7th European Meeting on 3D Geological Modelling

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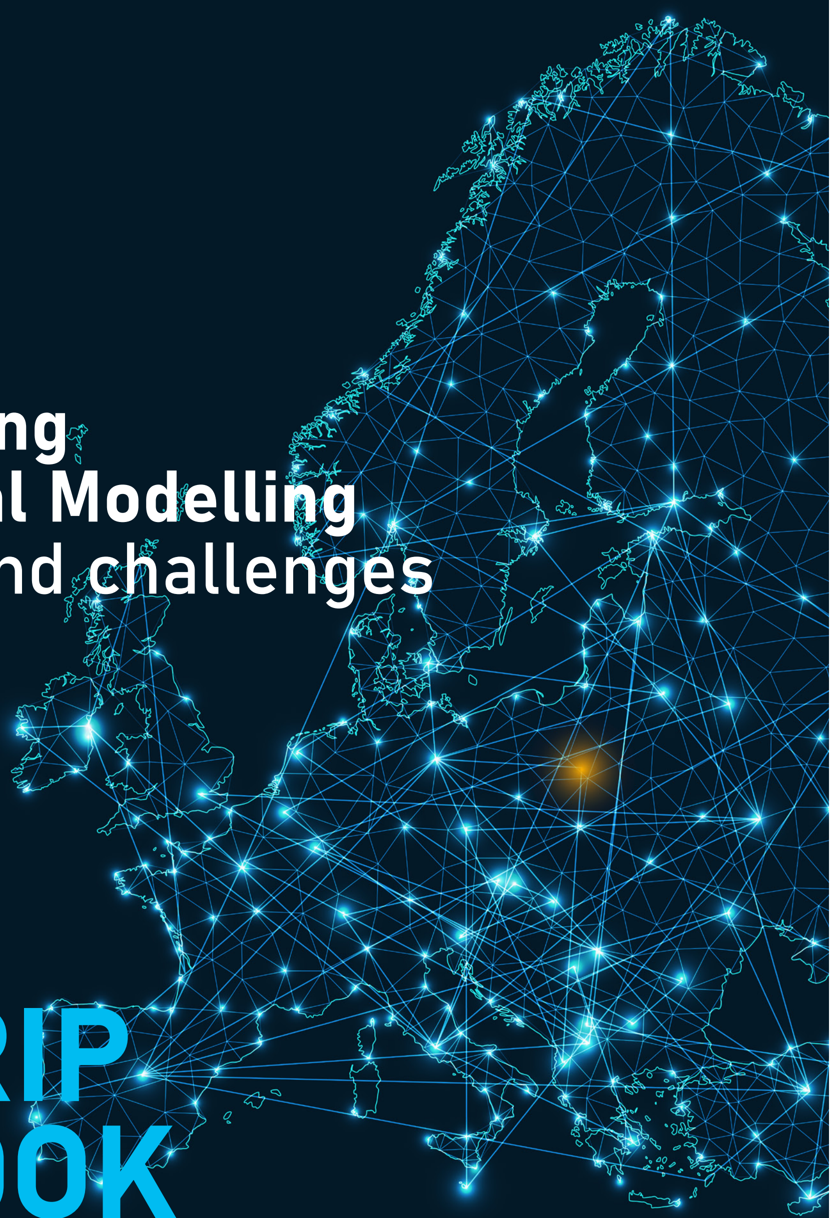

FIELD TRIP GUIDEBOOK

Warsaw, Poland

Polish Geological Institute
National Research Institute

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NATIONAL FUND
FOR ENVIRONMENTAL PROTECTION
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HOLY CROSS MOUNTAINS

Field Trip Guidebook

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The Holy Cross Mountains is a geological-geographical unit characterised by the occurrence of mainly sedimentary geological formations covering almost all geological periods of the Phanerozoic on a relatively small area. The geological history of this area is highly complexed, and the environmental formation of geological sets was conditioned by the palaeogeographic position of the two main parts of the Holy Cross Mountains: southern - Kielce and northern - Łysogóry. The southern region is part of a large geological unit, the Małopolska block, on the northern edge of which is today's Palaeozoic core, connected to the northern (Łysogóry) region by the Łysogóry dislocation. The common history of both geological units only began in the Devonian period (approx. 390 million years ago), when they merged along this dislocation. The Holy Cross Mountains are geologically divided into the Palaeozoic core and the Permo-Mesozoic rim. Both of these structural levels are separated by a stratigraphic-tectonic discontinuity, the formation of which is related to Variscan orogenic movements. All sedimentary deposits in the Holy Cross Mountains that consist siliciclastic and carbonates of different types are characterised by a richness of fossils, which characterise the environment in which they were deposited and help to determine their age. The most important of these are Cambrian trilobites, Silurian graptolites and Devonian fossils documenting the development of the terrestrial environment, its submersion, the formation of a carbonate platform with a wealth of reef organisms and the transition to deep-sea environments. Within this period, globally significant traces of the first terrestrial vertebrates, large armoured fish, as well as fossilised geodynamic processes in the form of landslides have been documented. The Permo-Mesozoic structural unit is mainly a series of continental deposits with a significant influence of river and marginal marine environments and consists mainly of siliciclastic deposits. Within them, the fossil record of the land evolution of fauna and flora is dominated by the richness of Triassic and Jurassic vertebrates, from the beginning of the reign of the dinosaurs. Within them, dinosaur nests and eggs, their tracks and rich plant communities have been documented. The youngest Cainozoic deposits surround Palaeozoic and Mesozoic on all sides and show the alpine stage of the formation of today's area of this part of Poland, including the formation and disappearance of the Paratethys. The current landscape of the Holy Cross Mountains was formed over the last 2 million years, under the influence of Pleistocene glaciations. One of their most interesting traces are the rock screes formed within the uplifted and uncovered Cambrian and Devonian rocks.

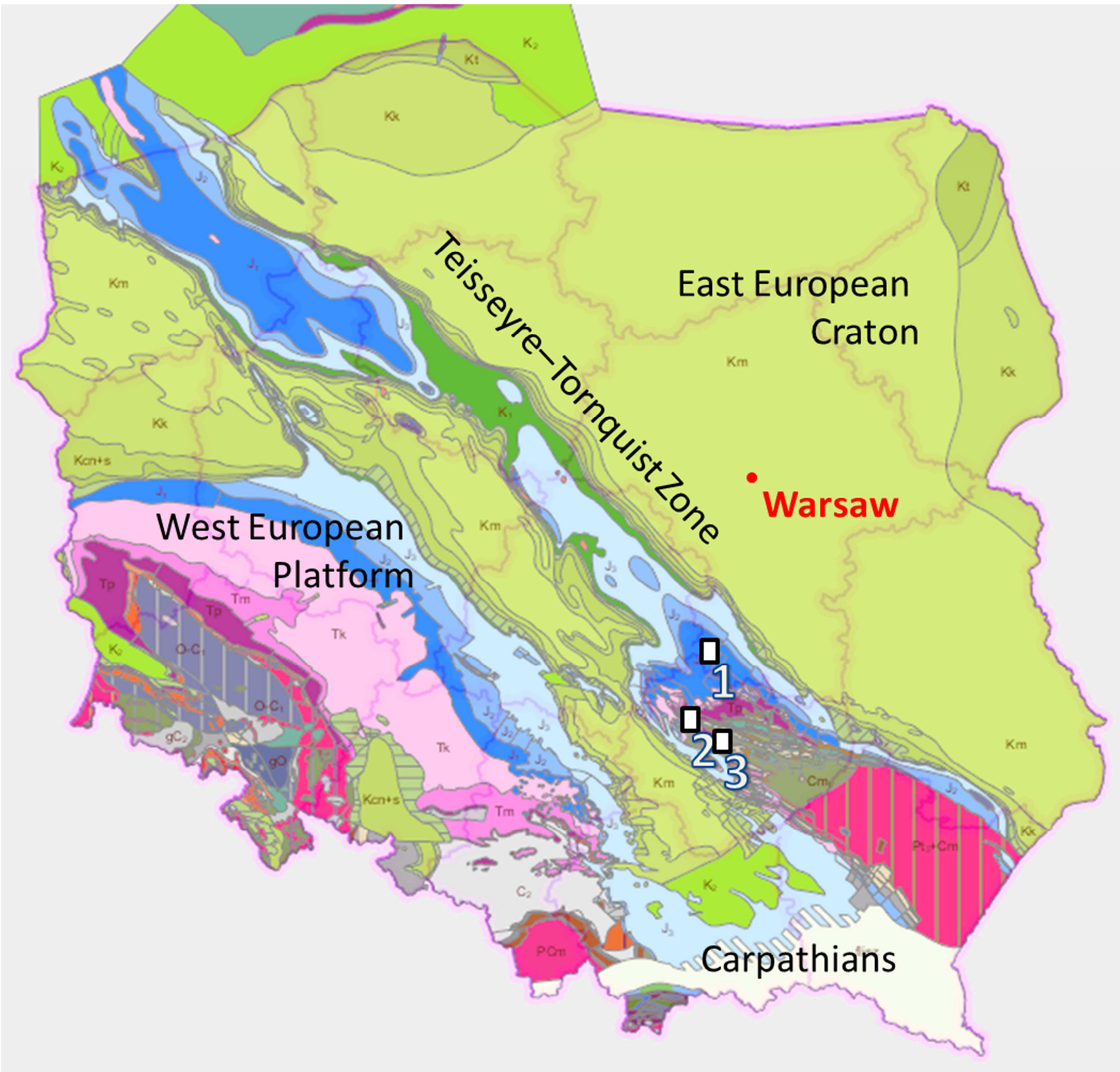

Fig. 1A. Overview sub-Cenozoic geological map of Poland 1:1M scale, showing field trip stops.

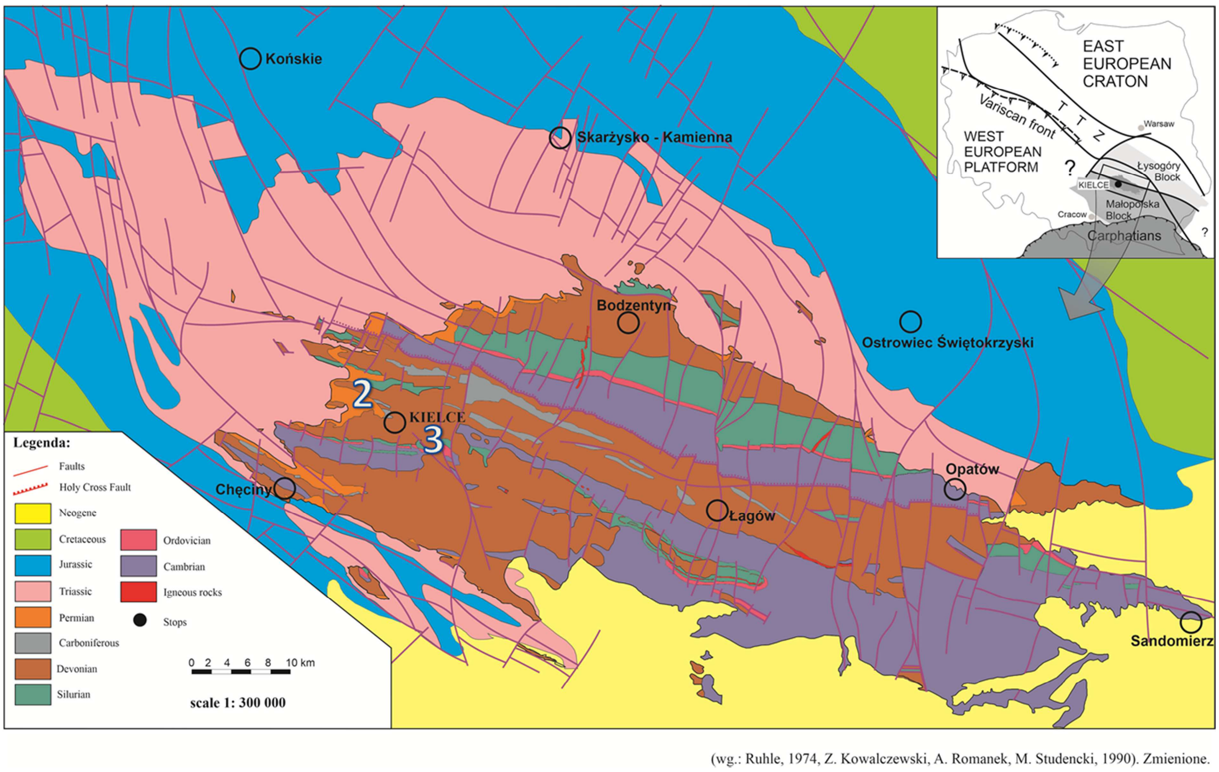

Fig. 1B. General geological map of the Holy Cross Mountains, showing stops 2&3, insert showcases fundamental tectonic subdivision of Poland.

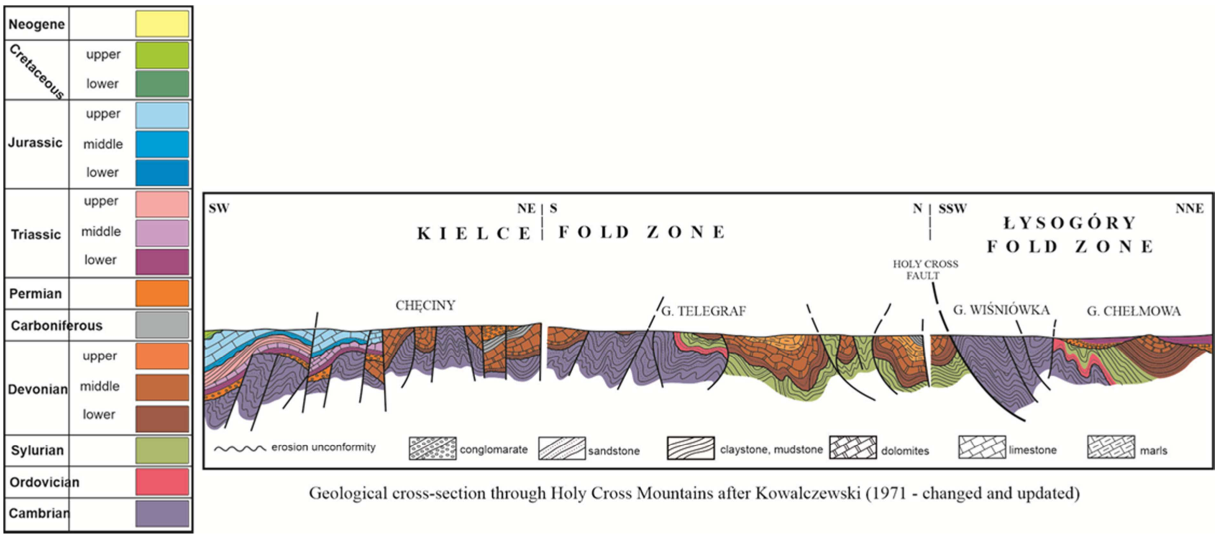

Fig. 2A. General geological cross-section through the Holy Cross Mountains.

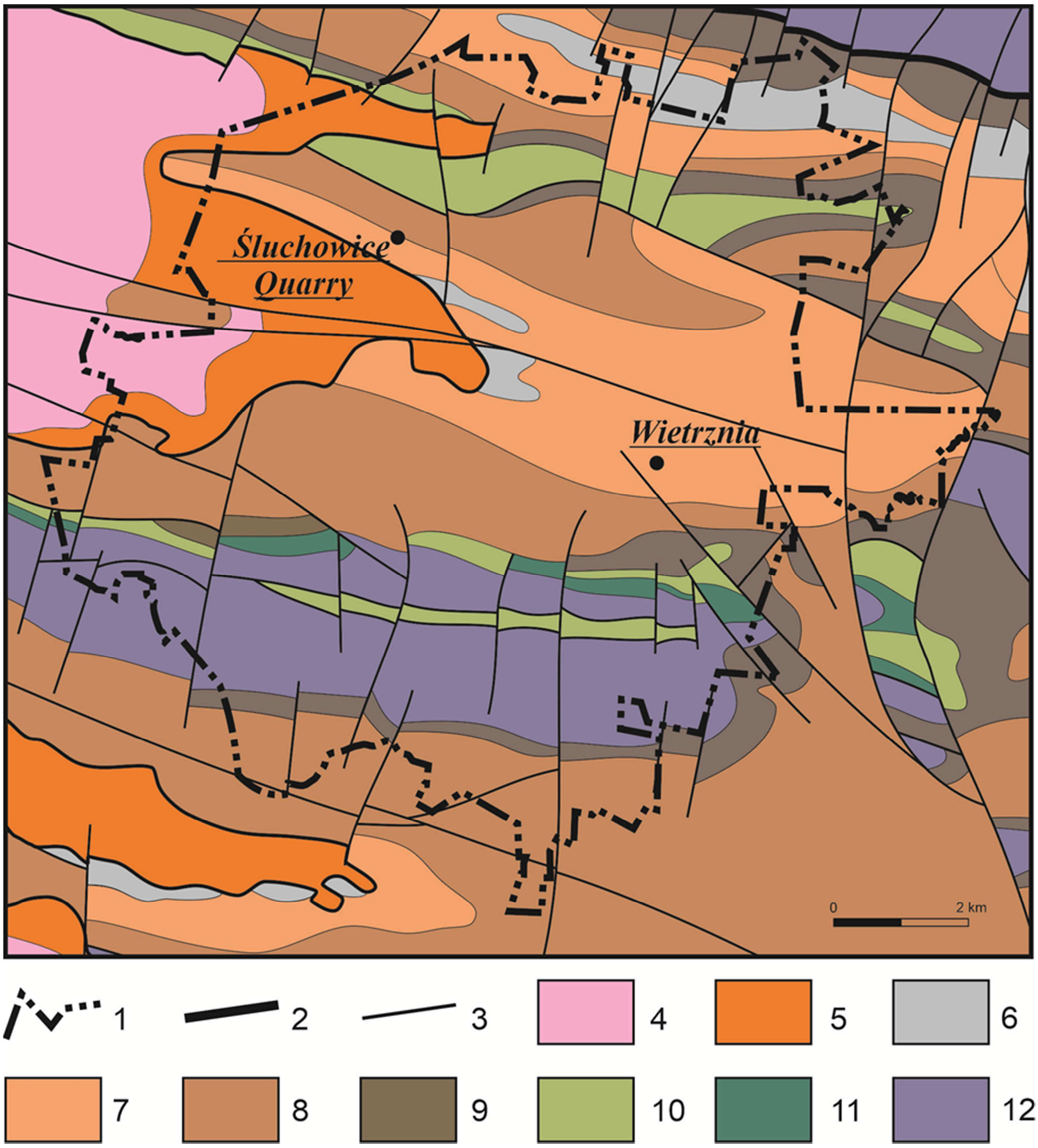

Fig. 2B. Detailed geological map of the Holy Cross Mountains in the vicinity of Śluchowice and Wietrznia quarries. Description: 1. city boundaries, 2. Łysogóry dislocation, 3. faults, 4. Triassic, 5. Permian, 6. Carboniferous, 7. Upper Devonian, 8. Middle Devonian, 9. Lower Devonian, 10. Silurian, 11. Ordovician, 12. Cambrian.

STOP 1 Borkowice

A unique palaeontological site with evidence of the beginning of the reign of the dinosaurs on Earth.

Over the last quarter of a century, dinosaurs from Poland have become one of the most important elements of palaeontological research in Poland. This is due to the traces of these animals, which, although underestimated for years, are an important testimony to their presence and behaviour as living elements of the ecosystem.

The kaolinite clay deposit and the accompanying packages of mudstones and sandstones in Borkowice are exposed at the foot of the eastern edge of the Gielniowski Ridge, a range of hills made up of Lower Jurassic sandstone and clay formation. The rock formation exposed in the mine has been described in lithostratigraphic diagrams as the Prusak ore-bearing formation (Pieńkowski 2004). The age of these sediments, based on sequence stratigraphy, has been determined as late Hetang (Pieńkowski, 1983, 2004), although based on old cyclostratigraphic interpretations (Dadlez, 1969, 1975), these formations are marked as lower Synemurian (e.g. on SMGP maps). It should be noted that Karaszewski (1960, 1975) consistently upheld his view of the Hettangian age based on biostratigraphic evidence. Later sedimentological and stratigraphic-sequence studies (Pieńkowski, 1983, 2004), as well as isotopic chemostratigraphy (Pieńkowski et al., 2020) and new data and palynological correlations (Krupnik et al., 2014; Marcinkiewicz et al., 2014) now allow the Susz ore-bearing formation to be dated to the late Hettangian, approx. 199.5 million years ago.

Fig. 3. The eastern wall of the clay pit in Borkowice showing sandy barrier deposits separating the claystone lagoonal horizons (the higher one is visible at the top). The layer with dinosaur footprints occurs at the bottom of the pit. Photo Grzegorz Niedzwiedzki (Pieńkowski & Niedźwiedzki 2021)

The dinosaur footprint-rich strata of the northern margin of the Holy Cross Mountains, ranging from the oldest in Sołtyków to the youngest in Gliniany Las, Zapniów and Borkowice, are therefore bracketed by a time span of less than 2 million years, which is important for understanding evolutionary trends.

These are marginal marine formations of barrier lagoon origin. In Zapniów, the presence of nautilus-like molluscs was found in these formations, while in Borkowice, there are traces of horseshoe crabs. The clays belong to two ore levels (for many years, iron ore - siderite - was mined from these levels), separated by sandstone barrier sandstones, and in some places also deltaic formations (Pieńkowski, 2004). The object of exploitation is a layer of clay over 3 metres thick, rich in kaolinite, extracted at the bottom of a deep excavation.

So far, several hundred dinosaur tracks have been collected and preserved in Borkowice, representing at least seven different species of these animals, and the exploration prospects are far more promising. It should be noted that these results of the research of two people (authors of this communication) have been obtained as a result of only a few field trips. The number of valuable objects that were in the rubble before the discovery is incomparably higher. However, in order to excavate them (the blocks weigh on average several hundred kilograms, some are several tonnes), heavy equipment and significant resources will be needed, which we hope will be obtained as part of local government development projects.

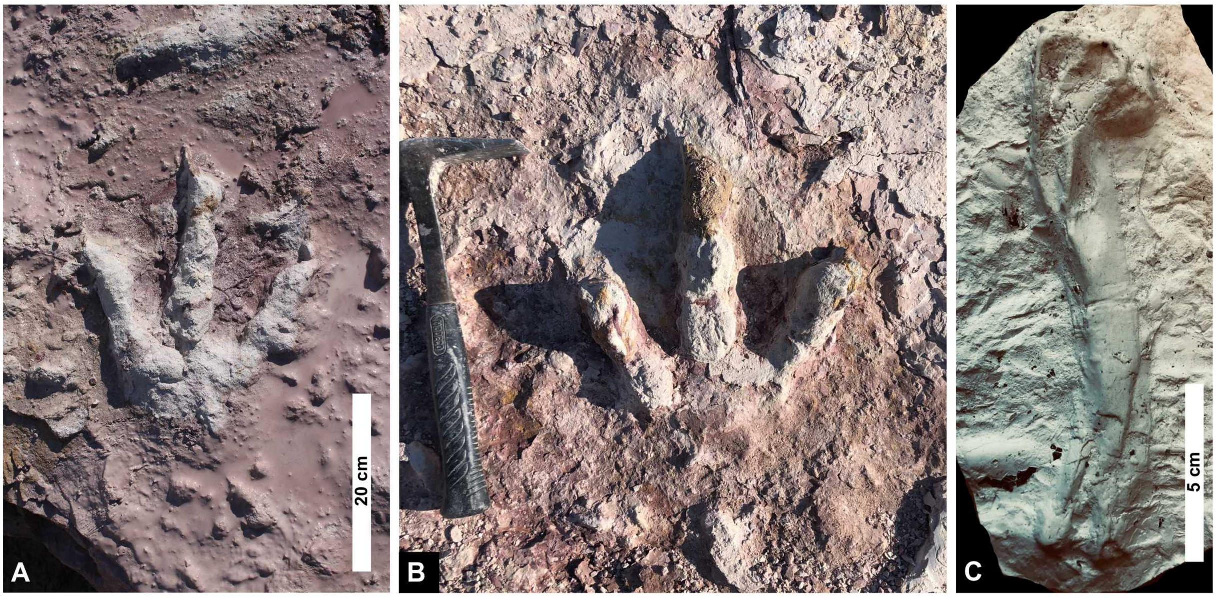

Fig. 4. Two examples of tridigit predatory dinosaur tracks (A-B) and an imprint of a ornitischian dinosaur femur (D). Photo Grzegorz Niedzwiedzki (Pieńkowski & Niedźwiedzki 2021)

Fig. 5. One of the tracks of a predatory dinosaur with preserved anatomical details (digital pads, claws, an imprint of scaly skin). Photo Grzegorz Niedźwiedzki (Pieńkowski & Niedźwiedzki 2021)

The site is currently the subject of geological, sedimentological and palaeontological research. Administrative procedures are also underway to establish the site as a protected site of historical interest. The coordinator of the ongoing and planned work is the Polish Geological Institute - National Research Institute in Warsaw, with the participation of scientists and 3D scanning specialists from Poland and Sweden. The participation of local governments (county and municipal), the State Forests and the deposit user (WIS-GROUP Sp. Z o.o., Opoczno) is crucial in terms of protection and further steps to secure the discoveries. It should be emphasised that these few surfaces with traces found represent the highest values not only scientifically, but also for exhibitions and museums. During a series of meetings, it was agreed that due to the priceless palaeontological finds, the aforementioned opencast mine should be excluded from the agricultural and forestry reclamation project and temporarily secured. In the future, a geostation/geological reserve and a museum/educational centre presenting the discovered tracks, bones and the environment in which the dinosaurs lived should be established here. The collection also includes ethological records (behaviour) left by dinosaurs running, swimming, resting and sitting on the muddy sediment, as well as many enigmatic biogenic structures, probably related to the various life activities of the dinosaurs living there (e.g. traces of zeroing or digging in the sediment). The discovery of footprints indicates an exceptionally complex faunal assemblage inhabiting this dinosaur area, and our preliminary observations suggest that the Borkowice dinosaur fauna is one of the richest known from Lower Jurassic deposits in the world.

Literature cited and for further reading

DADLEZ R. 1969 – Stratygrafia liasu w Polsce zachodniej. Prace Instytutu Geologicznego, 57: 1-92

DADLEZ, R. 1975 - On the Hettangian-Sinemurian boundary in extra-Carpathian Poland. A discussion. Bulletin de L'Academie Polonaise, Série des Sciences de la Terre, 22: 119-122

GEOLOGIC TIME SCALE 2020. F.M. Gradstein, J.G. Ogg, M.D. Schmitz and G.M. Ogg (eds), Elsevier.

GIERLIŃSKI, G., NIEDŹWIEDZKI, G., PIEŃKOWSKI, G., 2004 - Tetrapod track assemblage in the Hettangian of Sołtyków, Poland, and its paleoenvironmental background. Ichnos, 11: 195–211.

GIERLIŃSKI, G., PIEŃKOWSKI, G. 1999 - Dinosaur track assemblages from the Hettangian of Poland. Geological Quarterly, 43: 329-346.

KARASZEWSKI, W., 1960 - Nowy podział liasu świętokrzyskiego. Kwartalnik Geologiczny, 4: 894-920.

KARASZEWSKI, W., 1974 - On the Hettangian-Sinemurian Boundary in the Extra-Carpathian Poland. Bulletin de L'Academie Polonaise, Série des Sciences de la Terre, 22: 33-36

KRUPNIK, J., ZIAJA, J., BARBACKA, M., FELDMAN-OLSZEWSKA, A., JARZYNKA, A. 2014 - A palaeoenvironmental reconstruction based on palynological analyses of Upper Triassic and Lower Jurassic sediments from the Holy Cross Mountains region. Acta Palaeobotanica 54, 35–65.

MARCINKIEWICZ, T., FIJAŁKOWSKA-MADER, A., PIEŃKOWSKI, G. 2014 - Poziomy megasporowe epikontynentalnych utworów triasu i jury w Polsce – podsumowanie. Biuletyn Państwowego Instytutu Geologicznego 457: 15–42

NIEDŹWIEDZKI, G., PIEŃKOWSKI, G. 2016 - A dinosaur track assemblage from the Upper Hettangian (Lower Jurassic) marginal-marine deposits of Zapniów, Holy Cross Mountains, Poland. Geological Quarterly, 60, DOI: http://dx.doi.org/10.7306/gq.1310

PIEŃKOWSKI, G., GIERLIŃSKI, G. 1987 - Nowe znaleziska tropów dinozaurów w liasie świętokrzyskim i ich tło paleośrodowiskowe (New finds of dinosaur footprints in Liassic of Holy Cross Mountains and its paleoenvironmental background, Poland). Przegląd Geologiczny, 35: 199-205.

PIEŃKOWSKI, G. 2004 - The epicontinental Lower Jurassic of Poland. Polish Geological Institute Special Papers, 12, 1-156

PIEŃKOWSKI, G., HESSELBO, S.P., BARBACKA, M., LENG, M. 2020 - Non-marine carbon-isotope stratigraphy of the Triassic-Jurassic transition in the Polish Basin and its relationships to organic carbon preservation, pCO2 and palaeotemperature. Earth-Science Reviews 210, 103383, doi.org/10.1016/j.earscirev.2020.103383

PIEŃKOWSKI G., NIEDŹWEDZKI G. 2021. Borkowice – a world-class paleontological site with footprints and bones of Early Jurassic dinosaurs. Przegląd Geologiczny, 69: 716–720; doi: 10.7306/2021.39

STOP 2 Śluchowice Quarry, Kielce

The abandoned Śluchowice quarry is located in the western part of Kielce and consists of two pits: western and eastern. The western quarry was used for observations due to the better availability and visibility of geological phenomena. In both pits, Frasnian limestones and marls as well as Famennian marls and shales were mined. This area is located within the western end of the Devonian rock outcrop in the Kielce Syncline.

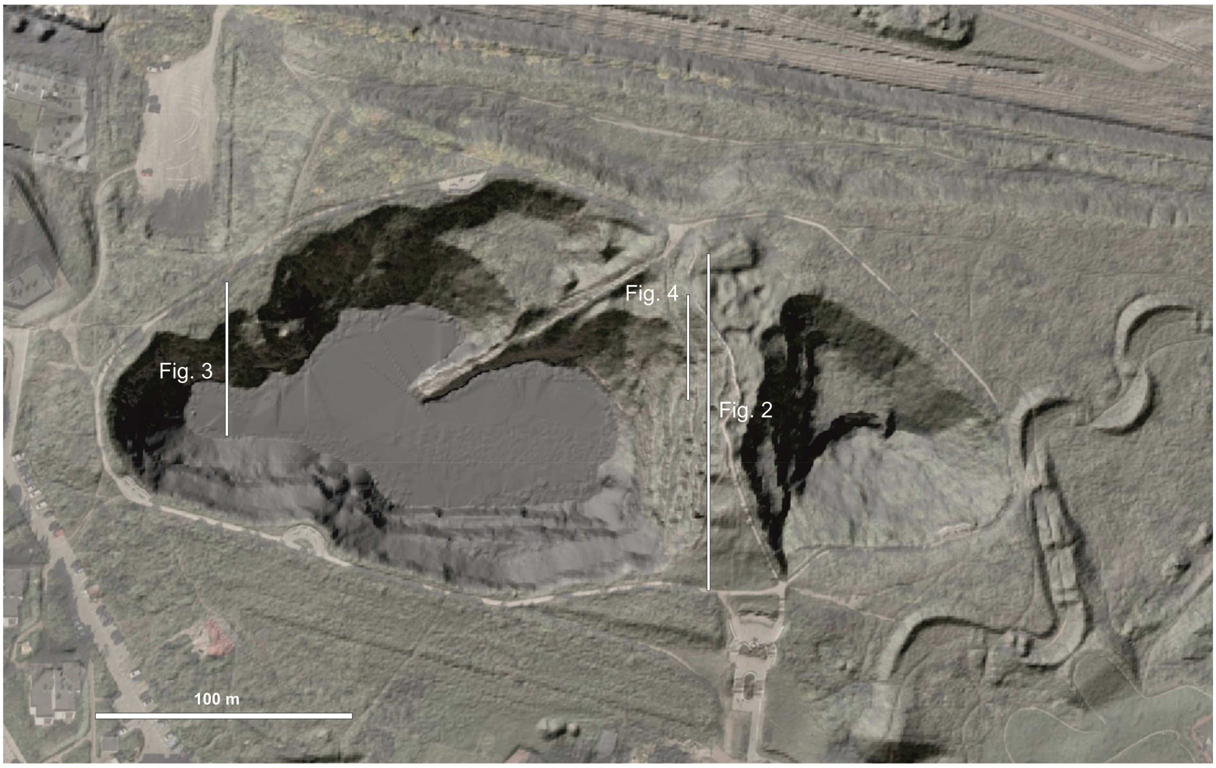

Fig. 6. Aerial overview of Śluchowice quarry.

This structure belongs to a higher-order unit, the Kielce-Łagów Synclinorium. The oldest part of the section is visible in the northern part of both quarries. Among the Frasnian limestones classified as Kostomłockie Beds, a stromatoporoid reef documenting a shallow-marine environment is also preserved (Racki, Sobstel, 2004). Towards the south, the Frasnian rocks deposited in relatively shallow-marine environment progress to Famennian marls and shales representing the deep Łysogóry basin sedimentation.

Fig. 7. Western wall of Śluchowice quarry.

The contact between those complexes is best visible on the western wall of the quarry (Fig. 7). For many years, scientific research has been conducted in the quarry (i.a.: Konon at al., 2010, Lamarche et al., 1999, Narkiewicz et al., 1990, Racki, 1992, Racki, Balińska, 1998, Racki, Bultynck, 1993, Szulczewski, 1971, 1995), including stratigraphic, sedimentological, geodynamic and tectonic studies.

The layers, perfectly visible in the quarry, dip steeply towards the north and are in inverted positions (Fig. 8). This is the effect of the Niewachlów anticline overthrusting from the north onto the northern wing of the Kielce Syncline. The result of this process was the formation of overturned folds visible towards the south on the eastern wall of the eastern quarry (Fig. 9). Due to the lithology of the rocks, similar forms with horizontal axes dominate among the folds.

After the end of an mining activity in 1952, geological nature reserve was established in the quarry and is named after Jan Czarnocki – famous geologist and researcher of the Holy Cross Mountains. It primarily protects the overturned fold visible on the eastern wall and now overtakes also the entire section of Upper Devonian rocks of the quarry.

Fig. 8. Steeply dipping beds at Śluchowice quarry.

Fig. 9. Eastern wall of Śluchowice quarry.

Literature cited and for further reading

KONON A., RYBAK-OSTROWSKA B., SZANIAWSKI R., 2010 – Folding and faulting in the HCM fold belt. 8th Meeting of Central European Tectonic Group Studies. Stop 2: Śluchowice Quarry. 32 - 37.

LAMARCHE J., MANSY J.L., BERGERA F., AVERBUCH O., HAKENBERG M., LEWANDOWSKI M., STUPNICKA E., ŚWIDROWSKA J., WAJSPRYCH B., WIECZOREK J., 1999 - Variscan tectonics in the Holy Cross Mountains (Poland) and the role of structural inheritance during Alpine tectonics. Tcctonophysics, 313 (1-2): 171 186.

NARKIEWICZ M., RACKI G., and WRZOŁEK T., 1990 - Lithostratigraphy of the Devonian stromatoporoid-coral carbonate sequence in the Holy Cross Mountains (in Polish with English summary). Kwart. Geol., 34 (3); 433-456.

RACKI G., 1992 - Evolution of the bank to reef complex in the Devonian of the Holy Cross Mountains. Acta Palaeontol. Pol., 37 (2-4): 87-182.

RACKI G., & BALIŃSKI A., 1998 - Late Frasnian Atrypida (Brachiopoda) from Poland and the Frasnian-Famennian biotic crisis. Acta Palaeont. Pol., 43 (2): 273-304.

RACKI G., & BULTYNCK P., 1993 - Conodont biostratigraphy of the Middle to Upper Devonian boundary beds in the Kielce area of the Holy Cross Mts. Acta Geol. Pol., 43 (1-2): 1-25.

SZULCZEWSKI M., 1971 - Upper Devonian conodonts, stratigraphy and facies development in the Holy Cross Mts. Acta Geol. Pol., 21 (I).

SZULCZEWSKI M., 1995 - Depositional evolution of the Holy Cross Mountains in the Devonian and Carboniferous - a review. Geol. Quart., 39 (4): 471 -488.

STOP 3 Wietrznia Quarry, Kielce

Wietrznia is an extense quarry located in the south-eastern part of Kielce. Until 1984, carbonate rocks of the Middle Devonian (dolomites and limestones of the Givetian) and Upper Devonian (limestones and shales) were exploited there. It is the easternmost part of the Kadzielnia chain, which consists of Frasnian limestones and Famennian shales. This area belongs to a larger geological structure – the Kielce-Łagów Synclinorium in the Kielce region of the Holy Cross Mountains. Before the start of quarrying work, there was a small mountain in place of today's quarry, which was cut out during mining to depths exceeding 30 m (Fig. 10).

This place has a long, more than a hundred-year history of geological research but the first complete description was given by Szulczewski in 1971. He documented the process of the collapse of carbonate platform under the influence of synsedimentary tectonics (Fig. 11). In the lower part of the section (Fig. 12), transitional reef-to-basin Frasnian deposits dominate. They are mainly composed of laminated or graded micritic limestones, nodular limestones, and detrital limestones. These rocks contain a large number of diverse fossils, e.g. brachiopods, gastropods, bivalves, rugose corals, stromatoporoids, and one of the best assemblages of vertebrates in the Holy Cross Mountains. The latter consists of ptyctodonts, arthrodires, porolepiforms, dipnoans, coelacanths and sharks (Gorizdro-Kulczycka 1934,1950, Kulczycki 1957, Liszkowski & Racki 1993, Ginter 1994, Ivanov &Ginter 1997, Ginter 2004, Szrek 2007).

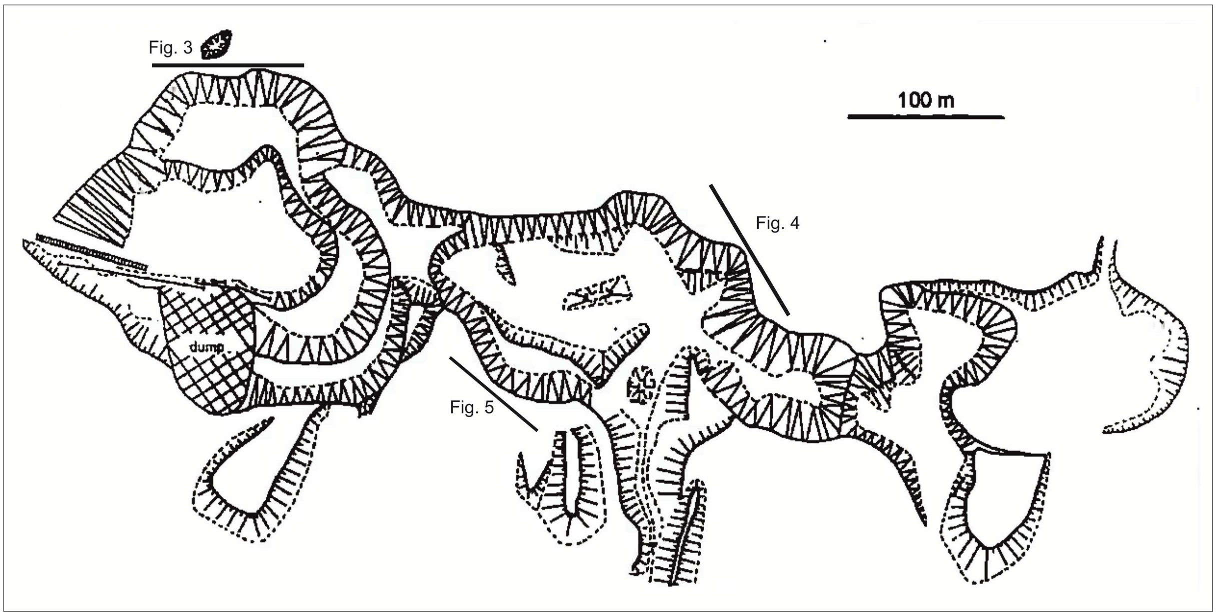

Fig 10. Sketch of the Wietrznia quarry in Kielce (after: Racki 1993, modified). Note the positions of parts illustrated in plates.

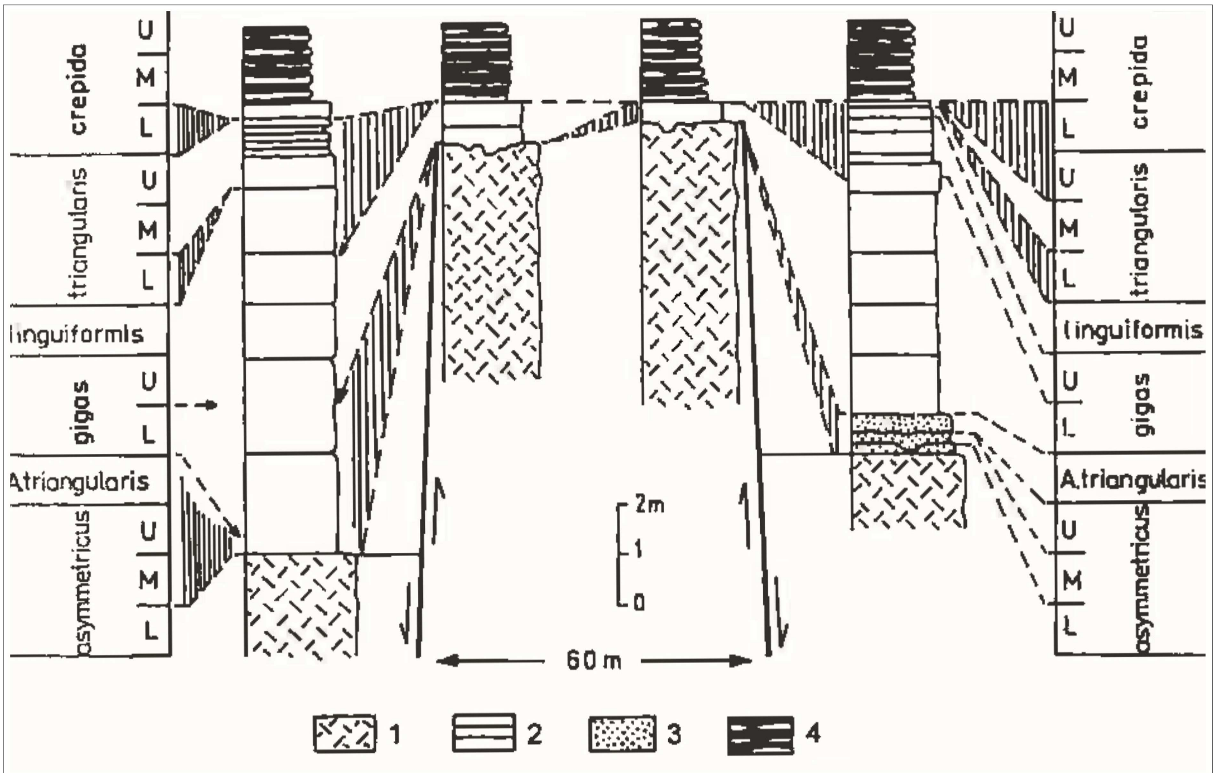

Fig. 11. Blocks in the Wietrznia quarry, caused by sysnsedimentary tectonics. 1 – massive biohermal limestones, 2 – micritic pelagic limestones, 3 – organodetritic grainstones, 4 – marls and shales. From Szulczewski (1989).

The synsedimentary block tectonics (Fig. 11) caused a variety of marine environments in this small area, mainly during the later part of the Frasnian and the earliest Famennian (Szulczewski 1971). The succession shows progressing, stepwise submersion of the carbonate platform. During that time, the carbonate platform was broken and by the middle Famennian sedimentation in the most of the Kielce area became uniform, except for isolated places. Deposition of the last Devonian member in the Wietrznia Quarry, marls, marly shales and shales (Fig. 13) similar to the Łagów Beds in the eastern part of the Holy Cross Mts, began in the Middle Palmatolepis crepida conodont Zone.

A longitudinal fault zone runs along the entire quarry, which is associated with tectonic/colluvial breccias visible on the eastern wall of the central part of the quarry (Szulczewski, 1971, Urban, 2007, 2013). In this place, the contact of Frasnian limestones with Famennian marly-shale sediments is also visible (Fig. 13).

The carbonate rocks occurring in the quarry were subjected to karst processes, and the resulting sinkholes and caves were partially filled with Permian and Triassic karst sediments (Fig. 14).

After the end of exploitation, the quarry was placed under protection and in 1999 a nature reserve was established there named after Zbigniew Rubinowski, who was a geologist and initiator of activities aimed at protecting this area. It protects the rocks occurring in this place, the geological phenomena recorded in them and the fossil fauna.

Fig. 12 – Western part of the Wietrznia quarry, mainly Frasnian detrital limestones.

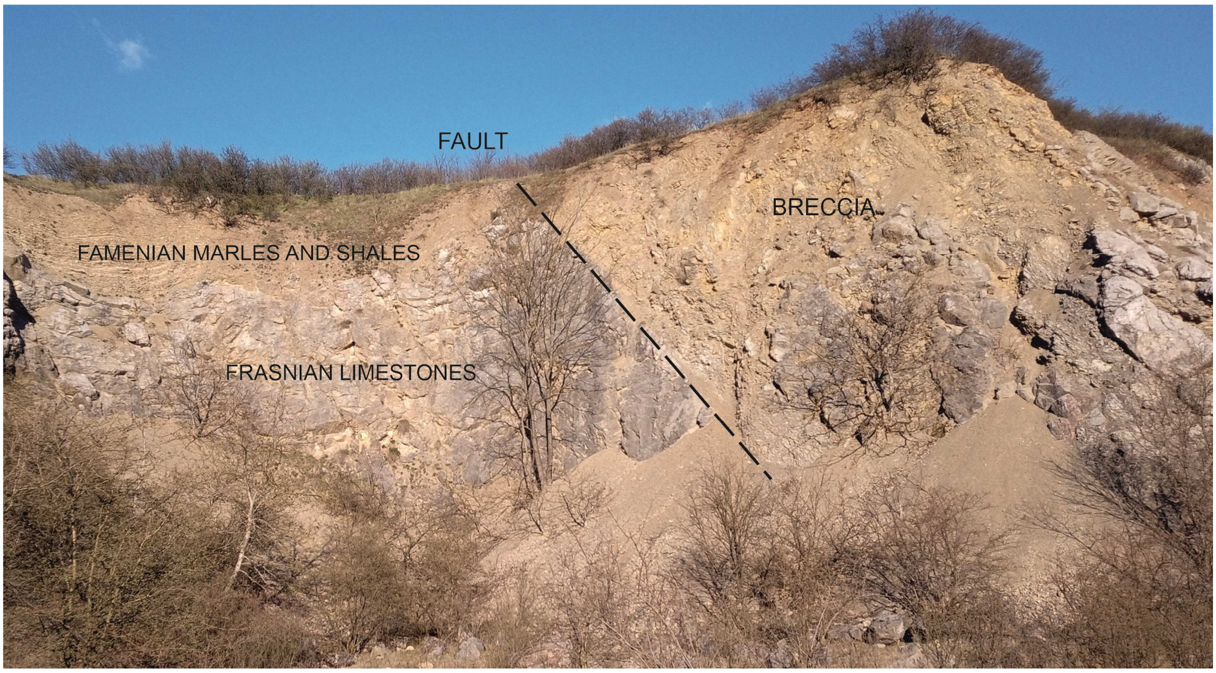

Fig. 13 – Middle part of the Wietrznia quarry, Frasnian detrital limestones cut by the fault zone with tectonic/colluvial breccias inside. In the upper left side of the photo, famenian marls and shales are visible.


Fig. 14 – Middle part of the Wietrznia quarry, karst phenomena in the Frasnian detrital limestones.

Literature cited and for further reading

GINTER, M, 1994. Ichtiolity dewońskie z Polski i Uralu, oraz ich znaczenie stratygraficzne. -Unpublished Ph. D. thesis. Instytut Geologii Podstawowej, Warszawa.

GINTER, M. 2004. Devonian sharks and the origin of Xenacanthiformes. - In: G. Arratia, M. V. H.

WILSON & R. CLOUTIER (Eds), Recent advances in the origin and early radiation of vertebrates, pp. 473-486. Friedrich Pfeil, Miinchen.

GORIZDRO-KU1CZYCKA, Z. 1934. Sur les Ptyctodontidae du Devonien Superieur du Massif de S-te Croix. - Prace Państwowego Instytutu Geologicznego, 3: 1-38. Warszawa [in French and Polish]

GORIZDRO-KULCZYCKA, Z. 1950. Les Dipneustes dćvoniens du Massif de S-te Croix. - Acta Geologica Polonica, 1: 53-82.

IVANOV, A. & GINTER, M. 1997. Comments on the Late Devonian placoderms from the Holy Cross Mountains (Poland). Acta Palaeontologica Polonica, 42: 413 - 426.

KULCZYCKI, J. 1957. Upper Devonian fishes from the Holy Cross Mountains. - Acta Palaeontologica Polonica, 2: 285-380.

LISZKOWSKI, J. & RACKI, R. 1993. Ichthyolits and deepening events in the Devonian carbonate platform of the Holy Cross Mountains. -Acta Palaeontologica Polonica, 37: 407-426.

RACKI, G. 1993. Evolution of the bank to reef complex in the Devonian of the Holy Cross Mountains. Acta Palaeontologica Polonica, 37.

SZREK, P. 2007. Coelacanths (Actinistia, Sarcopterygii) from the Famennian (Upper Devonian) of Kadzielnia Chain, Holy Cross Mountains, Poland. — Acta Geologica Polonica, 57, 403-413.

SZULCZEWSKI, M. 1971. Upper Devonian conodonts, stratigraphy and facial development in the Holy Cross Mountains. -Acta Geologica Polonica, 21: 1-129.

SZULCZEWSKI, M. 1989. Światowe i regionalne zdarzenia w zapisie stratygraficznym pogranicza franu i famenu Gór Świętokrzyskich. - Przegląd Geologiczny, 37: 551-557.

SZULCZEWSKI, M., BELKA, Z., & SKOMPSKI, S. 1996. The drowning of a carbonate platform: an example from the Devonian-Carboniferous of the Holy Cross Mountains, Poland. - Sedimentary Geology, 106:21-49.

URBAN J. 2007 – Permian to Triassic paleokarst of the Świętokrzyskie (Holy Cross) Mts, Central Poland. Geologia, 33 (1): 5–50.

URBAN J. 2013 – Zapis lądowych etapów historii geologicznej Gór Świętokrzyskich w osadach i formach krasowych – wybrane przykłady. Biul. Państw. Inst. Geol., 454: 77–102.

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