lobe off-axis, which is represented by increasing sand content and bed thickness (Łapcik, 2023). The lobe deposits of Zagórnik-Rzyki section lack typical signature of progradational trends or compensational stacking, hence more random distribution of thick-bedded sandstone is related with partial confinement of the depositional area, which hinders typical stacking of lobe elements (Łapcik, 2023).

While evidence suggests at least partially anoxic conditions on the seafloor during the deposition of the Lhoty Formation, recent research has proposed correlations of two such events to OAE 1c (Wójcik-Tabol & Ślączka, 2015), and OAE 1d (Górny *et al*., 2022). The majority of green-grey shales within the Lhoty Formation exhibit trace fossils such as *Planolites*, *Chondrites*, and *Thalassinoides* against a thoroughly bioturbated background. This particular ichnofabric signifies a generally enhanced level of oxygenation compared to the underlying Veřovice Formation. While *Phycosiphon incertum* is still present in the lower portions of the Lhoty Formation, its occurrence becomes less frequent in the middle and upper sections. Additionally, *Protovirgularia* is observed very rarely. Bioturbation extends upwards to encompass the entirety of the turbiditic sandstone beds, with *Thalassinoides* being abundant in certain layers. Questionable specimens of *Zoophycos* isp. and *Nereites* isp. have been identified within the uppermost section. The soles of turbidites within the Lhoty Formation exhibit a paucity of trace fossils, with those present primarily consisting of semi-reliefs of *Thalassinoides* and *Planolites*. The presence of "*Arthrophycus*" *tenuis* is noted in specific beds, while graphoglyptids are entirely absent. Notably, this location marks the first documented occurrence of *Scolicia* within the Flysch Carpathians (Książkiewicz, 1970, 1977a). In rare instances, dark grey or black shales are observed underlying turbidite layers, and these lack any evidence of trace fossils or bioturbation activity. While this suggests the occurrence of brief anoxic events, the overall oxygenation of the Lhoty Formation sediments was significantly more prevalent compared to the underlying Veřovice Formation.

Stop 2 – Leszna Górna quarry – carbonate flysch (lowermost Cretaceous, Berriasian) (Figs 8, 13, 14, 19, 20)

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The Leszna Górna quarry is located in the northern part of the Silesian Unit, i.e. the Cieszyn Subunit (Fig. 14), in the folded zone of the Kopiniec – Jelenice thrust-sheet. In the quarry, the Upper Tithonian(?) – Berriasian rocks named the Cieszyn Limestone Formation, are excavated, which are the oldest rocks incorporated into the thrust-and-fold belt.

The unique character of the Cieszyn Limestone Formation, also known as Lower and Upper Cieszyn limestones, is related to the origin of the Proto-Silesian Basin and the uplift of its shoulders, so-called the Silesian and the Baška-Inwałd ridges, which were the source area for these rocks. The ridges were covered by shallow-water, Štramberk type carbonates (Słomka, 1986, 2001), which were eroded due to the constant uplifting, most likely linked with the Neo-Cimmerian tectonic phase (Golonka *et al*., 2003). The detrital material produced by this process was transported to the deeper, axial part of the basin (Słomka, 1986; Leszczyński & Malik, 1996). The Cieszyn Limestone Formation is thus interpreted as deep-water allodapic limestones deposited from calciturbiditic and calcifluxoturbiditic currents. The cessation of the Cieszyn Limestone sedimentation is marked by the transition from calcareous to siliciclastic deep water sediments, which indicates that the erosion reached the crystalline basement as evidenced by the presence of exotics of metamorphic and igneous rocks (Słomka, 2001).

Within the outcrop, two different facies can be distinguished: the lower part of the outcrop (Upper Tithonian?) consisting rhythmic, thin-to-medium bedded sequence, corresponds to the outer fan facies, while the upper part, where a thickening-upward sequence can be observed, is interpreted as a lobe facies. Both facies associations are abundant with sedimentological features and structures (Fig. 19), including a full Bouma sequence, bioturbations, or evidence of underwater slumping and landslides (Malik, 1994). The diversified kinds of clasts, i.e. ooids, bioclasts (broken fragments of brachiopods, echinoids, bivalves), fragments of microbial mounds, or coral-algal reefs, found within the Cieszyn Limestone Formation document the diverse environment of the source area (Matyszkiewicz & Słomka, 2004). This area is interpreted as narrow carbonate platforms with diverse kinds of reefs (Hoffmann *et al*., 2021). In the inner part of the platform coral-microbial patch-reefs developed, and foraminiferal-algal as well as peloidal-bioclastic limestones were deposited. On the high-energy platform margin ooid grainstones and poorly sorted, detrital limestones were formed. The latter were also deposited in the peri-reefal zone. Microencruster-microbial-cement buildups developed on the upper slope of the platform, and microbial and microbial-sponge buildups in a deeper setting. Pelitic limestones with calpionellids were deposited in a deeper part of the platform slope and in a basinal area.

In conclusion, such type of allochthonous sequence represents rare example of calcareous turbiditic system in the Mesozoic fossil record (e.g., Payros & Pujalte, 2008 with literature therein). The basic grain components of these formations are ooids, as resedimented grains from shallow-sea carbonate platforms, which are the source areas for calcareous turbidite/fluxoturbidite systems (e.g., Price, 1977; Wright & Wilson, 1984; Cooper, 1989, 1990; Wright, 2004; Brookfield *et al*., 2006). On the other hand, olistoliths/exotics of coral-algal reefs or microbial-sponge mud mounds well documented a wide range of shallow-water carbonate platform facies in source areas (Waśkowska *et al*., 2008).

In the quarry, different meso- and macro-tectonic structures can be identified and interpreted in the context of the Outer Carpathian evolution (Fig. 20). The structural observations of folds' limbs, stress inversion results and published data (Koprianiuk, 2007) allowed for the identification of two phases of shortening pointing to the NNW (older) and N (younger), documenting the counterclockwise rotation of this part of Outer Carpathians, also evidenced by the palaeomagnetic data and joint analysis (Mastella & Konon, 2002; Grabowski *et al*., 2006). The same shortening directions can be traced in all tectonic units in this part of the Outer Carpathians (see the Klubina quarry). The published thermochronologic data from the Cieszyn Subunit from the adjacent Czech Outer Carpathians, suggest that the thrust-related exhumation was initiated in the latest Eocene (36,7 Ma) and lasted until the Miocene (18,2 Ma) (Danišík *et al*., 2008).

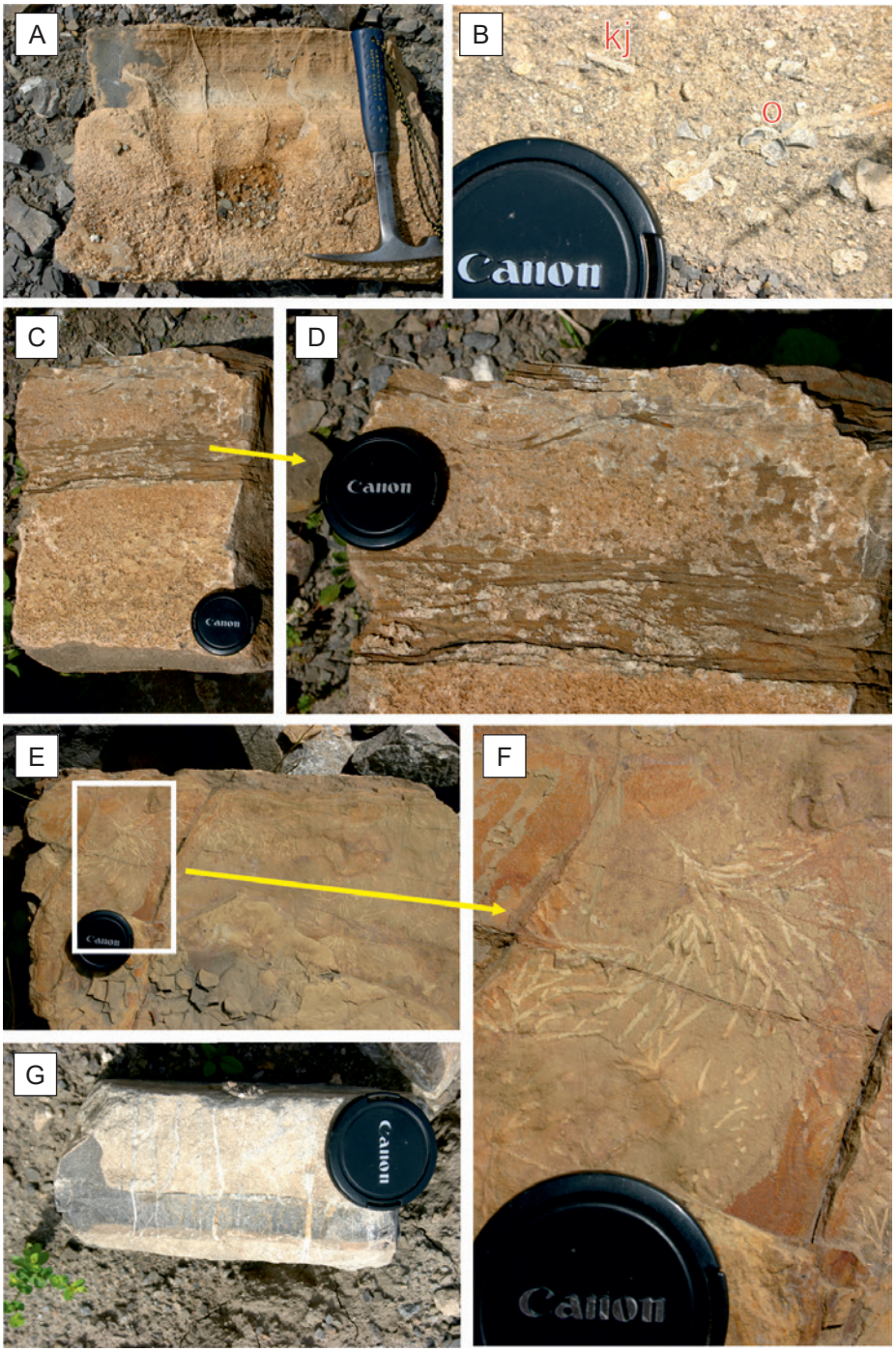

Fig. 19. Organodetrital limestones with gradational fractionation (A, C) sometimes with identifiable fossils at the base beds (B: o – *Nanogyra* sp. oyster; kj – echinoid spine) and convolution in the top (C, D) and trace fossils in more marly parts of bed (E, F – *Chondrites* isp.), and rarely with cherts (G) (after Waśkowska-Oliwa *et al*., 2008)

Fig. 20. Selected tectonic structures in the Leszna Górna quarry: A – a fold structure proving NNW shortening; B – hinge zone of the fold in picture A, with well-visible dextral shear zones (C) (hammer for a scale); D – conjugate set of normal faults formed as a result of fold axis-parallel extension.

Stop 3 – Dolní Líštná near Třinec (Moravian part of the Czech Republic) – rare fossil polychelid lobsters in turbiditic palaeoenvironments (Lower Cretaceous, Valanginian) (Figs 8, 13)

(*Michał Krobicki*)

In the Dolní Líštná surroundings the Hradiště Formation is dominant, especially in its lower part, and was known earlier as the Upper Těšín (Cieszyn) Shales (= Oberen Teschener Schiefer of Uhlig 1902 or Oberen Těšín-Schichten of Vašíček 1975; see also Menčík *et al*., 1983) which belonged recently to the Cisownica Shale Member of the Hradiště Formation (Golonka *et al*., 2008) (Fig. 8).

The extremally sporadic benthic macrofossils of the Silesian Basin are Polychelidan lobsters which were indentified here in Hradiště Formation. They are one of the rare groups of decapod crustaceans which were first discovered as fossils long before being identified in extant deep-sea environments. As for other decapods, their fossil record is highly incomplete. Only three fossil Polychelidae have been identified to date. Species *Woodwardicheles neocomiensis* (Woodward, 1881) derived from the Valanginian (Early Cretaceous) of the Outer Carpathians (Dolní Líštná near Třinec, Moravian part of the Czech Republic). Analysis specimen is probably autochthonous or parautochthonous to turbiditic palaeoenvironments and corresponds to typical Polychelidae which inhabited deep water regime (Audo et al., 2018).