both larger and smaller foraminifera. They cover the time span of Hauterivian–Albian, predominantly the Barremian to Early Aptian. Sporadic planktonic organisms, such as planktonic foraminifera (*Hedbergella*, *Heterohelix*, *Favusella*), tintinnids (*Colomiella* cf. *recta* Bonet) and calcareous dinocysts ("Calcispheres") [*Crustocadosina semiradiata* (Wanner)] have also been observed. Tintinnids (*Colomiella* cf. *recta* Bonet) and planktonic foraminifera [*Heterohelix* aff. *moremani* (Cushman)] suggest that the age of some assemblages may be younger than the earliest or even Late Albian (Reháková & Michalík, 1997; Nederbragt *et al*., 1998).

Additionally, magmatic/sub-volcanic exotic pebbles occur here, which are very well rounded. The exotics are represented by granitic and andesitic-type rocks (mainly andesite, basaltic andesite, basaltic trachyandesite, trachyandesite and rhyolitic pebbles, and rare dacite, tephrite, trachybasaltic and basaltic pebbles). Radiometric dating of these exotics (by U-Pb SHRIMP 206Pb/238U method) are following: 266.0 Ma ±1.6 Ma, 266.4 Ma ±1.8 Ma, 268.8 Ma ±1.9 Ma and 269.7 Ma ±1.8 Ma (Middle Permian; Guadalupian) (Poprawa *et al*., 2013; Krobicki *et al*., 2018). Additionally, such features suggest origin of these exotics from the same source area (Inner Carpathians the most probably) and have been connected with the Middle Permian oceanic crust subduction and origin of magmatic arc mentioned above, presumable connected with southern margin of Laurusia with subduction of oceanic crust of the Palaeotethys (proto-Vardar Ocean?). In conclusion, results of SHRIMP data and geochemical character of investigated exotics excluded their Barremian-Albian age of subduction and the Early Cretaceous age of oceanic crust (Birkenmajer, 1986, 1988), and existence of so-called Exotic Andrusov Ridge as well, postulated earlier in several papers (e.g., Birkenmajer, 1977, 1986, 1988).

Stop 3 – Bereśnik hill near Jaworki village ("mid"-Cretaceous pelagic shell beds, Late Cretaceous deposits and inversion structure) (Fig. 29)

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Pelagic deposits of the Albian/Cenomanian transition occur mainly in the Kapuśnica and Jaworki formations. The Kapuśnica Formation (Upper Aptian-Albian) is represented by dark-grey shales, grey-blue and green marly shales with intercalations of light-grey pelitic spotty (also cherty) limestones, rare fine-grained turbidite sandstone intercalations, and a few layers of black radiolarian shale. Other fossils, i.e. belemnites, ammonites and pelecypods, are very rare (see Kokoszyńska & Birkenmajer, 1956). The shell beds described here occur in the Niedzica Succession and represent the late Upper Albian through early Lower Cenomanian (foraminiferal palaeobathymetric association B1 of Gasiński (Gasiński 1991; Birkenmajer & Gasiński, 1992). The Albian-Cenomanian shell beds discussed are exposed in a right tributary of the Skalski Stream, about 1.5 km southeast of the Jaworki village (Krobicki, 1995) (Fig. 29). A section 7.5 m thick is seen in the steep bank of the stream. The section exposes mostly green and green-grey hard marls, spotty marly limestones and shales (cherry red-grey at some places), with subordinate intercalations of green spotty pelitic limestones and shell beds from a few to 30 cm thick. Some beds are technically boudinaged. The shell beds occur as layers and lenses varying in thickness from about 0.5 cm to 20 cm. They are built almost exclusively of small thin-shelled bivalves of the genus *Aucellina*. The shells are dismembered and severly crushed, many are also deformed by compaction, as is shown by broken shells whose fragments remain in place. Unbroken shells are preserved in the lower parts of some shell beds. Abundant and very well preserved mainly planktonie foraminiferal tests are present together with the bivalve shells, other fossils are represented by small pieces of indeterminable bivalve shells with spines and fragments of echinodenns. The shell beds are nearly monospecific (paucispecific sensu Kidwell *et al*., 1986). Belemnites and single shells of the bivalve *Aucellina* sp. Are very rare in the accompanying marls and marly limestones which show the presence of abundant trace fossils. They are represented mainly by *Chondrites* and by *Zoophycos* and *Planolites*-like burrows in marls and pelitic limestones. Sedimentary features of the described deposits are indicative of deep water pelagic deposition. Soft-substratum conditions are suggested by body fossils (*Aucellina* shells) and trace fossils (deposit-feeders dominating), the latter indicative of low energy of the bottom water. The foraminiferal assemblages are characteristic of middle slope (Gasiński, 1991; Birkenmajer & Gasiński, 1992). The dominant sedimentary features of the Albian-Cenomanian pelagic marls and limestones, their foraminifers and the macrofauna, all indicate low energy of their depositional environment In contrast, the skeletal accumulations represent highenergy events. Wide occurrence of shell beds in different carbonate or mixed clastic/carbonate shallow-marine sediments, both ancient (e.g. Kreisa & Bambach, 1982; Aigner, 1985; Fürsich & Oschmann, 1986; Eyles & Lagoe, 1989; Johnson, 1989) and modem (e.g. Gagan *et al*., 1988; Davies *et al*., 1989) is well known. Most of the shell beds formed above the storm wavebase, and skeletal accumulations formed below it are rare (Kidwell *et al*., 1986: fig. 5). Pelagic bivalve turbidites occurring widely in the Alpine-Mediterranean region are an exception (e.g. Bernoulli & Jenkyns, 1974).

In the upper part of the Bereśnik hill we can see the Late Cretaceous *Scaglia Rossa* deposits again overlying by flysch-type of the Sromowce Formation with exotics in local inversion structure.

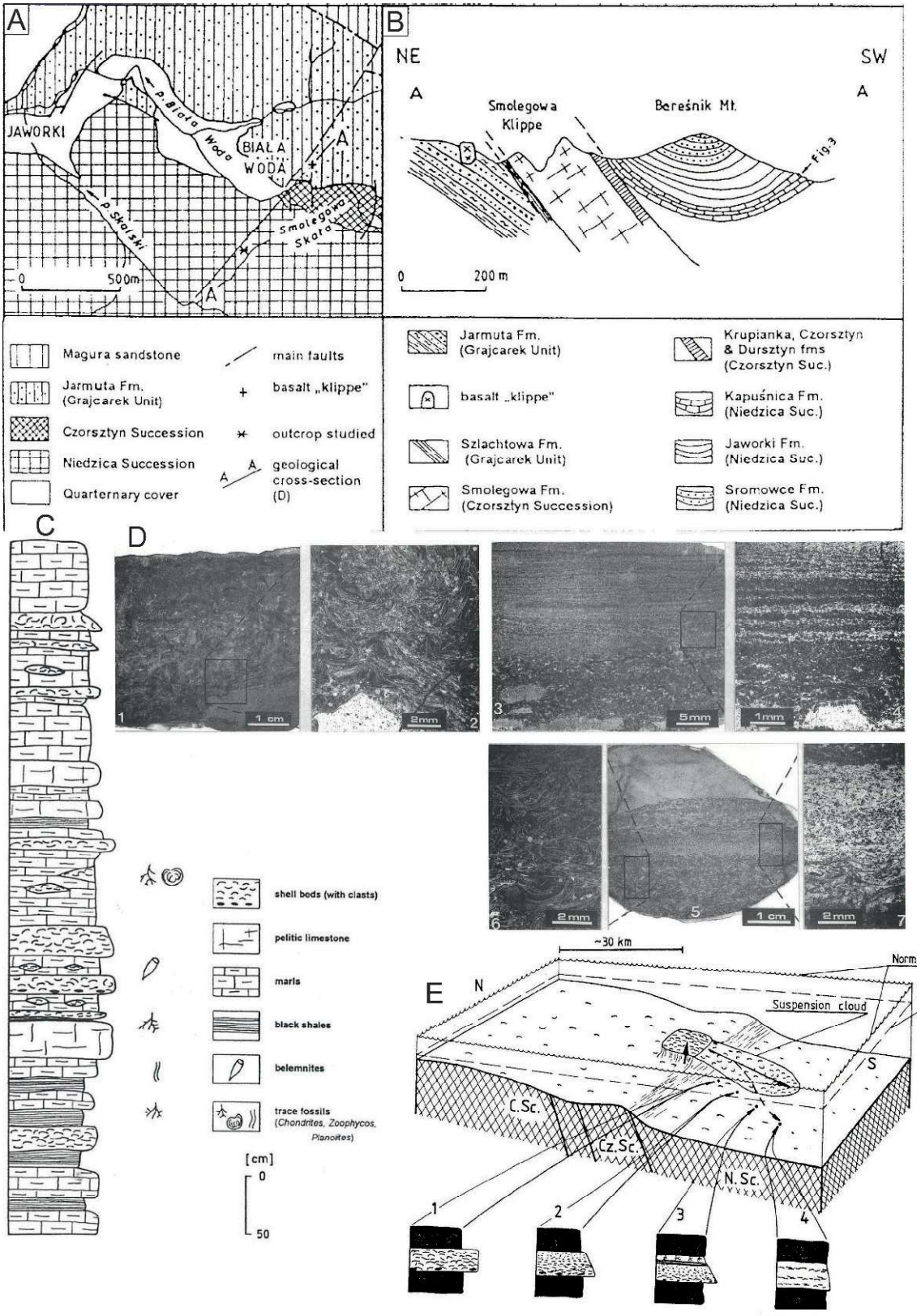

Fig. 29. Position of the outcrop with mid-Cretaceous shell beds: A – geological sketch-map of the Pieniny Klippen Belt in the vicinity of Jaworki (after Birkenmajer, 1979 simplified); B – geological cross-section at Biała Woda valley (after Krobicki, 1995); C – *Aucellina* shell beds-bearing exposure of the Kapuśnica Formation attributary of the Skalski Stream; D – different types of *Aucellina* shell beds in pelagic Albian sediments, Kapuśnica Formation of the Niedzica Succession; E – a generalised model for the origin of the four types (1–4) of storm-generated shell beds. C.Sc. – Czorsztyn Succession; Cz.Sc. – Czertezik Succession; N.Sc. – Niedzica Succession. Type of shell beds: 1 – densely packed, homogenous shell beds, in some cases with clasts, sharply delimited from marl or pelitic limestone beds; 2 – graded shell beds with clasts at base; 3 – sequences starting from small clasts and shell lag at base, through graded, laminated to bioturbated at top; 4 – thin shell accumulations in silty marls and limestones (after Krobicki, 1995, 2022a; Krobicki & Olszewska, 2022)