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# Geological setting of the Patrovec block in the Považský Inovec Mts., Western Carpathians

ONDREJ PELECH[1], JÁN SOTÁK[1, 2, 3] and JOZEF HÓK[1]

[1]Department of Geology and Paleontology, Faculty of Natural Sciences, Comenius University, Mlynská dolina, SK-842 15 Bratislava, Slovak Republic; pelech@fns.uniba.sk
[2]Geological Institute of Slovak Academy of Sciences, Severná 5, SK-974 01 Banská Bystrica, Slovak Republic
[3]Department of Geography, Faculty of Education, Catholic University, Hrabovská cesta 1, SK-034 01 Ružomberok, Slovak Republic

**Abstract**

The areal extent, stratigraphy and tectonics of the geological units in the northeastern segment of the Považský Inovec Mts. were observed and reinterpreted, applying the results of detailed geological mapping and biostratigraphic investigation. Explored area is built by the pre-Carboniferous crystalline basement of the Infratatricum, Jurassic-Lower Cretaceous rocks of the Beckov Succession of Fatricum and relicts of the Middle to Upper Triassic rocks of the Veterlín Succession of Hronicum, being preserved in the area between the municipalities of Patrovec and Dubodiel, and possibly also south-west of Trenčianske Jastrabie. The complexes of the unit of Hronicum were defined in this area for the first time. They are composed of the Anisian Gutenstein Limestones, Ladinian Reifling Limestones and Middle Carnian Wetterstein Limestones and Wetterstein Dolomites. Poorly preserved Miocene sedimentary fill of the Bánovce depression lies on the top of the Paleoalpine tectonic units.

**Key words:** biostratigraphy, Fatricum, Hronicum, Infratatricum, Považský Inovec

## Introduction

The Považský Inovec Mts. is a pre-Tertiary basement horst block, emerging from beneath the Neogene sedimentary fill of the Danube Basin and forming one of the external mountain ranges of the Tatra-Fatra Belt of Core Mountains (Fig. 1). Research was done on the eastern and northeastern slopes of the Považský Inovec Mts. and on adjacent margins of the Bánovce depression (Figs. 1, 2a). Investigated locality lies in the area among the villages Trenčianske Jastrabie, Veľká Hradná (Patrovec is a settlement of this municipality) and Dubodiel.

Internal structure of the mountain range is segmented into 3 amalgamated blocks: Selec, Bojná and Hlohovec blocks (from north to south; Maheľ, 1986). Due to its position in the footwall of overlying Bojná block, and overall external position relative to Tatricum, the Selec block is assigned to Infratatricum (Plašienka, 1999). The Infratatricum in the Považský Inovec Mts. is represented by Hercynian metamorphites and their diaphtorites, Post-Hercynian Upper Paleozoic volcano-sedimentary complex (Kálnica Group; Olšavský, 2008), Triassic to Lower Cretaceous sedimentary cover unit (Selec Unit, Olšavský and Hók in Ivanička et al., 2011) and Upper Cretaceous sediments in variously interpreted position and ambiguous relationships to other units (Belice Unit; Plašienka et al., 1994; Rakús in Ivanička et al., 2011). Fragments of the Fatricum and Hronicum nappes are also present in the western (and according to this investigation also in the northeastern) portion of the investigated area. The Fatricum is represented by the shallow water Beckov Succession (Hók in Ivanička et al., 2011) and Hronicum by the slope Veterlín-type Succession (Havrila in Ivanička et al., 2011). Geological structure of the northeastern segment of the mountain range was not adequately understood, despite continuing investigation in this area (Polák in Pristaš et al., 2000; Polák in Ivanička et al., 2007). Lack of exact knowledge about stratigraphy of the Mesozoic sequences and their tectonic position was apparent.

Principal geological knowledge from the Patrovec area was published by Maheľ (1950, 1951). He described

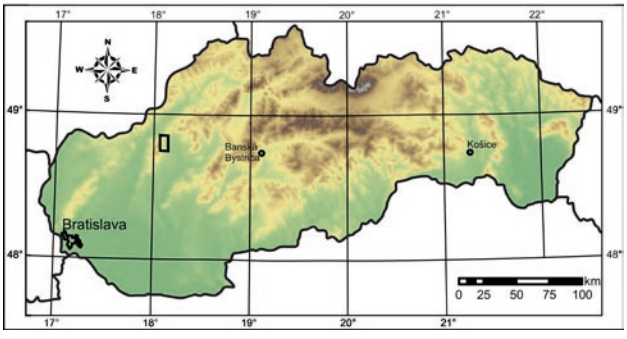


**Fig. 1.** Location of the investigated area on the map of Slovakia marked by a rectangle.

recumbent fold with Lower Jurassic rocks in its core and younger red nodular limestones of Middle Jurassic age and limestones of Upper Jurassic and Lower Cretaceous in its limbs. In the quarry in Dubodiel village similar succession was found. He considered both relicts of the Mesozoic rocks as gravity slides from the exhumed basement of the Selec block in the west. These investigations were later reinterpreted and Mesozoic rocks, outcropping in the area, were considered as a part of Manín Unit (Maheľ, 1986), and served as proof of its Inner Carpathian provenance (Maheľ, 1985).

According to the geophysical investigation, the structural position of the Mesozoic formations in the area was later interpreted as one of the numerous gravity slides, now overlying the Miocene fill of the margin of Bánovce depression (Leško et al., 1988).

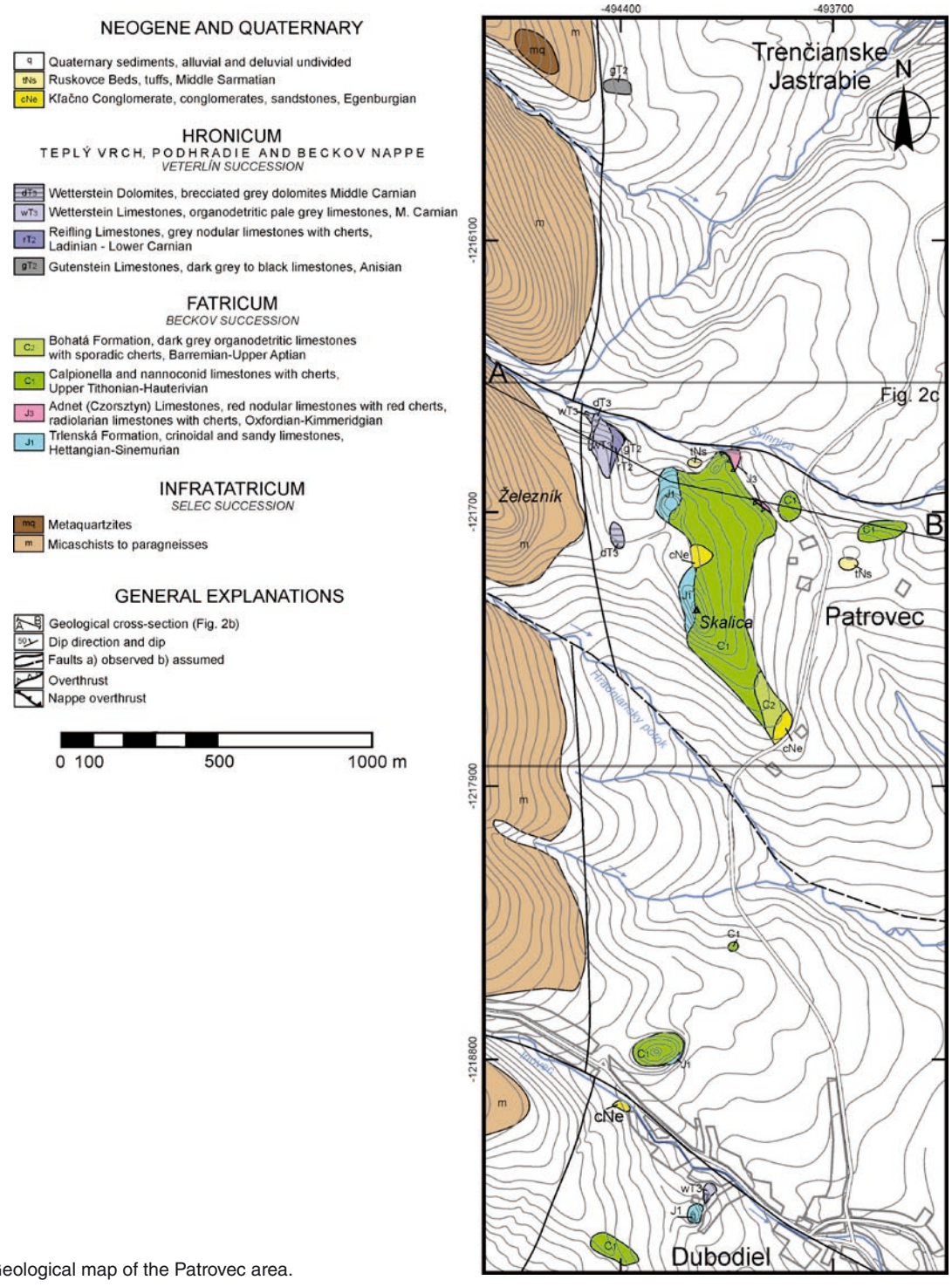


**Fig. 2a.** Geological map of the Patrovec area.

According to the previous lithostratigraphic investigations of the Mesozoic formations in the area (Kullmanová, 1958, 1980; Kullmanová in Brestenská et al., 1980), the basal part of the sequence is composed of Middle to Upper Triassic carbonates. The upper part of the sequence is formed by the Lower Jurassic sandy crinoidal limestones, Middle Jurassic radiolarites and radiolarian limestones as well as the Upper Jurassic Saccocoma limestones. Uppermost part of the sequence is composed of Upper Jurassic Calpionella limestones and Lower Cretaceous pelagic limestones. Overlying cherty limestones were assumed to be the terminal member of the sequence. Whole Mesozoic succession was considered to be of relatively shallow water origin. The question, whether it constitutes a portion of the Tatricum sedimentary cover unit (Kullmanová in Brestenská et al., 1980; Polák in Pristaš et al., 2000) or the Beckov Succession of Fatricum (Kullmanová, 1980), was not solved.

Polák (in Ivanička et al., 2011) named whole Mesozoic sequences in the area (including relicts of the Mesozoic rocks NW of Zlatníky) as the Patrovec Succession and considered it as a deep water (Šiprúň type) Tatricum sedimentary cover succession. According to his investigation it contained also the Lower Triassic quartzite

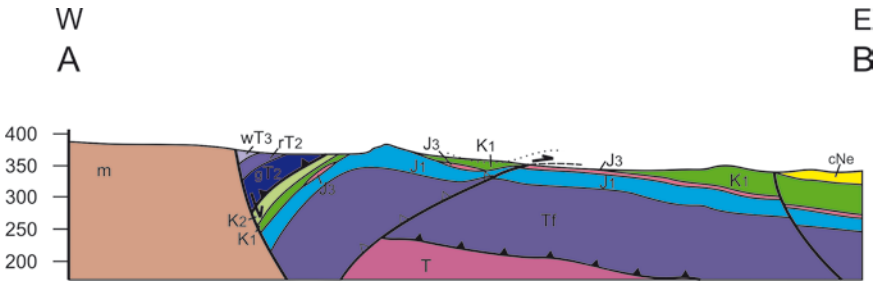


**Fig. 2b.** Schematic geological cross-section through the investigated area. Area is disrupted by parallel normal faults of the Dubodiel fault zone. Mesozoic Beckov Succession is partially backthrust to the NE. *Hronicum:* gT2 – Gutenstein Limestones, dark grey to black limestones, Anisian; rT2 – Reifling Limestones, grey nodular limestones with cherts, Ladinian – Lower Carnian; wT3 – Wetterstein Limestones, organodetric pale grey limestones, Middle Carnian; dT3 – Wetterstein Dolomites, brecciated grey dolomites, Middle Carnian; *Fatricum:* Tf – Triassic of Fatricum, lithostratigraphically undivided; J1 – Trlenská Formation, crinoidal and sandy limestones, Hettangian--Sinemurian; J3 – Czorsztyn Limestones, red nodular limestones with red cherts, radiolarian limestones with cherts, Oxfordian--Kimmeridgian; C1 – Calpionella and Nannoconous limestones with cherts, Tithonian-Hauterivian; C2 – Bohatá Formation, dark grey organodetritic limestones, Barremian-Upper Aptian; *Tatricum:* T – Tatricum lithostratigraphically undivided; m – micaschists and micaschist paragneisses; mq – metaquartzites; *Neogene sediments:* cNe – Kľačno Conglomerate, conglomerates, sandstones, Eggenburgian.

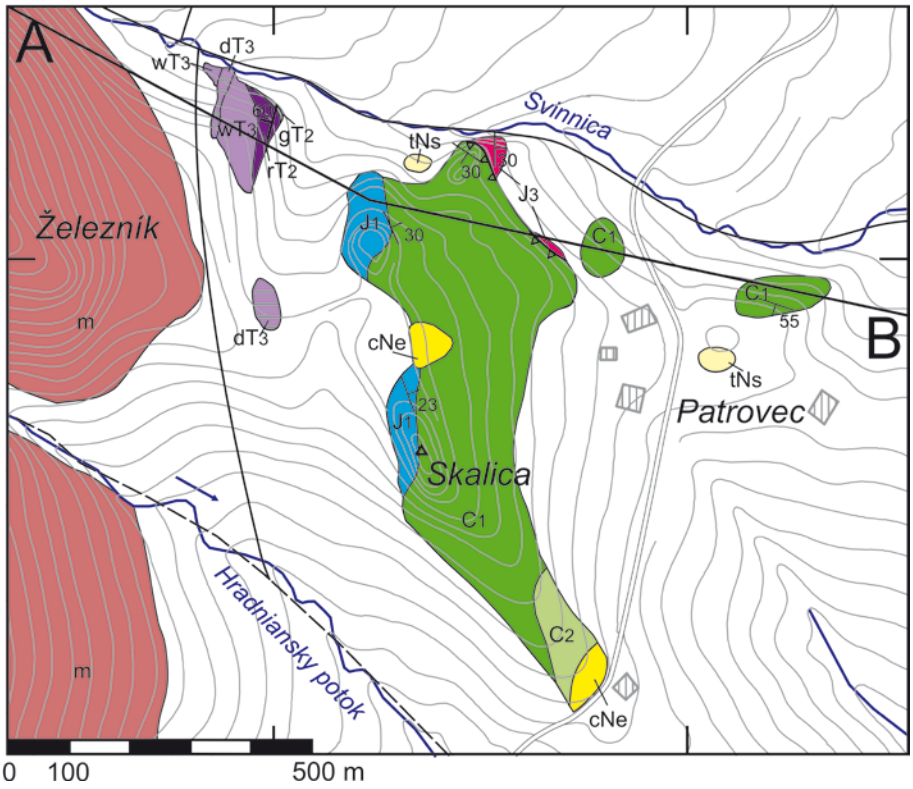


**Fig. 2c.** Detailed map of the Patrovec area. Legend is the same as in Fig. 2a.

sandstones of the Lúžna Formation and Middle Triassic Ramsau dolomites cropping out west of Trenčianske Jastrabie and overlapping the basement rocks (Polák in Ivanička et al., l. c.).

Most distinctive difference can be seen in the description of the Jurassic succession, which apart from the relatively shallow water facies known by Kullmanová (1980), also contains the hemipelagic spotted marlstones of Janovka Formation and "siliceous fleckenmergel" member (Polák in Ivanička et al., 2011). The existence of two sedimentary covers overlaying the Selec block basement would have important tectonic implications.

Doubts about the correct tectonic classification, lithologic description, stratigraphic range and facial characteristics of the Patrovec Succession, being highly distinct from the Selec cover unit was evident (Hók et al., 2006). The main aim of this paper is to describe the geological structure and the stratigraphy of the Mesozoic complexes in the vicinity of Patrovec.

## Results of investigation

### Infratatricum

The crystalline basement of the Infratatricum in the investigated area is composed dominantly of micaschists to gneisses, only locally the lenses of quartzite paragneisses, quartzites and amphibolites occur. Due to similar lithological appearance, some of the quartzite outcrops were confused with the sediments of the Lúžna Formation (Polák in Ivanička et al., 2007), however the presence of metamorphic garnet and overall metamorphic pattern excludes this assumption (Figs. 4a, b). This fact was correctly pointed out by older investigations (Ivanička in Pristaš et al., 2000). Oldest portion of the Infratatricum sedimentary cover in the locality Jarabina west of Trenčianske Jastrabie is formed by the relicts of the Upper Paleozoic Kálnica Group with locally preserved Lower Triassic quartzite sandstone of the Lúžna Formation.

### Fatricum (Beckov Succession)

The Jurassic to Lower Cretaceous sequence, cropping out in the area between Patrovec and Dubodiel, is according to its lithological similarity, especially absence of the typical hemipelagic Janovka Formation or thicker radiolarites of the Ždiar Formation, assigned to the shallow water Beckov Succession of the Fatricum (Fig. 3).

The oldest exposed rocks are crinoidal and sandy limestones which constitute morphologically the most significant landforms with steep slopes. Overall thickness of the complex is 20–50 m. Rocks can be described as grainstones to rudstones, composed almost entirely of crinoidal detritus (Fig. 4c). Siliciclastic admixture is formed by quartz and fragments of metamorphic rocks. The rock also contains authigenic quartz and feldspars. Lower portion of the complex is of grey to grey-brown colour. The pink to red limestones are abundant in the upper portion. Pink and reddish crinoidal limestones formed discontinuous less abundant thin lenses. Rocks locally contain fractured chert nodules of elliptical shape, usually 3 × 10 cm large. Intercalated quartzose conglomerate and tectonic breccias with 2–5 mm clasts of quartz, quartz sandstone and limestones were locally present (Fig. 5d). Age of the crinoidal limestone complex was determined

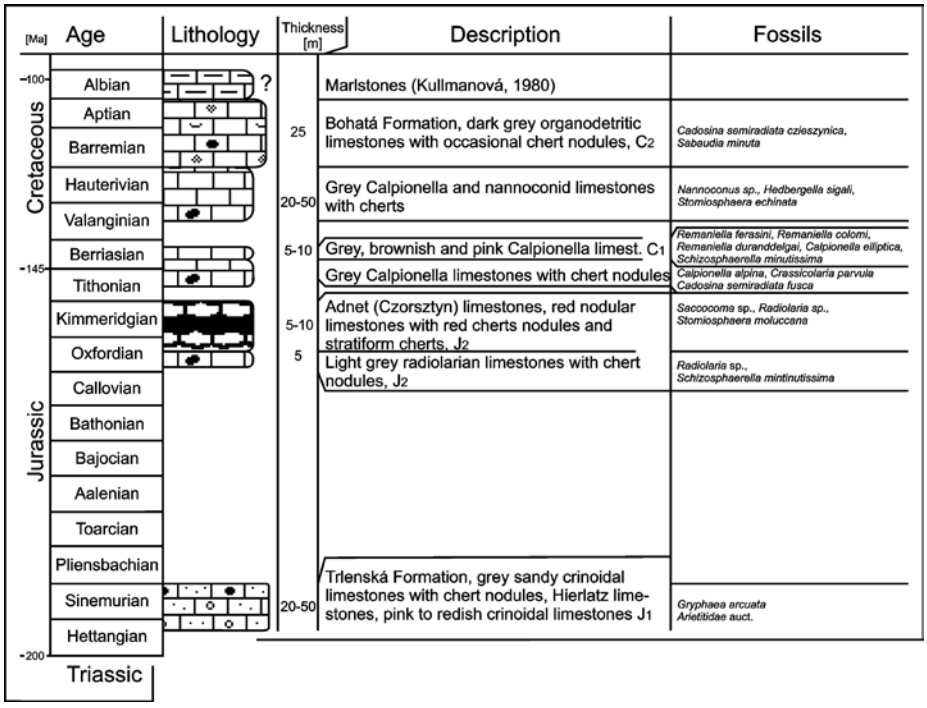


**Fig. 3.** Lithostratigraphy of the Beckov Succession of the Fatricum in the investigated area (modified after Kullmanová, 1980).

as Hettangian to Sinemurian according to occurrence of the lamellibranch *Gryphaea arcuata* (Kullmanová, 1980) and ammonite from the family *Arietitdae* auct. (Maheľ, 1950). The grey crinoidal limestones are correlated with the Trlenská Formation. Pink and reddish limestones can be correlated with the younger Hierlatz or Vils limestones. Most of the outcrops formerly assigned to the Trlenská Formation by previous investigations (Polák in Pristaš et al., 2000; Polák in Ivanička et al., 2007) near the Patrovec, Dubodiel and Zlatníky represents, according to this study, various lithostratigraphic units of the Tatricum, Fatricum and Hronicum.

In the well exposed cliff in the Skalica hill app. 500 m west of Patrovec (Figs. 2a, c), the sequence of the grey radiolarian and red nodular limestones with chert nodules was observed. The lower, at least 6 m thick portion of the radiolarian limestone section, is composed of the grey limestones with chert nodules. Limestones are predominantly mudstones to wackestones with softly recrystallized matrix. They contain numerous radiolarians (Fig. 4e), thin-shelled bivalves, fragments of ophiura, crinoids and *Globochaete*. Remnants of calcareous nannoplankton are represented by dinoflagellate species *Schizosphaerella minutissima* (Colom) (Fig. 4l). Following biostratigraphic zonation of pelagic limestones with Capionellids and calcareous dinoflagellate cysts was carried out on the basis of zoning established by Reháková and Michalík (1997) and Reháková (2000). Rocks are medium to thin bedded, bedding surfaces are locally irregular, partially due to dissolution and tectonic activity. Intensive tectonic overprint was observed in the micro- and macroscale by frequent stylolites and calcite veins. Higher grade diagenetic conditions are assumed due to presence of authigenic quartz. Grey radiolarian limestones are 6 m thick, their substratum is not exposed.

Red nodular limestones with sporadic red cherts predominate in the upper portion of the section. They are medium bedded, with occasional green shale laminae and thin to medium bedded stratiform red cherts, siliceous limestones or radiolarites. Stratiform cherts are locally laterally changing to limestones. Limestones have mudstone to wackestone fabric and high radiolarian content. Other bioclasts include remnants of *Saccocoma* sp. (Fig. 4f) and crinoid elements, silicified rycholites, sponge spicules and dinoflagellate *Stomiosphaera moluccana* Wanner. Stratigraphic range of the radiolarian and red nodular limestones is according to presence of dinoflagellates and *Saccocoma* remains Upper Oxfordian to Upper Kimmeridgian. Red nodular limestones are 6–8 m thick. Uppermost portion of the section is disrupted by thrust fault with the top to east vergency (Fig. 2b). Sequence of grey radiolarian limestones with cherts and red nodular limestones with sporadic cherts and stratiform radiolarite beds can be correlated with Adnet Limestones (Czorsztyn Limestones sensu Borza and Michalík, 1987).

The sequence in the hanging wall of the thrust fault and above the Lower Jurassic crinoidal limestones is built by Calpionella limestones. Grey and pinkish micritic limestones are usually white, light grey or light brown on the weathered surfaces. Grey limestones in the hanging wall of the thrust fault contain chert nodules and are macroscopically hardly distinguishable from the radiolarian limestones from the basal part of the Skalica cliff and also to the overlying grey micritic nannoconid limestones. Calpionella limestones exhibit variable thickness, only 1–1.5 m in the contact with the crinoidal limestones, up to more than 10 m in the hanging wall of the thrust fault in the Skalica cliff, where it was not possible to distinguish them from the overlying nannoconid limestones. Superposition of pinkish calpionella limestones over its substratum is clearly seen only in the area west of Patrovec (Fig. 2c). Observation of the bedding surfaces in this lithologic unit was not possible due to the strong tectonic overprint and widespread brecciation. It is not excluded that portion of crinoidal limestones (Trlenská Formation) forms the slide bodies derived from shelf and extended into the deeper portion of the basin. Pelagic limestones are microfacially described as mudstones to wackestones, containing radiolarians, calpionellids and zoospores *Globochaete*. Other less abundant organic constituents are echinoderm fragments, ostracods, thin-shelled molluscs, aptychi, sponge spicules and benthic foraminifera *Lenticulina* sp. The age of the Calpionella limestones is Upper Tithonian to Middle Berriasian. Lower stratigraphic boundary is indicated by calpionellids *Crassicolaria parvula* (Remane) (Kullmanová, 1980). Association of calpionellids *Calpionella alpina* Lorenz (small form, Fig. 4g), *Remaniella ferasini* (Catalano) (Fig. 4k), *Remaniella colomi* Pop (Fig. 4i), *Remaniella duranddelgai* Pop (Fig. 4j) and *Calpionella elliptica* Cadisch (Fig. 4h) indicates the presence of the whole Calpionella interval zone. Together with the dinoflagellate *Cadosina semiradiata fusca* (Wanner) they mark the Middle to possibly Upper Berriasian age of the upper boundary of the Calpionella limestone complex. Pinkish and brownish Calpionella limestones can be correlated with the Padlá Voda Formation occurring in the Vysoká Succession of the Fatricum in the Malé Karpaty Mts. (Borza and Michalík, 1987).

The Calpionella limestones are overlain by the cherty nannoconid limestones. They are medium to thick bedded, light to dark grey on fresh surfaces and light grey, light yellow to white on the weathered surfaces. Primary sedimentary features are commonly overprinted by the brittle deformation structures. Occasional chert nodules 3 x 10 cm in diameter are dark grey, black or yellow on the weathered surfaces. Microscopically they are mudstones with matrix composed of well preserved nannoconid detritus. Other bioclasts include dinoflagellate, ostracod, *Globochaete*, bivalve and echinoderm fragments, filaments, phantoms of foraminifera, among them *Hedbergella sigali* Moulade and *Lenticulina* sp. Previous researchers found also genus *Anomalina* sp. and radiolarians (Kullmanová, 1980). Phosphatic fragments and elements of the fish teeth were also recognized. Stratigraphic age of the nannoconid limestone was determined due to presence of dinoflagellate *Stomiosphaera echinata* Nowak (Fig. 4m) as Upper Valanginian to Hauterivian. The upper portion of the Calpionella limestones complex together with the cherty nannoconid limestones could be correlated with the Hlboč Formation (Borza and Michalík, 1987). Calpionella

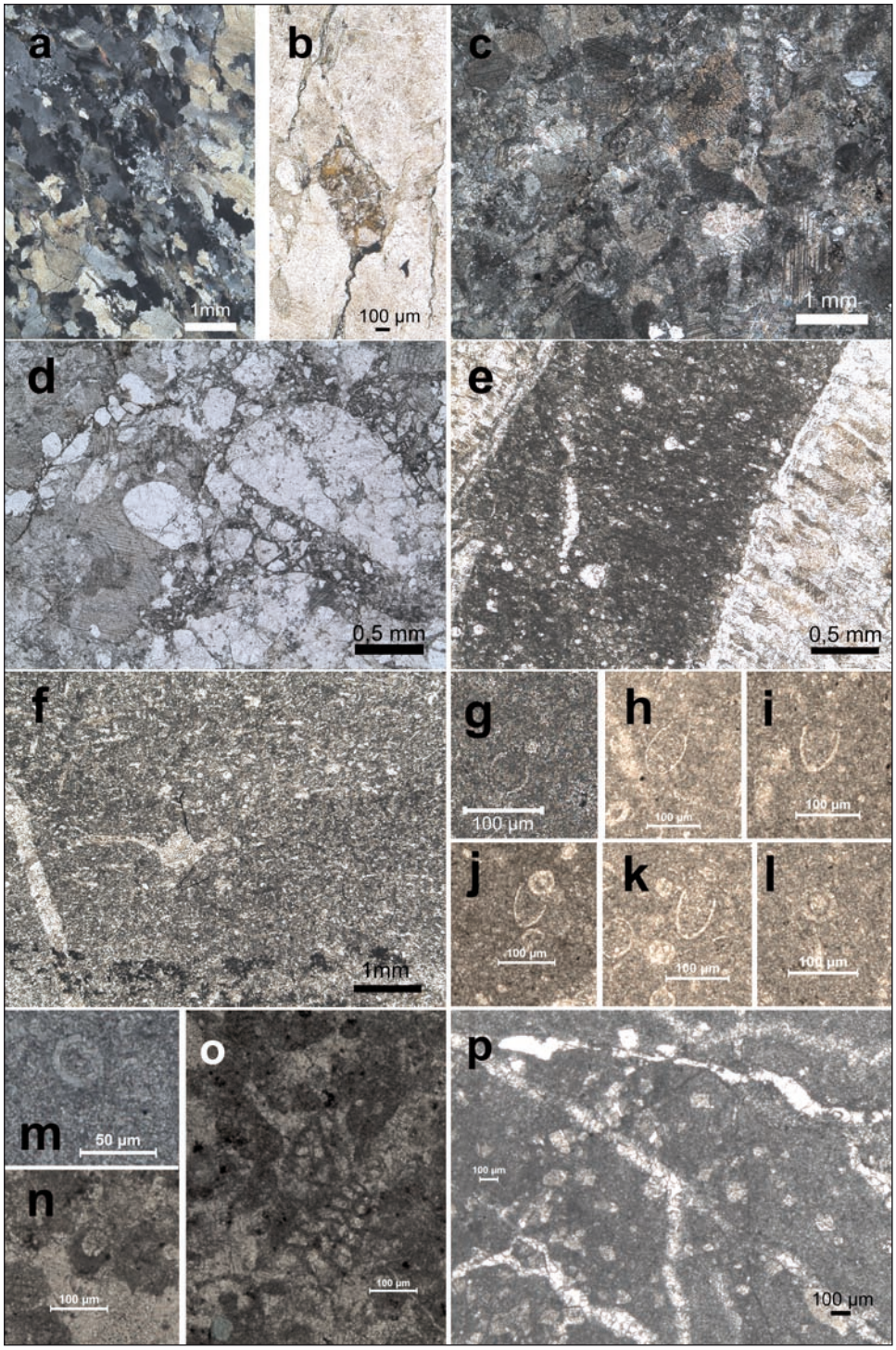


**Fig. 4. a** – Microstructure of metaquartzite layer in crossed polars; **b** – Detail from the central part of Fig. 4a on the garnet, indicating metamorphic overprint in the lower amphibolite facies; **c** – Crinoidal grainstone composed of well sorted crinoidal plates, sample from the area west of Patrovec; **d** – conglomerate and breccia containing quartzose, locally rounded, detritus, being present in the crinoidal limestones; **e** – Radiolarian limestone with wackestone structure, section in the cut of the Svinica creek; **f** – Planktonic echinoid *Saccocoma* sp. from the red nodular limestones; **g** – Calpionellids from the pink and grey Calpionella and nannoconid limestones; *Calpionella alpina* Lorenz (small form); **h** – *Calpionella elliptica* Cadisch; **i** – *Remaniella colomi* Pop; **j** – *Remaniella duranddelgai*; **k** – *Remaniella ferasini* (Catalano); **l** – dinoflagellate *Schizosphaerella minutissima* (Colom) from the red nodular limestones; **m** – nannoconid limestone with dinoflagellate *Stomiosphaera echinata* Nowak; **n** – dinoflagellate *Cadosina semiradiata czieszynica* (Nowak) from the dark grey organodetritic limestones; **o** – organodetric limestone with glauconite grain and fragment of orbitolid foraminifera *Sabaudia minuta* (Hofker); **p** – rhomb-shaped dolomite crystals indicating dolomitization in the slightly recrystallized matrix of Gutenstein Limestones of Hronicum SW of Trenčianske Jastrabie.

and nannoconid limestones were mapped, and are shown as one lithostratigraphic unit (Fig. 2a, c).

Dark grey organodetritic limestones occur in the southeast portion of the Skalica hill west of Patrovec (Fig. 2a, c). According to the lithological appearance and superposition in the sequence, the limestones penetrated by borehole DB-5 northeast of Dubodiel (Seneš and Brestenská, 1963) are considered to be a member of the same lithological unit. Thickness and bedding of limestones was not observed due to the poor outcrop conditions. Microfacially they are packstones to grainstones, with numerous organic detritus that was largely damaged by transport. Bioclasts are composed of echinoderms, foraminifers and algae fragments. Kullmanová (1980) also found sponge spicules, cadosinids and rudist fragments. Foraminifers *Globigerinelloides* sp. and *Sabaudia minuta* (Hofker) (Fig. 4o) and dinoflagellate *Cadosina semiradiata czieszynica* (Nowak) (Fig. 4n) were found. Clastic quartz of silt size, authigenic quartz, pyrite and glauconite grains are present (Fig. 4o). Kullmanová (1980) described also fragments of volcanic glass. According to the microfossil content, the stratigraphic age of the organodetritic limestones is Barremian-Upper Aptian. Nature of the studied samples indicates that they represent distal facies with redeposited shallow water microfauna. Dark grey organodetritic limestones can be correlated with the Bohatá Formation (Borza and Michalík, 1987).

Current poor outcrop conditions do not allow to confirm the presence of marlstones south of Dubodiel, containing foraminifers and other microfossils of Albian age (Gašpariková in Kullmanová, 1980).

## Hronicum (Veterlín Succession)

In the locality Železník west of Patrovec and in the southern portion of the Dubodiel (Fig. 2a, c), the isolated outcrops expose the Anisian-Carnian carbonate complex, which is, according to its facial and stratigraphic attributes, assigned to the Hronicum (Fig. 5). Despite being able to observe only a relatively thin portion of the sedimentary sequence, obtained stratigraphic data show its affinity to the Teplý vrch, Podhradie and Beckov partial nappes (sensu Havrila in Ivanička et al., 2011), which represent transitional succession of the Veterlín type. The occurrence of the Hronicum sediments was recognized for the first time in this area.

The oldest portion of the sequence is composed of black bituminous, intensively interveined and cracked limestones, exposed only in few outcrops and in debris in the valley of Svinica stream. Dark grey limestones exposed west of Trenčianske Jastrabie, previously considered as dolomites (Polák in Ivanička et al., 2011), were according to their structural position and similar lithology also assigned to this lithostratigraphic unit. Microscopically they represent packstones with partially recrystallized micritic matrix, local dolomitization (Fig. 4p) and fragments of poorly preserved but well sorted bioclasts, mostly *Globochaete*, ostracods and echinoderm fragments (Fig. 6a). According to its lithological and microfacial character and position in the sequence, they are identified with Gutenstein Limestones of Anisian age.

The Gutenstein Limestones in the valley of Svinica stream are overlain by a sequence of medium bedded grey micritic and partially nodular limestones with sporadic black chert nodules of irregular shape (Fig. 6e). According to the lithological character, microfacial and biostratigraphic findings, they could be correlated with the Reifling Limestones. Microscopically they are grainstones and breccias composed of fragments of mudstones to packstones. Limestones contain thin-shelled bivalves (Fig. 6b), foraminifers, zoospores Globochaete, ostracods and echinoderm fragments. Numerous intraclasts (Fig. 6d) indicate that they may represent the bodies of slope breccias of redeposited intrabasinal material or transitional facies between Reifling and Raming limestones. Stratigraphic age was determined by the presence of *Turriglomina mesotriassica* (Koehn-Zaninetti) (Fig. 6c), which represents the index species of the Ladinian to Lower Carnian foraminiferal microfauna and facial fossils of the Reifling Limestones. The foraminiferal microfauna of the Reifling Limestones is completed by the species of *Arenovidalina chialingchiangensis* (Ho), *Nodosaria* sp., *Lamelliconus* sp., etc. The contact of the Reifling Limestones with overlying organodetritic (Wetterstein) limestones is not seen, thickness of the formation is at least 2 m.

Organodetritic (Wetterstein) limestones occur on the eastern slopes of the locality Železník and in the southern portion of the municipality Dubodiel (Fig. 2a). They are

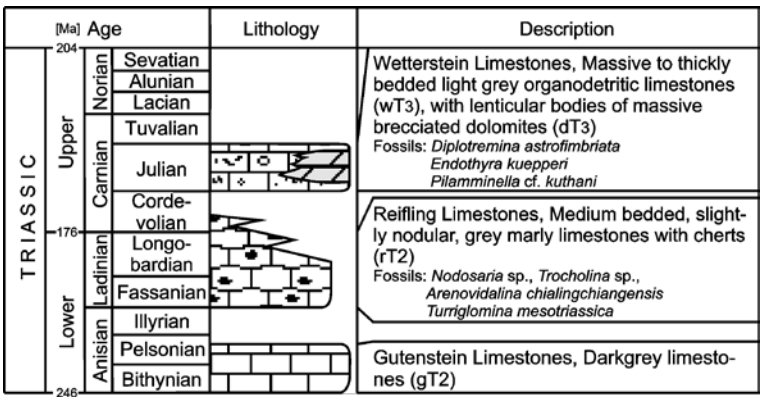


**Fig. 5.** Schematic lithostratigraphic section of the Veterlín Succession of the Hronicum in the investigated area.

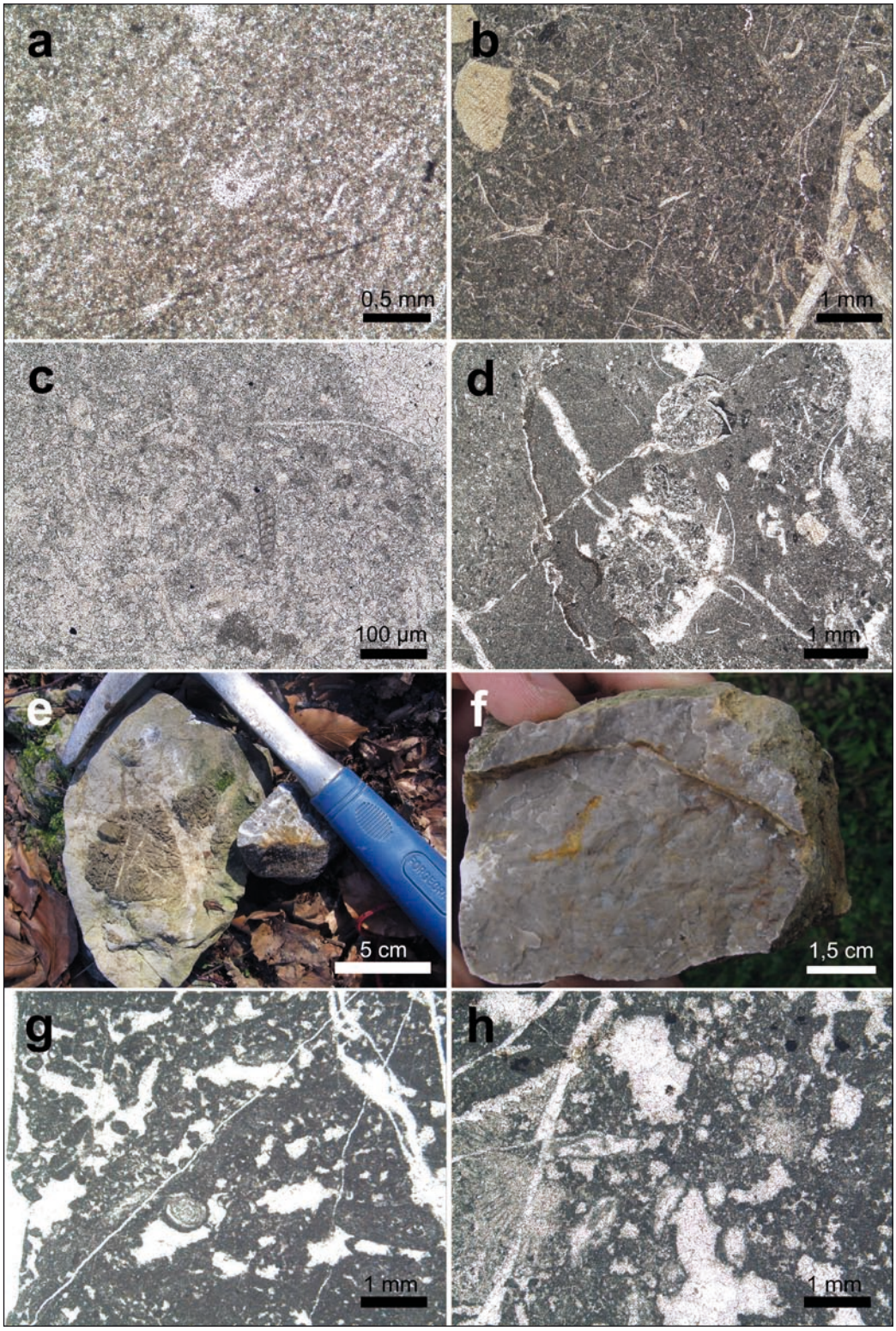


**Fig. 6. a** – recrystallized matrix of the Gutenstein Limestones with preserved echinoderm fragment; **b** – wackestone with numerous detritus of thin shelled bivalves and echinoderms from the Reifling Limestones; **c** – foraminiferal species *Turriglomina mesotriassica* (Koehn-Zaninetti) from the Reifling Limestones; **d** – mudstone intraclast in coarser grained limestone matrix, sheared brachiopod fossil from the Reifling Limestones; **e** – nodular Reifling Limestones with dark grey cherts; **f** – organodetric Wetterstein Limestones from locality Dubodiel; **g** – porous biomicrite with fenestral fabric and foraminifers *Rakusia oberhauseri* Salaj in the Wetterstein Limestones; **h** – organodetric Wetterstein Limestones with rudstone structure and fenestral fabric, bioclasts formed by fragments of algae and foraminifers (*Diplotremmina astrofimbriata* Kristan-Tollmann).

represented by massive beds of light grey to brown grey organodetritic limestones (Fig. 6f) with occasional dark grey tectonic breccias and brecciated dolomites. According to the biostratigraphic research, lithological pattern and their position in the sedimentary sequence, they are considered to be a portion of the Wetterstein Formation. Limestones generally represent the packstones to grainstones, locally rudstones with high content of skeletal grains, mostly of foraminifers, fragments of green algae, algal nodules and ostracods. Non-skeletal grains are represented by peloids and rounded grains. Important sign is the fenestral fabric (Fig. 6g, h), indicating the extremely shallow water diagenesis. Locally parallel lamination can be observed at a microscale. Middle Carnian age was determined by the presence of the foraminifers *Pilamminella* cf. *kuthani* (Salaj), *Diplotremina astrofimbriata* Kristan-Tollmann (Fig. 6h) and *Endothyra kuepperi* Oberhauser. At least 15–20 m thick formation forms the terminal member of the Hronicum succession in the investigated area. In the area west of Patrovec, Wetterstein Limestones are accompanied by dolomites. Contact with underlying strata is not well exposed, only the outcrop in the locality Železník shows that the underlying strata are composed of Reifling Limestones.

Organodetritic limestones are accompanied by the more or less continuous strip of lenticular bodies of dolomitic rocks (Fig. 2a, c). Dolomites are massive. The weathered samples are light grey, yellowish to light orange. Fresh surfaces show distinct brecciated fabric or pure white colour. According to the position in the sedimentary sequence, they are correlated with Wetterstein Dolomites.

## Tectonic setting

According to the surface and seismic data from the area, the Selec block is structuralized by multiple subparallel shear zones dipping to the SE locally with backthrusts (Vozár et al., 1999). The map view and the borehole data indicate that mountain range and adjacent portion of the Bánovce depression are segmented by transversal faults into smaller blocks with different rates of vertical movement (Maglay et al., 1999). Investigated area lies on the elevated Svinná and Držkovce blocks (Pristaš et al., 2001).

Rock complexes of the Infratatricum and both thin--skinned nappe units were exposed to polyphase ductile and brittle deformation. Especially studied Mesozoic complexes were brecciated and disrupted by calcite veinlets which often precluded the determination of neither primary nor secondary structures.

The oldest deformation phase in the investigated area is Hercynian that was coeval with the prograde and retrograde metamorphism, resulting in formation of thick micaschist complexes (Krist et al., 1992). At least one Hercynian deformation phase can be recognized in the crystalline basement rocks by the south vergent ductile rotated porphyroclasts and folds.

Observed fold structures of the crystalline basement and Mesozoic sediments show similar orientation of the fold axes (Fig. 7). Uniform structural pattern in both crystalline basement and Mesozoic rocks suggest the Alpine deformation phase. Fold β-axes show the orientation in SW–NE and ENE–WSW directions. The ESE–WNW folds might result from younger deformation (Fig. 7).

Contact of Bánovce depression and Považský Inovec Mts. is formed by S–N trending Dubodiel fault system that is well marked in the morphology of the area, e.g. by triangular facets. Transverse dislocations divide the mountain range in NW–SE direction and partially follow the blocks of the Bánovce depression substratum (Pristaš et al., 2001). They probably represent older reactivated faults, active in recent tectonic regime of orogen-parallel extension (Vojtko et al., 2008).

## Conclusion

Research has confirmed that the earlier interpretation of the presence of the Mesozoic sediments of Infratatricum sedimentary cover unit (Patrovec Succession sensu Polák in Ivanička et al., 2011) is not conformable with the results of the field and biostratigraphic investigations. The presence of characteristic deep water facies of the Šiprúň type of the Infratatricum, such as spotted clayey limestones of Janovka Formation or thicker radiolarites, was not confirmed.

The Mesozoic complexes between the municipalities Dubodiel and Trenčianske Jastrabie, formerly assigned to the Patrovec block, represent mainly the relicts of the Beckov Succession of the Fatricum (Vysoká facial type) and the Veterlín Succession of the Hronicum. The presence of the shallow water Beckov Succession confirms some earlier concepts (Kullmanová, 1980). Triassic complexes of the Hronicum were recognized in the studied area for the first time.

Current poor status of outcrops of the Mesozoic deposits NW of the Zlatníky locality, south of investigated area, formerly assigned into the Patrovec Succession (Polák in Ivanička et al., 2007), does not allow a correct interpretation of their tectonic origin.

Sediments of the Infratatricum are present only in the northern portion of the investigated territory and have the smallest areal extent. Superposition of the Lower Triassic quartzite sandstones (Lúžna Formation) directly on the top of the basement was not confirmed in the investigated area.

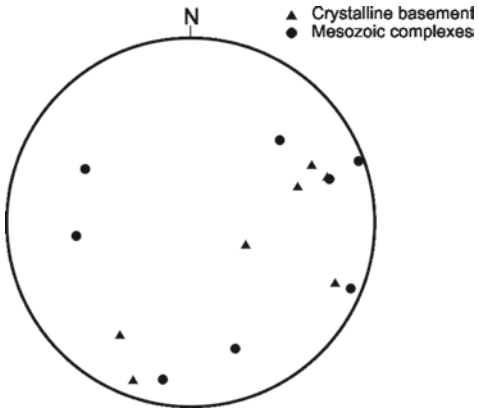


**Fig. 7.** Fold β-axis from the investigated area plotted onto the lower hemisphere.

Observed metaquartzites are a portion of the micaschist complex.

Relicts of the younger transgressive complexes are formed by erosional remnants of the Eggenburgian carbonate sandstones and conglomerates (Kľačno Conglomerates). Important volume of the sedimentary fill of the Bánovce depression, especially in the area of subsiding blocks in the north and south of the studied area, is formed by the Badenian Svinná Formation. Erosional remnants of the Middle Sarmatian volcaniclastic deposits of the Ruskovce Formation were locally found.

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