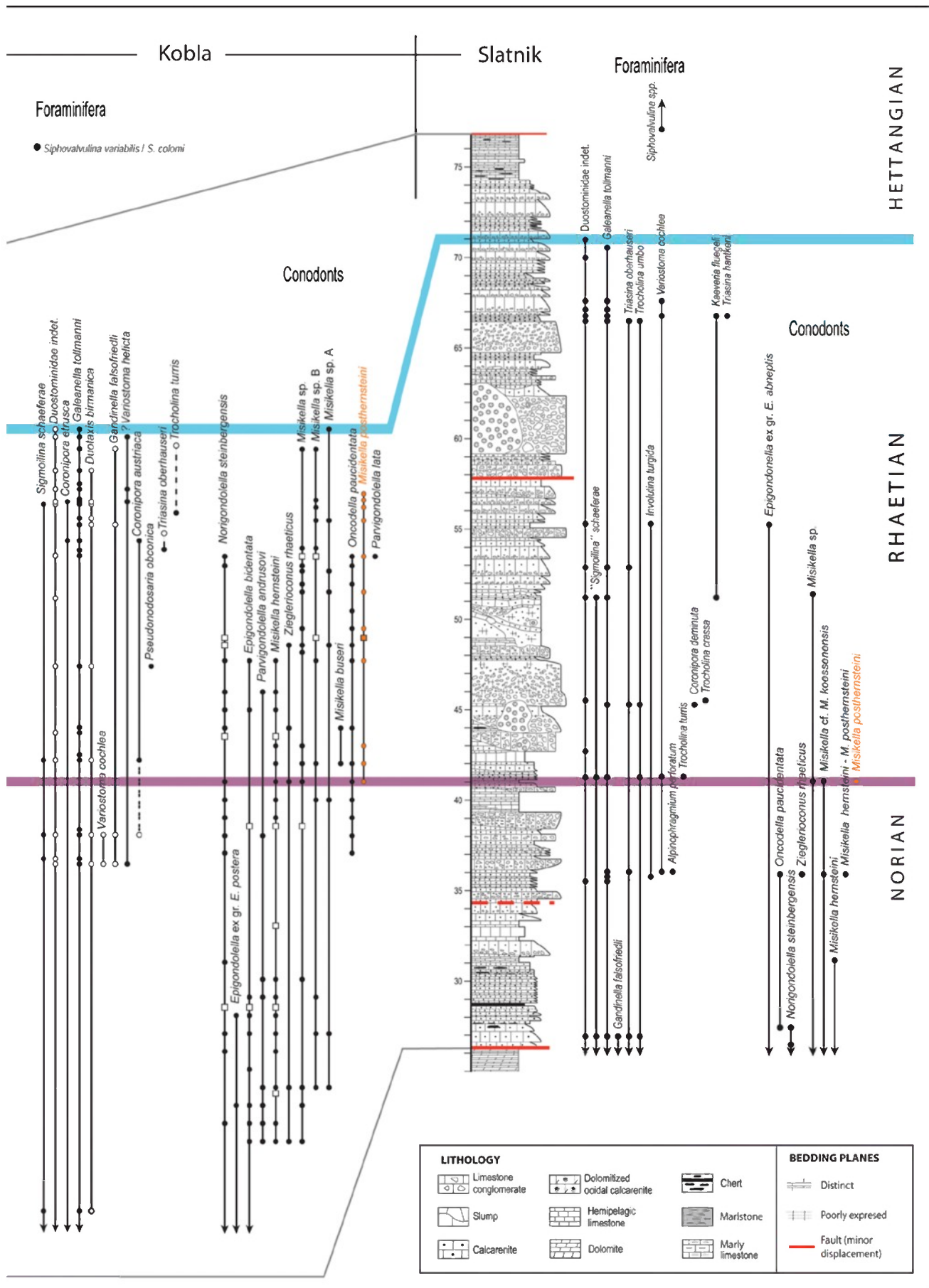


Figure 2. Javor and Povdnar sections with distribution of foraminifera and conodonts (Bača Dolomite was investigated in the Javor section for an additional 15 m and is composed of generally thicker beds - not presented in this figure) and correlation with previously studied Kobla and Slatnik sections (Rožič et al., 2009; Gale et al., 2012) with positions of biostratigraphically



significant foraminifera and conodonts (*Miskella posthernsteini* – a Rhaetian marker, is coloured in orange), formational boundaries (thin grey lines), and chronostratigraphic boundaries: Norian-Rhaetian (thick violet line), Rhaetian-Hettangian (thick blue line)

wards trend, observable in the two mentioned sections, which was interpreted as a progradation of the platform edge during the Rhaetian (ROŽIČ et al., 2009). Herein we have to acknowledge that the nature of the outcrops, where sections are distributed linearly on the thrust facies belt, prevents three-dimensional reconstruction of the depositional area, and described facies changes could record either proximal-distal or lateral changes in the slope area.

Further distalization towards the Javor section can be recognized on the basis of the total dominance of hemipelagic limestone in that area, but some caution is needed, as only the lower part of the Slatnik Formation was logged. Namely, the lower portions of the Slatnik Formation are generally fine-grained in all known sections. The more distal position in the basin, however, is strongly supported by relatively distal facies of the overlying Krikov Formation in the Mt. Javor area (ROŽIČ, 2006, 2009).

The upwards-thinning trend in the uppermost part of the Slatnik Formation in the Povdnar section was also observed on Mt. Kobla and on Mt. Slatnik (ROŽIČ et al., 2009; GALE et al., 2012). Whether this is due to the position on the same submarine fan or not remains unresolved. The lithological change was so far (ROŽIČ et al., 2009; GALE et al., 2012) interpreted as a reflection of a biocalcification crisis at the Triassic-Jurassic boundary (McROBERTS & NEWTON, 1995; GALLI et al., 2005; VAN DE SCHOOTBRUGGE et

al. 2007; RUHL et al. 2010; ČRNE et al. 2011; GREENE et al., 2012; MARTINDALE et al., 2012). Alternatively, this facies shift could be due to the beginning of a new transgressive cycle (see ROŽIČ et al., 2009).

Conclusions

The Slatnik Formation has been recognized as the uppermost Triassic formation of the Slovenian Basin in the eastern part of the Kobla Nappe unit (BUSER & OGORELEC, 2008; ROŽIČ et al., 2009; GALE et al., 2012). The Povdnar and Javor sections offer new data on the lateral extent of this formation further to the west.

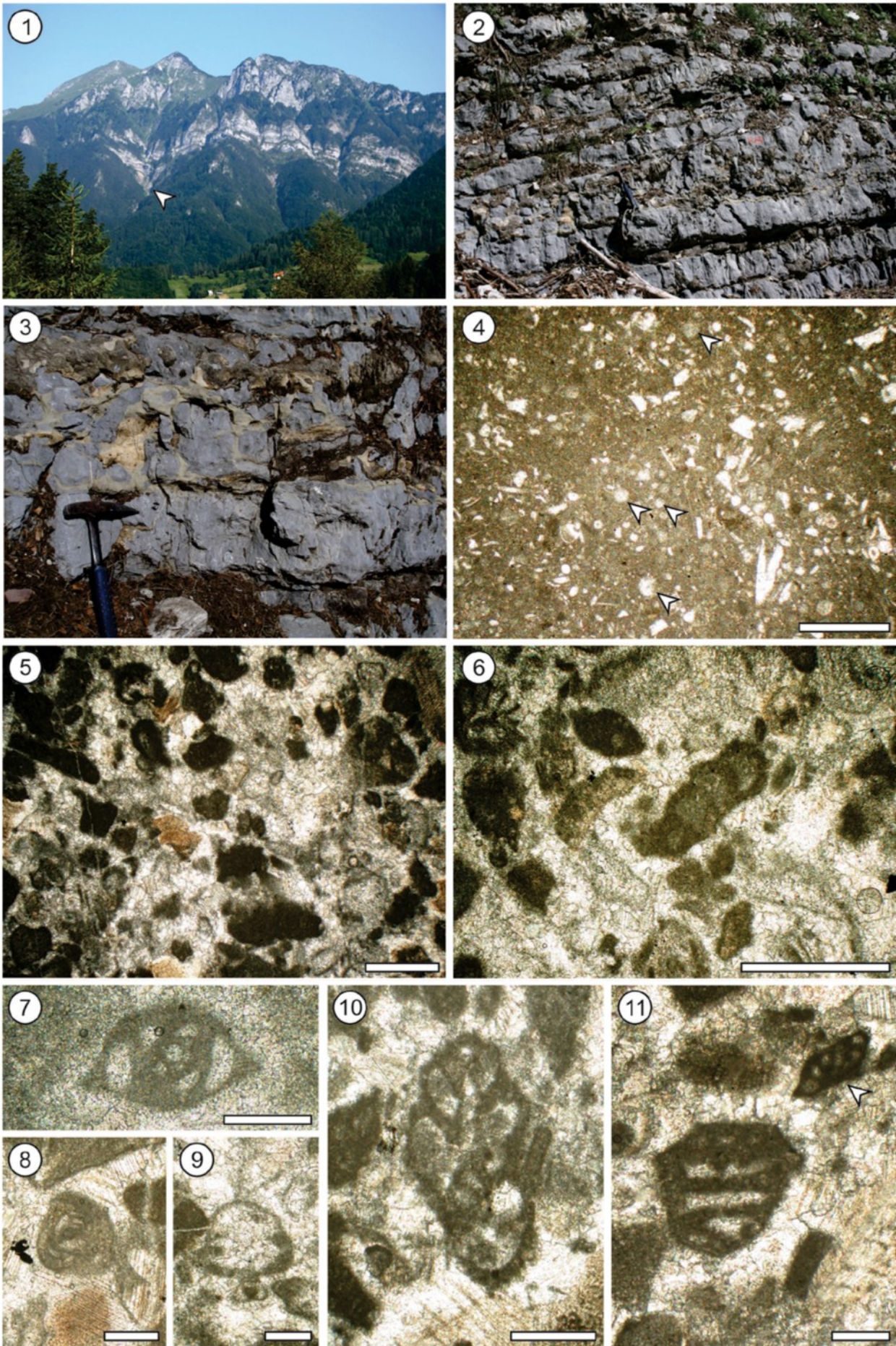
Both sections were sampled for conodonts. The presence of sparse coarser limestone beds in the Povdnar section further allowed sampling for benthic foraminifera. The gathered data were necessary for a sound correlation with the previously described exposures of the Slatnik Formation, namely the Mt. Kobla and Mt. Slatnik sections (ROŽIČ, 2008; ROŽIČ et al., 2009; GALE et al., 2012). Compared to these, the Povdnar section predominantly consists of hemipelagic limestone, while resedimented limestones are few. This section thus contains more distal development of the Slatnik Formation. The Javor section only partly confirms the hypothesis of westward distalization, as only the lower part of the Slatnik Formation is preserved.

PLATE 1

The Slatnik Formation in the Povdnar section

1. Panoramic view on Mt. Šoštar (right) and Črna prst (centre). The position of the Povdnar section is marked by an arrowhead
2. Bedded micritic limestone of the Slatnik Formation
3. Internal disruption due to slumping (note rounded intraclasts in brown matrix)
4. Dense bioclastic wackestone with mollusc (?) debris and radiolarians (arrowheads). Scale bar 1 mm
5. Bioclastic-peloidal grainstone. Scale bar 1 mm
6. *Reophax asperus* Cushman & Waters. Scale bar 1 mm
7. *Decapoolina schaeferae* (Zaninetti, Altiner, Dager & Ducret). Scale bar 250 µm
8. *Galeanella tollmanni* (Kristan). Scale bar 250 µm
9. *Trocholina crassa* Kristan. Scale bar 250 µm
10. *Variostoma cochlea* Kristan-Tollmann. Scale bar 250 µm
11. *Kaeveria fluegeli* (Zaninetti, Altiner, Dager & Ducret) and *Decapoolina schaeferae* (Zaninetti, Altiner, Dager & Ducret) (arrowhead). Scale bar 250 µm

PLATE 1



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