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"Triassic of the Tethys Realm"
A contribution to the Project

Uppermost Triassic sequences of the Choč nappe (Hronic) in the West Carpathians of Slovakia and Poland

ABSTRACT: The paper presents lithological and stratigraphical analysis of the uppermost Triassic deposits of the Choč unit of the Strážovská hornatina (Slovakia) and West Tatra Mts (Poland). The unique lithological and paleontological characteristics of these deposits permit recognition of a new lithostratigraphical unit, the Norovica Formation, in the Triassic of the West Carpathians. The formation includes light-grey compact limestones overlying the Hauptdolomit and underlying the Lower Liassic crinoidal limestones. Three members are distinguished within the Norovica Formation, *viz.* Lower Limestone Member, Siwa Woda Limestone Member, and Mojtin Limestone Member. The Norovica Formation contains the conodonts *Misikella posthernsteini* Kozur & Mock and the foraminifers *Triasina hantkeni* Majzon indicative of the Rhaetian. Only the lowermost part of the formation may represent the Upper Norian (Sevatian).

INTRODUCTION

The uppermost Triassic deposits of the Choč unit (Hronic) in the West Carpathians are only fragmentarily preserved, as they have undergone an erosion in several sections due to the Early Kimmerian epeirogenic movements. These are mostly light-grey to grey, compact, organodetritic limestones resembling in lithology the Dachstein Limestone. They occur in the northwest part of the Strážovská hornatina (*cf.* Foetterle 1864; Kulcsar 1915, 1916; Mahel 1946, 1962; Kochanová 1959, 1962, 1967), the north Male Karpaty Mts (Mahel 1958, Kochanová 1964), northern slopes of the Nizke Tatry Mts (Biely 1962), and the Polish West Tatra Mts (Guzik 1959; Gaździcki & Zawidzka 1973; Gaździcki 1978a, b). Only in Hybe region the uppermost Triassic strata are re-

presented by dark limestones intercalated with marls and marly shales recognized for the Hybe Beds (*cf.* Stache 1868, Goetel 1917, Michalik 1973, Gaździcki & *al.* 1979).

The below presented stratigraphical and facies analysis of the uppermost Triassic of the Choč unit is based upon sections of the Strážovská hornatina in Slovakia, and of the Polish West Tatra Mts (Text-fig. 1).

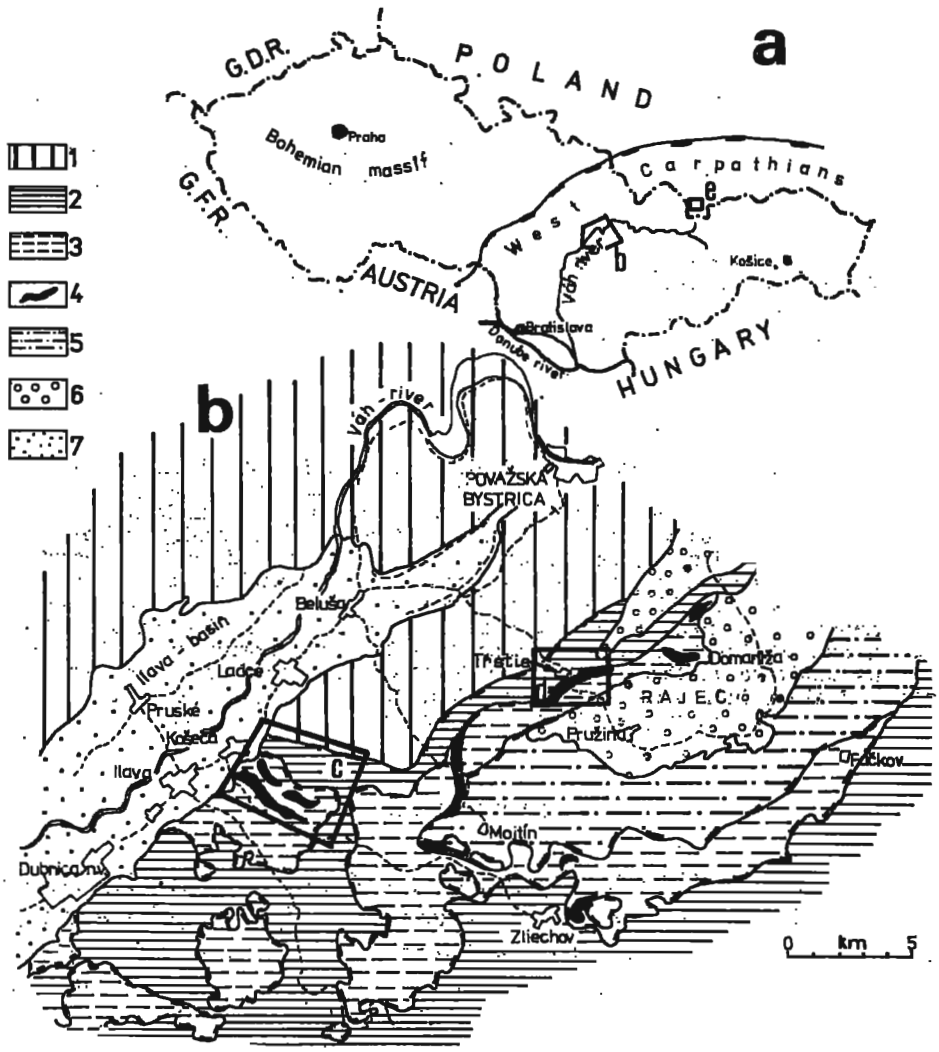


Fig. 1. Localization of the investigated areas in Czechoslovakian and Polish West Carpathians (a), and geological sketch-map of the middle Váh Valley (b) with delimitation of the investigated areas (c and d — see Text-figs 5 and 7)
1 Klippen Belt (Jurassic-Cretaceous), *2* Krížna nappe (Lower Jurassic-Middle Cretaceous), *3—4* Choč nappe (Middle Triassic-Lower Cretaceous), *4* uppermost Triassic limestones of the Choč unit (Norovica Formation), *5* Strážov nappe (Middle Triassic), *6* Paleogene sediments, *7* Neogene sediments

CHARACTERISTICS OF THE DEPOSITS

The sedimentary sequence and microfacies of the uppermost Triassic of the Choč unit is presented after some selected sections from the Chochołowska and Lejowa valleys in the West Tatra Mts, and the sections of Mt. Norovica and Tŕstie in the Strážovská hornatina (*cf.* Text-figs 1—9 and Pls 1—10).

WEST TATRA MTS

The uppermost Triassic strata of the Choč unit show considerable tectonic disturbances between the Chochołowska and Lejowa valleys. This may be due to post-orogenic gravitational tectonics of pre-Paleogene age: the uppermost Triassic limestones occur in form of isolated blocks scattered in the megabreccia of Middle to Upper Triassic dolomites (Text-fig. 2).

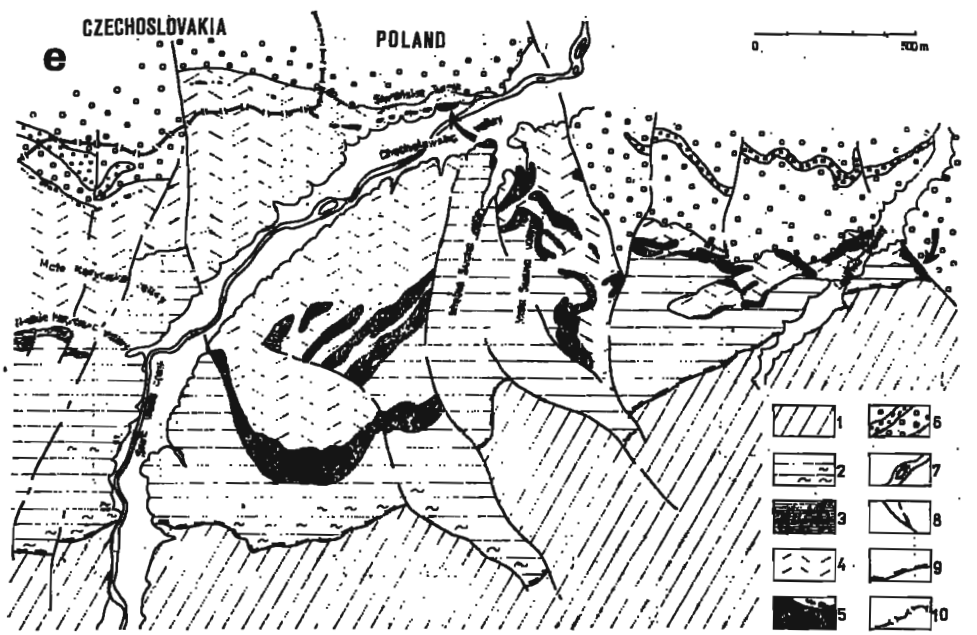


Fig. 2. Geological sketch-map of the area between the Lejowa and Chochołowska valleys, West Tatra Mts (for localization see area *e* in Text-fig. 1*a*)

1 Krížna nappe (Triassic — Lower Cretaceous); *2—5* Choč nappe (Middle & Upper Triassic): *2* Middle Triassic dolomites, limestones and breccias (lower right corner); *3* Partnach Beds; *4* megabreccia of Middle and Upper Triassic dolomites; *5* uppermost Triassic limestones (Norovica Formation) preserved as blocks in the megabreccia; arrows indicate sections of the Norovica Formation

CHOCHOŁOWSKA VALLEY SECTION

The uppermost Triassic rocks are best exposed at the western slope of the Chochołowska Valley at the foot of Siwiańskie Turnie (Text-fig. 2 and Pl. 1). The investigated, 9 m thick sequence comprises light-grey to grey limestones in normal position (Text-fig. 3 and Pl. 1). Three lithological sets are distinguished in the succession:

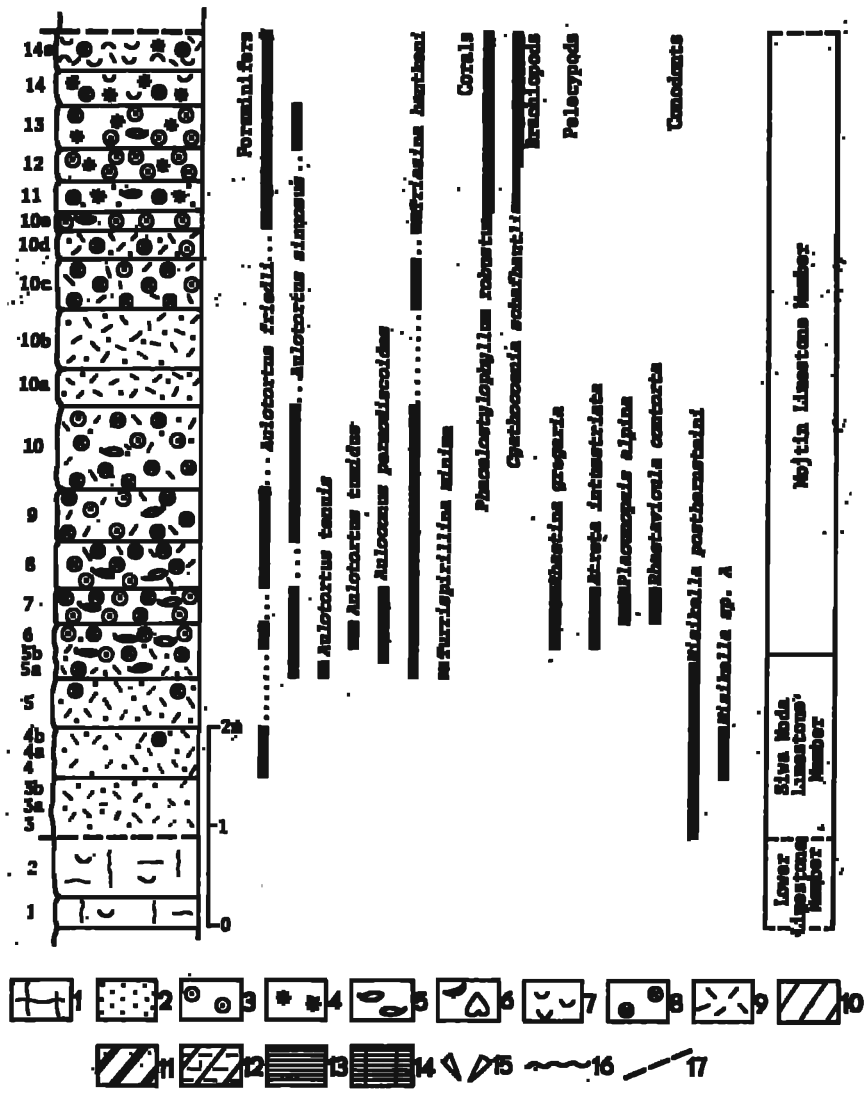
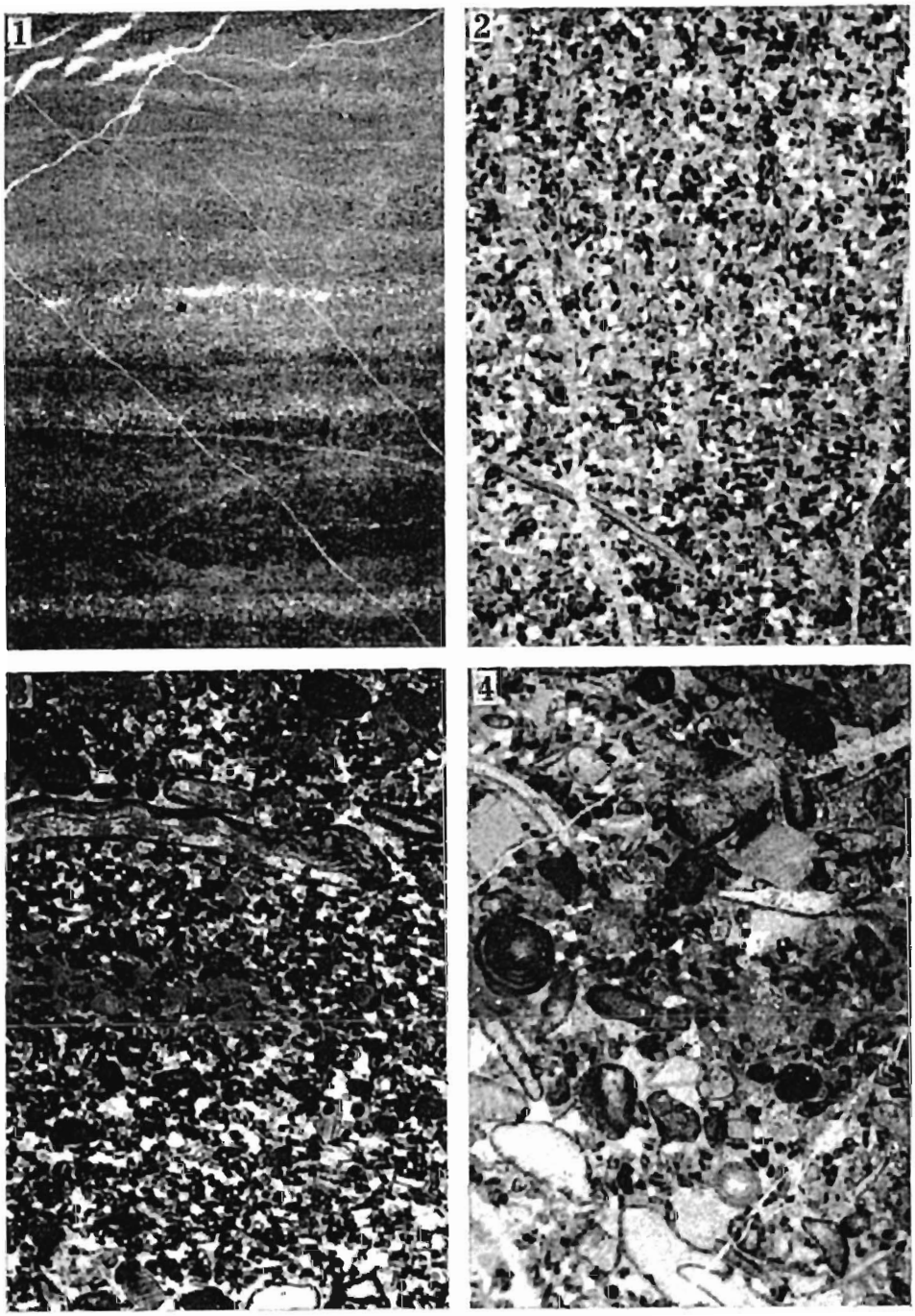


Fig. 3. Hypostratotype section of the Norovica Formation at the foot of Siwiańskie Turnie in the Chochołowska Valley (*c* in Text-fig. 1*a*, see also Text-fig. 2 and Pl. 1); the section comprises lithology and distribution of some important organic components

1 limestones, 2 sandy limestones, 3 oolitic limestones, 4 coral limestones, 5 brachiopod limestones, 6 Megalodon limestones, 7 lumachelles, 8 crinoid limestones, 9 organodetrital limestones, 10 dolomites, 11 limy dolomites, 12 laterite dolomites, 13 marly shales, 14 marls, 15 bituminous, 16 erosion surfaces, 17 dislocations

Exposure of the uppermost Triassic limestones of the Choč unit (hypostratotype section of the Norovica Formation) at the foot of Siwiańskie Turnie in the Chochołowska Valley; sampling sites (*1—15*) are indicated; photo taken in May 1978



Microfacies from Chocholowska Valley section; taken ×10

1 — Laminated micrite; Lower Limestone Member, layer *1*
2 — Sandy biopelsparite containing the youngest Triassic conodonts of the genus *Misikella*; Siwa Woda Limestone Member, layer *4*
3 — Crinoid-brachiopod biooosparite; Mojtin Limestone Member, layer *5b*
4 — Biosparrudite composed of crinoid and brachiopod debris as well as of subordinate oolids and foraminifers *Aulotortus sinuosus*; Mojtin Limestone Member, layer *7*

LAYERS *1—2*: Laminated micrites (Pl. 2, Fig. 1), some 80 cm thick, with occasional remains of pelecypods, gastropods, and ostracodes associated with some foraminifers *Glomospira*.
LAYERS *3—5a*: Sandy biopelsparites (Pl. 2, Fig. 3), some 180 cm thick, containing small fragments of crinoids and the conodonts *Misikella posthernsteini* Kozur & Mock and *Misikella* sp. A (*sensu* Gaździcki 1978b). The foraminifers are represented by *Glomospira*, *Trochammina*, *Agathammina*, *Nodosaria*, and very rare *Aulotortus friedli*; *Triasina hantkeni* appears at the top of the set. There are also the algae *Aciculella*. It is to be noted that the stratigraphically important conodonts *Misikella posthernsteini* co-occur in the uppermost part of the set (layer *5a*) with the large benthic foraminifers *Triasina hantkeni*.
LAYERS *5b—14a*: Crinoid-brachiopod biooosparites with corals, pelecypods, and intraclasts (Pl. 2, Fig. 4 and Pl. 6, Figs 1—3). There is also a rich foraminifer assemblage representative of the family Involutinidae Bütschli, 1880, *sensu* Piller (1978), including *Aulotortus friedli*, *A. sinuosus*, *A. tenuis*, *A. tumidus*, *Auloconus permodiscoides*, and especially *Triasina hantkeni*. The species *Turrispirillina minima* has also been recorded in the set. The brachiopod assemblage is dominated by *Rhaetina gregaria*, while the pelecypods are represented by *Atreta intusstriata*, *Placunopsis alpina*, and a few specimens of *Rhaetavicula contorta*. Coral colonies assigned to *Cyathocoenia schafhautli* and *Phacelostylophyllum robustum* in life position occur in the uppermost part of the set (layers *11—14a*).

LEJOWA VALLEY SECTION

The uppermost Triassic rocks of the Choč unit are exposed at the eastern slope of the valley close to its mouth (Text-fig. 2 and Pl. 3). These are light-grey to grey organodetrital limestones intercalated here and there with loferitic and limy dolomites (Text-fig. 4). The exposed sequence is some 13 m thick but both the lower and upper boundaries of the unit are covered with waste deposits. The brachiopods *Rhaetina gregaria* and the pelecypods *Atreta intusstriata* occur rather commonly. The pelecypods *Rhaetavicula contorta*, *Placunopsis alpina*, and *Modiolus schafhautli*, and the corals *Phacelostylophyllum robustum* and *Retiophyllia* sp. have been found in the waste deposits. The rocks are represented mostly by biopelmicrites (Pl. 4, Fig. 1) and biointrasparites (Pl. 5, Fig. 3) containing brachiopod, crinoid, and gastropods debris associated commonly with pellets, intraclasts, and/or ooids as well as onkolitic crusts. The abundant foraminifer assemblage (*cf.* Pl. 5, Figs 1—2) includes *Aulotortus friedli*, *A. sinuosus*, *A. tenuis*, *Auloconus permodiscoides*, *Trocholina crassa*, and *Triasina hantkeni*.

The sequence resembles the uppermost set of the above described section from the Chochołowska Valley.

STRÁŽOVSKÁ HORNATINA

In the northwest part of the Strážovská hornatina, the uppermost Triassic limestones of the Choč unit overlie the Hauptdolomit of a considerable thickness (Text-fig. 5). They are overlain in turn by transgressive Lower Liassic crinoidal limestones yielding pelecypods of Hettangian age (Kochanová 1962). The Upper Triassic strata are cut by

dislocations, which results in isolated blocks of Upper Triassic to Middle Jurassic limestones being scattered within the Hauptdolomit (*cf.* Text--fig. 5).

MT. NOROVICA SECTION

The uppermost Triassic deposits are exposed at the afforested northeastern slope of the Mt. Norovica, some 250 m northeast of the top (Text-fig. 5). The sequence, 12 m thick, comprises light-grey organodetrital limestones intercalated with oolitic, crinoidal, and *Megalodon* limestones (Text-fig. 6). Loferitic dolomites and marls occur in minor amounts. The boundary with the Hauptdolomit is

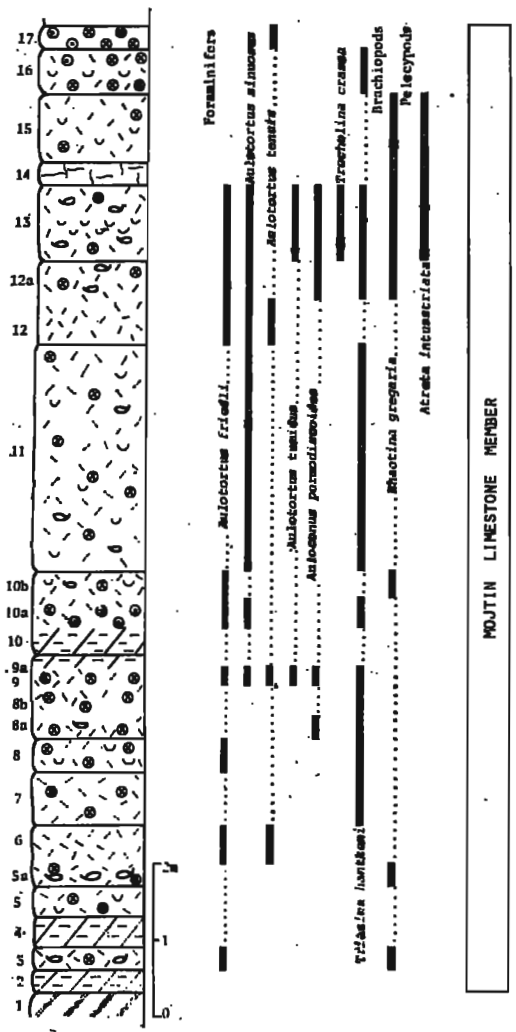
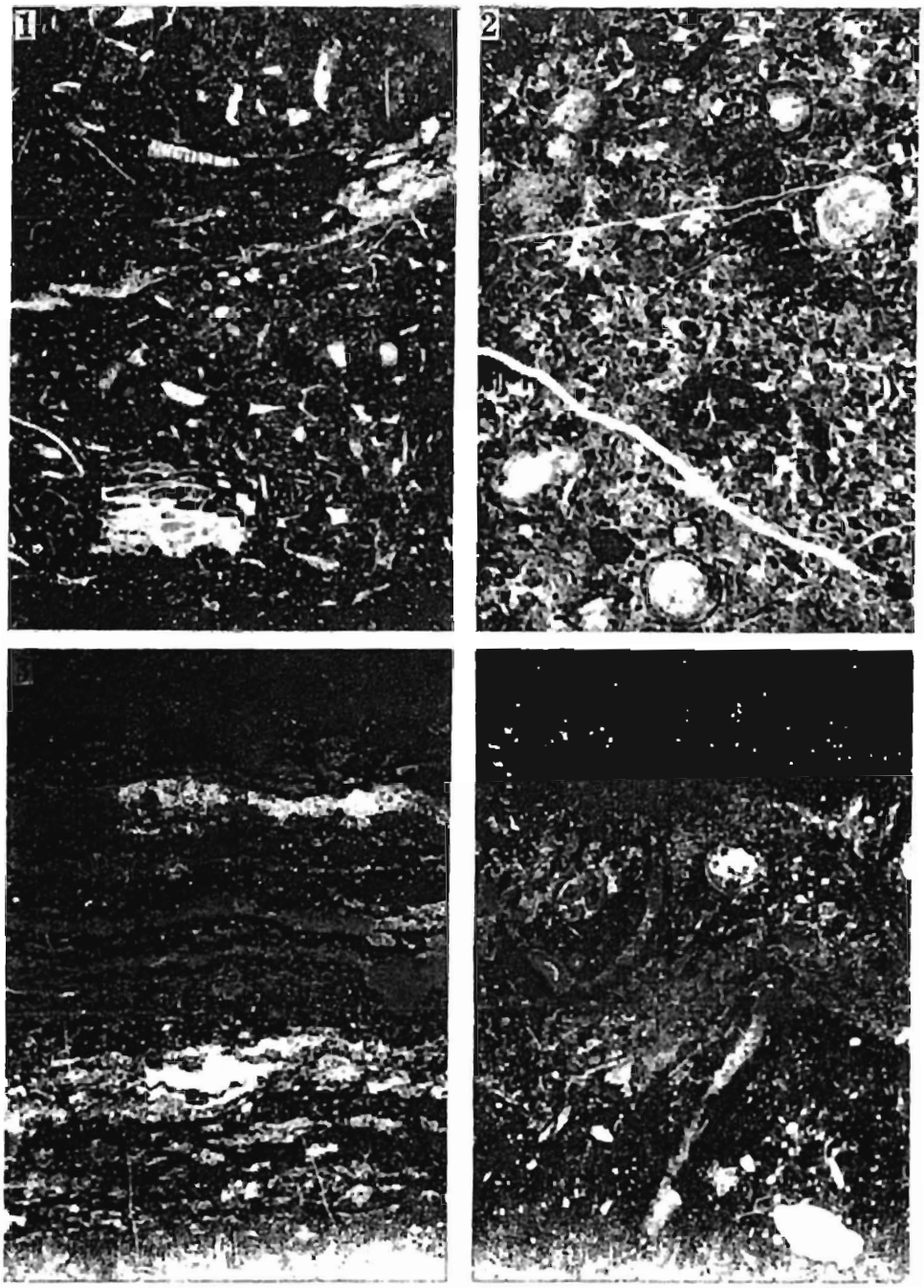


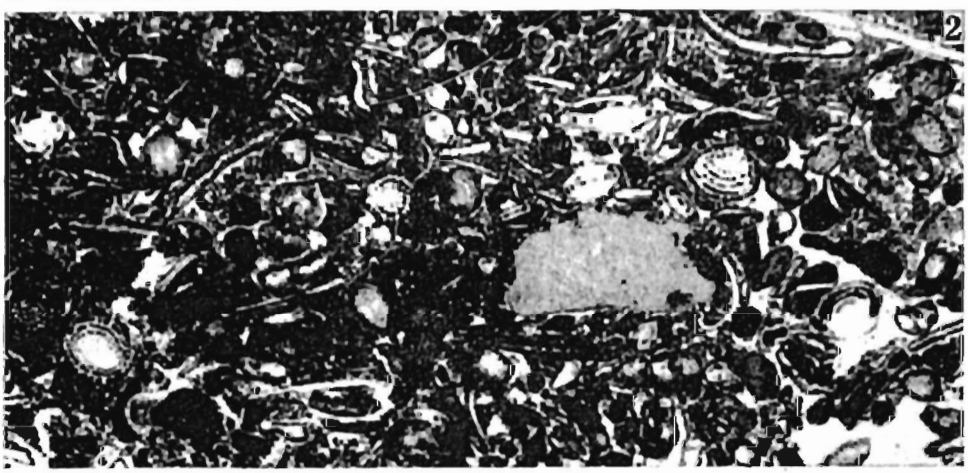
Fig. 4: Section of the Norovica Formation in the Lejowa Valley (*e* in Text-fig. 1*a* see also Text-fig. 2 and Pl. 3); explanations the same as for Text-fig. 3

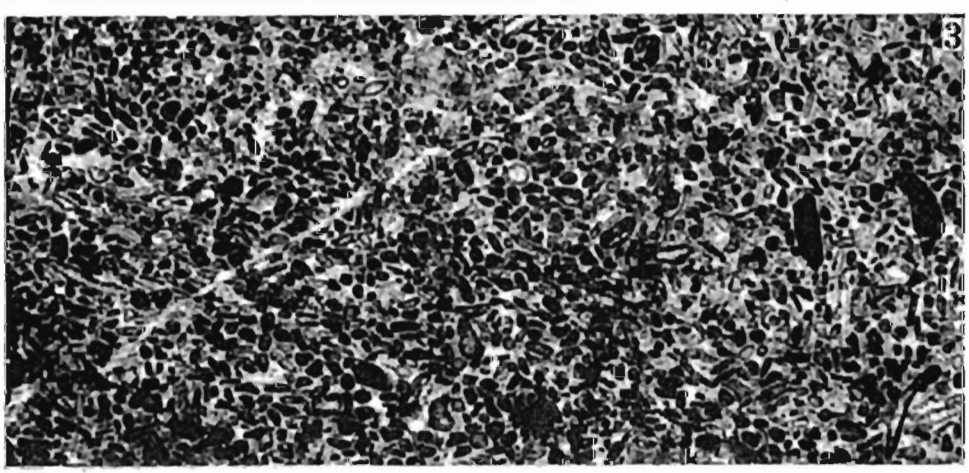
Exposure of the uppermost Triassic limestones of the Choč unit (Norovica Formation) in the Lejowa Valley; lower and middle parts of the section are exposed (sampling sites *1—11*); photo taken in August 1978



Lejowa Valley section, Mojtin Limestone Member; taken ×10

1 — Biopelmicrite composed of brachiopod and corals debris as well as of pellets; layer 3
2 — Biopelsparenite composed of strongly crushed bioclasts and some foraminifers *Triasina hantkeni*; layer *9*
3 — Loferitic limy dolomite with algal lamination; layer *10*
4 — Foraminifers *Triasina hantkeni* in biopelmicrite; layer *12a*

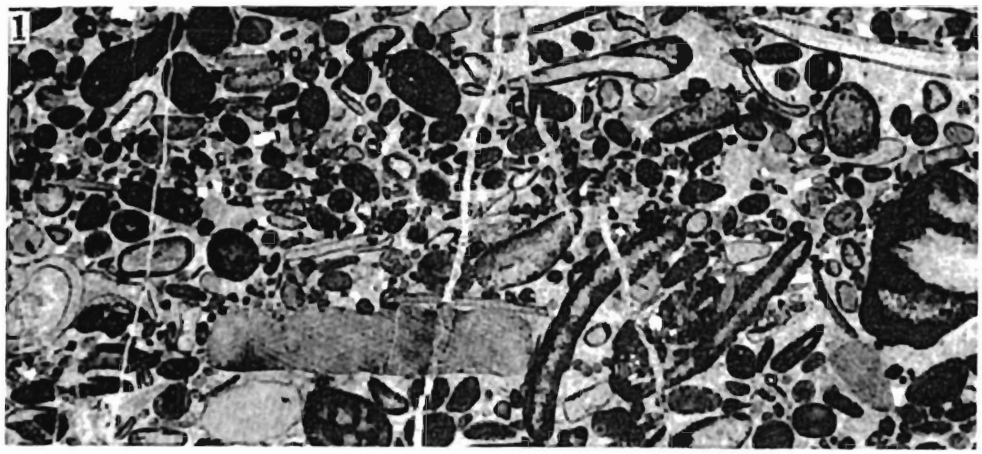


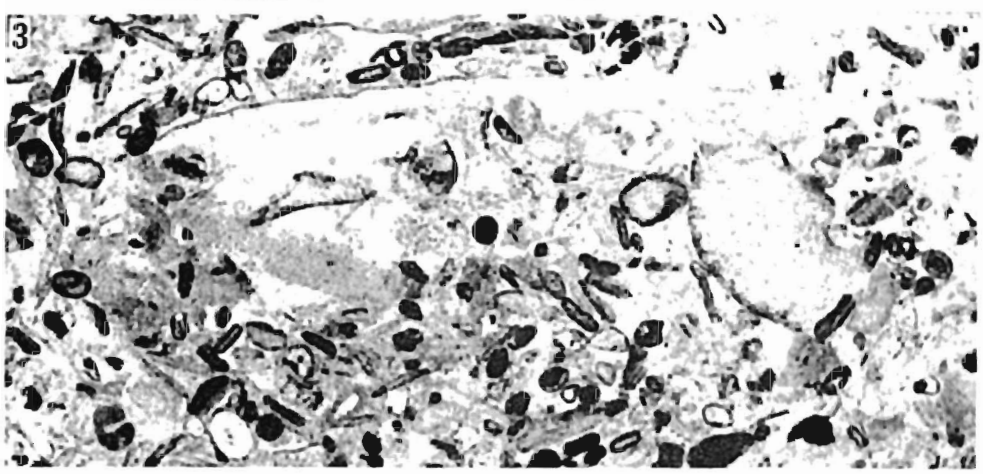


Lejowa Valley section (cnt'd), Mojtin Limestone Member; taken ×10

1—2 — Microfacies with foraminifers *Triasina hantkeni*, *Aulotortus friedli*, *Aulotortus tumidus* and *Auloconus permodiscoides* in brachiopod-crinoid biosparite; layer *13*

3 — Biointrasparite composed of brachiopod, crinoid and gastropod debris, as well as of intraclasts and ooids; layer *17*





Chochołowska Valley section (cnt'd from Pl. 2), Mojtin Limestone Member; taken ×10

1 — Biosparrudite containing crinoid and brachiopod debris with onkolitic crusts as well as of ooids and foraminifers *Triasina hantkeni*; layer *9*

2 — Crinoid biooosparite with *Triasina hantkeni*; layer *10c*

3 — Crinoid-brachiopod biosparite containing bioclasts with onkolitic crusts and some ooids; layer *13*

covered with waste deposits. The rocks contain abundant brachiopods *Rhaetina gregaria* (Pl. 9, Fig. 4), pelecypods *Placunopsis alpina, Atreta intusstriata, Mysidioptera* sp., and unidentifiable megalodontids. Fish teeth occur sporadically at the base of the section. The dominant microfacies are biooosparites with brachiopod, crinoid, and pelecypod debris and onkolitic crusts as well as ooids (Pl. 9, Fig. 4 and Pl. 10, Figs 3—4). Biopelmicrites (Pl. 9, Fig. 2) and biointrasparites (Pl. 10, Fig. 2) occur subordinately. Foraminifers occur abundantly throughout the sequence, including *Triasina hantkeni* (Pl. 9, Figs 3—5) associated with *Aulotortus friedli* (Pl. 10, Fig. 3). The species *Miliolipora cuvillieri* has been recorded in the lower part of the sequence.

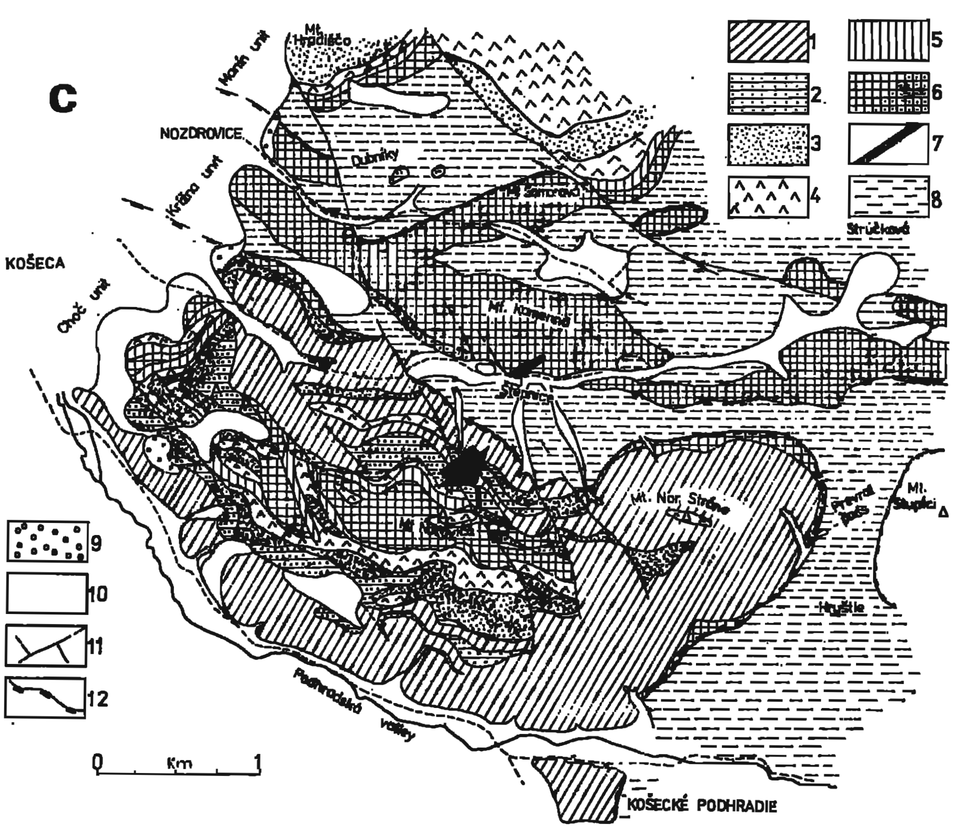


Fig. 5. Geological map of the area between Košeca and Košecké Podhradie (for localization see area *c* in Text-fig. 1*b*); arrow indicates stratotype section of the Norovica Formation

1 Middle and Upper Triassic dolomites, *2* uppermost Triassic limestones of the Norovica Formation, *3* Lias crinoidal limestones, *4* Dogger cherty limestones, *5* Malm fine-grained limestones, *6* Lower Cretaceous marly limestones and Aptian black orgahodetrital limestones (lower right corner), *7* Aptian? tuffites, *8* Albian-Cenomanian shales with intercalations of limestones (in the lowermost part) and sandstones, *9* Neogene conglomerates and sandstones, *10* Quaternary deposits, *11* faults, *12* main overthrusts

TRSTIE SECTION

The uppermost Triassic rocks are exposed at the southwest slope of Mt. Trudovac on the Pružinka creek (Text-figs 7—8). The investigated sequence is located at the road cut Tŕstie-Pružina, 1 km southwest off Tŕstie (Text-fig. 9); it approximates 46 m in thickness. Some samples (*M1-M28*) were also taken for comparative purposes from a 14 m thick sequence located 50 m above the creek bed (Text-fig. 8); the latter section was studied by Račková (1979). The

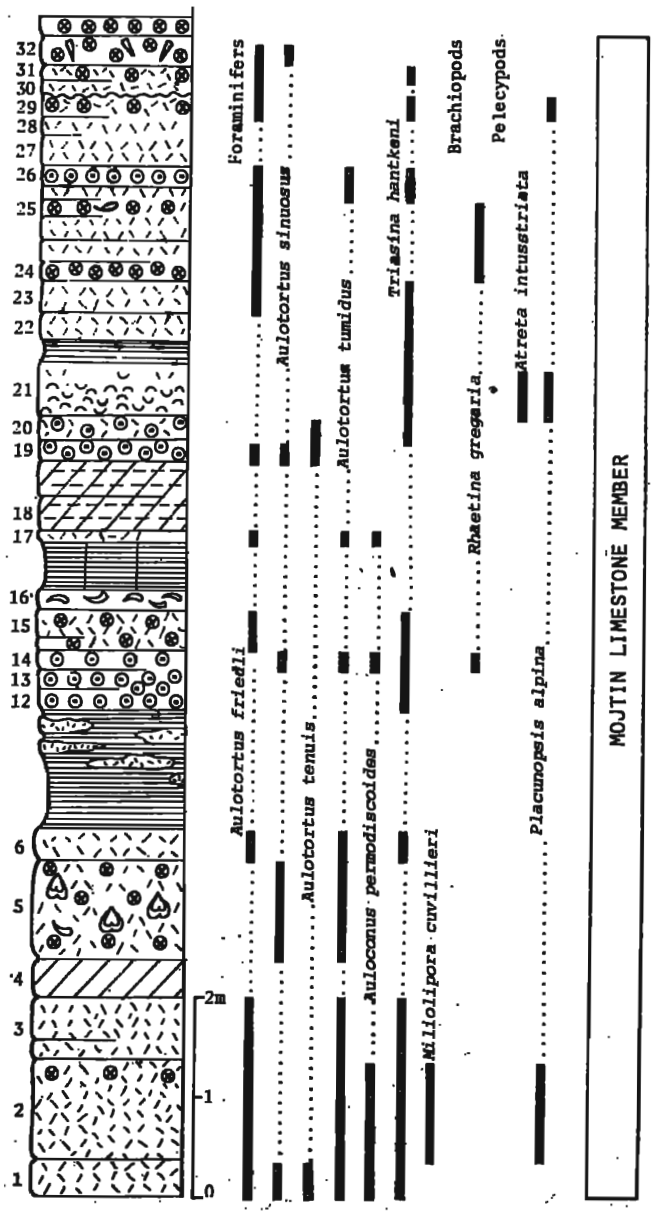


Fig. 6. Stratotype section of the Norovica Formation at Mt. Norovica (*c* in Text-fig. 1*b* see also Text-fig. 5); explanations the same as for Text-fig. 3

boundary with the Hauptdolomit is covered with waste deposits. In turn, the contact with the Lower Liassic crinoidal limestones appears clearly in the additional, higher-located section (Text-fig. 8). The main investigated sequence is split into 6 parts by dislocations but nonetheless, the subunits can be easily correlated with one another. The uppermost Triassic rocks include light-grey, compact, organodetrital limestones intercalated commonly with oolitic limestones (Text-fig. 9). There are also some intercalations of brachiopod and coral limestones, dolomites, and marls. The recorded macrofaunal assemblage includes the corals *Retiophyllia clathrata* and *R. paraclathrata*, abundant brachiopods *Rhaetina gregaria* and *Zugmayerella uncinata*, pelecypods *Atreta intusstriata* and *Placunopsis alpina*, and unidentifiable gastropods. The rocks are represented mostly by brachiopod-crinoid biopelmicrites (Pl. 7, Figs 2 and 4) and bio-oosparenites with brachiopod, pelecypod and crinoid debris and onkolitic crusts and oolitic coatings (Pl. 8, Figs 4—6). Foraminifers occur especially abundantly in biopelsparites and biopelmicrites; they include mostly *Triasina hantkeni* (Pl. 7, Fig. 3 and Pl. 8, Figs 1—2) associated with *Aulotortus friedli*, *A. sinuosus* (Pl. 10, Fig. 1), *A. tenuis*, *A. tumidus*, *Auloconus permodiscoides* (Pl. 8, Figs 1—2), *Trocholina crassa*, and *Semiinvoluta clari*. The higher-located section yielded also the spores *Globochaete alpina*, algae *Cylindroporella* sp., and holothurian sclerites *Theelia seniradiata*, *Th. stellifera*, and *Th. variabilis* (see Račková 1979).

SEDIMENTARY SEQUENCE AND IMPORTANT FAUNAL ASSEMBLAGES

The presented characteristics of the uppermost Triassic of the Choč napipe (Hronic) demonstrates clearly that these rocks are largely different from their time equivalents of the high-tatric (Tatric) and sub--tatric (Križna = Fatric) units.

First of all, the investigated rocks are close in lithology to the Dachstein Limestone and show a unique position in the Triassic of the West Carpathians. They display a continuous sedimentary transition from the underlying Hauptdolomit, while they are transgressively overlain by the Lower Liassic crinoidal limestones. There is no such Upper Triassic to Lower Jurassic sequence in any other tectonic unit of the West Carpathians (*cf.* Michalík 1977).

The investigated rocks contain very rich and abundant associations of large benthic involutinid foraminifers dominated by the species *Triasina hantkeni* (see Text-figs 3—4, 6, and 9). This is the area with maximum frequency of the involutinids in the uppermost Triassic of the West Carpathians.

Furthermore, the investigated rocks yielded the latest known conodonts *Misikella posthernsteini* and *Misikella* sp. A *sensu* Gaździcki (1978b). The conodont frequency is here the highest among those few thus far known localities with *Misikella posthernsteini* (*cf.* Gaździcki 1978a,b).

The investigated rocks contain also the corals *Phacelostylophyllum robustum*, *Pinacophyllum lejowae*, and *Cyathocoenia schafhautli* (see Roniewicz 1974).

These unique characteristics of the uppermost Triassic of the Choč unit (Hronic) makes the basis for recognition of a new lithostratigraphic unit in the Triassic of the West Carpathians, the Norovica Formation.

NOROVICA FORMATION

NAME: After Mt. Norovica, Strážovská hornatina, Slovakia (*cf.* Text-fig. 5).
GENERAL LITHOLOGY: Light-grey to grey, compact, organodetritic limestones close to the Dachstein Limestone. There are intercalations of oolitic, crinoidal, brachiopod, coral, and *Megalodon* limestones (Text-figs 3—4, 6, and 9), with loferitic dolomites and marls in minor amounts.
SYNONYMY: Thus far, these rocks were called as the Rhaetic or Rhaetic grey limestones (Mahel 1964), or the grey limestones of the Hronic (Michalík 1977).
TYPE LOCALITY: Northern slope of Mt. Norovica, northwest part of the Strážovská hornatina, Slovakia (see Text-figs 5—6).
HYPOSTRATOTYPE LOCALITIES: (*1*) at the foot of Siwiańskie Turnie in the Chochołowska Valley, West Tatra Mts, Poland (see Text-figs 2—3 and Pl. 1); and (*2*) near Tŕstie, Slovakia (see Text-figs 7—8).
BOUNDARIES: The lower boundary is at the top of the Hauptdolomit. The upper boundary is marked by the transgressive Lower Liassic crinoidal limestones (see Text-fig. 9).
THICKNESS: Total thickness approximates 50 m.
FOSSILS: As those listed in the text (Text-figs 3—4, 6, and 9).
AGE: ?Late Norian (Sevatian) to Rhaetian.

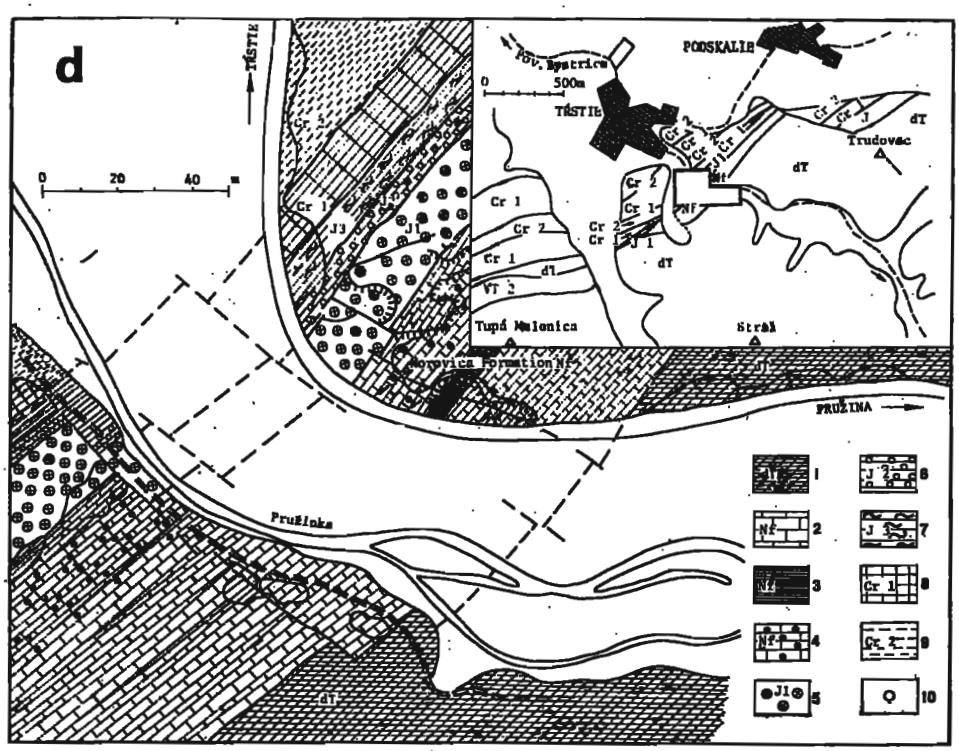


Fig. 7. Geological sketch-map of the Tŕstie area (for localization see area *d* in Text-fig. 1b)

1 Upper Triassic dolomites (dT), *2—4* uppermost Triassic sequence (Norovica Formation, Nf: *2* gray and light-gray limestones, *3* marls, *4* oolitic limestones), *5* Lower Lias crinoidal limestones (J1), *6* Dogger cherty limestones (J2), *7* Malm grey marly limestones (J3), *8* Neocomian marly limestones (Cr1), *9* Albian marls (Cr2), *10* Quaternary deposits (Q)

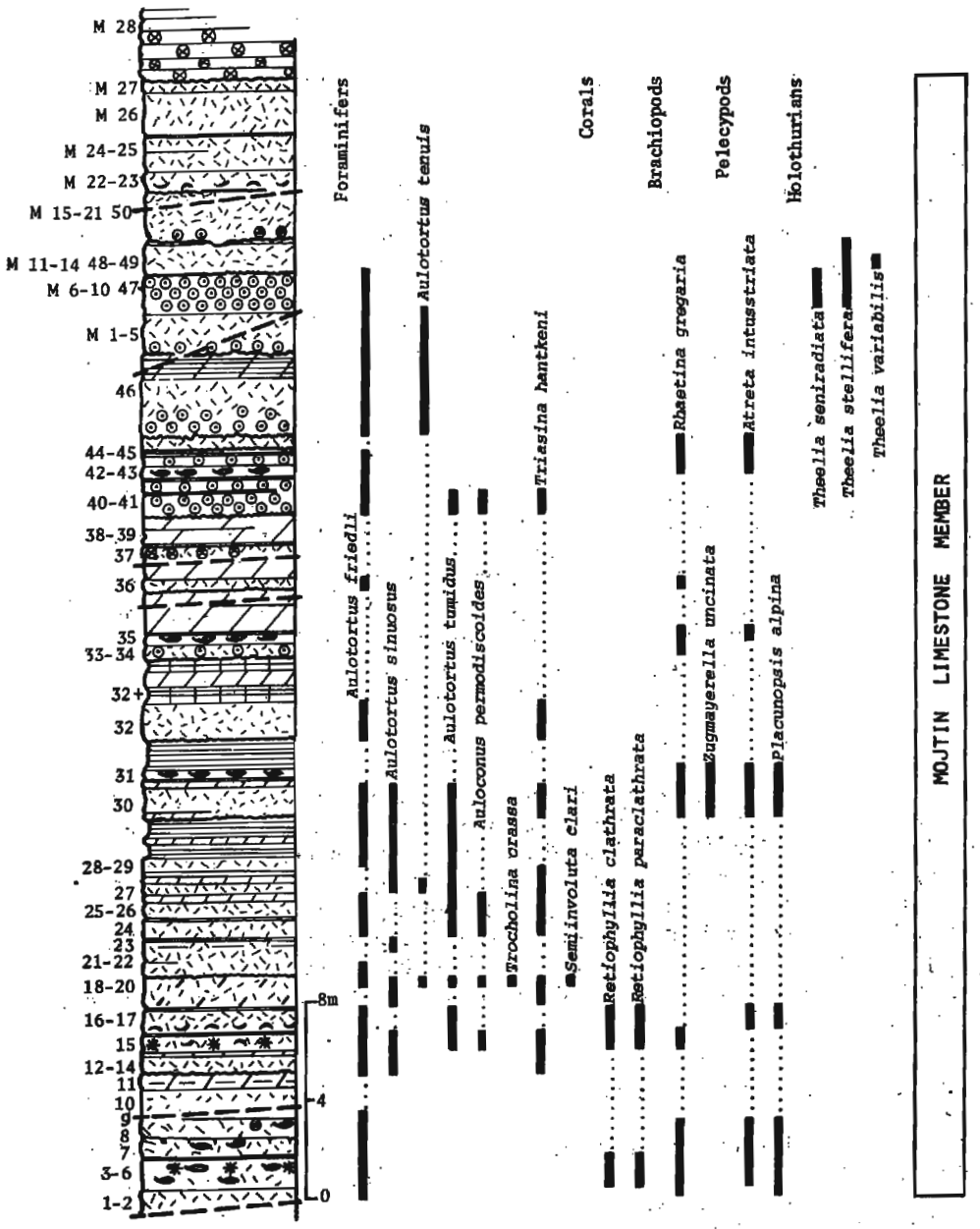
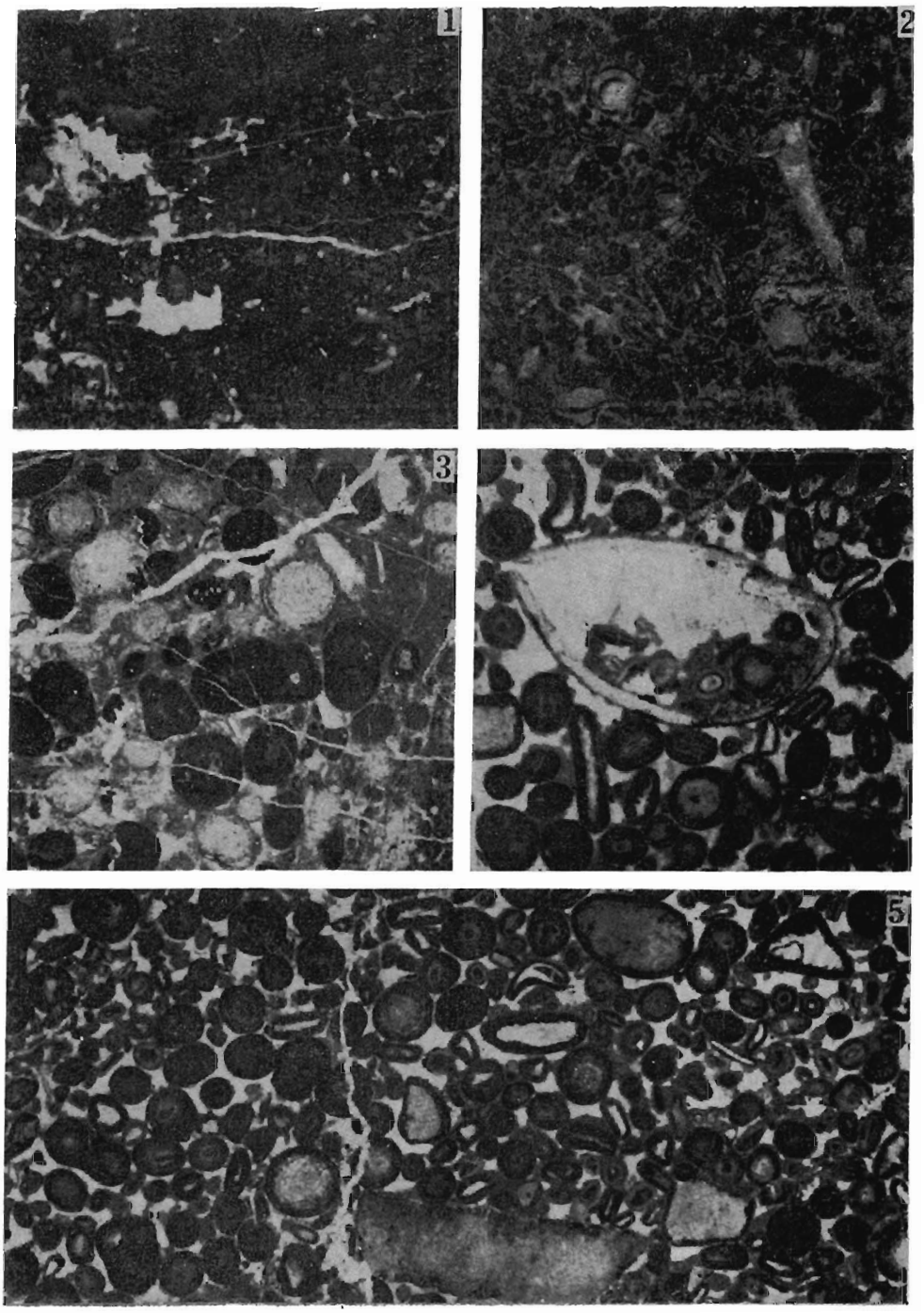
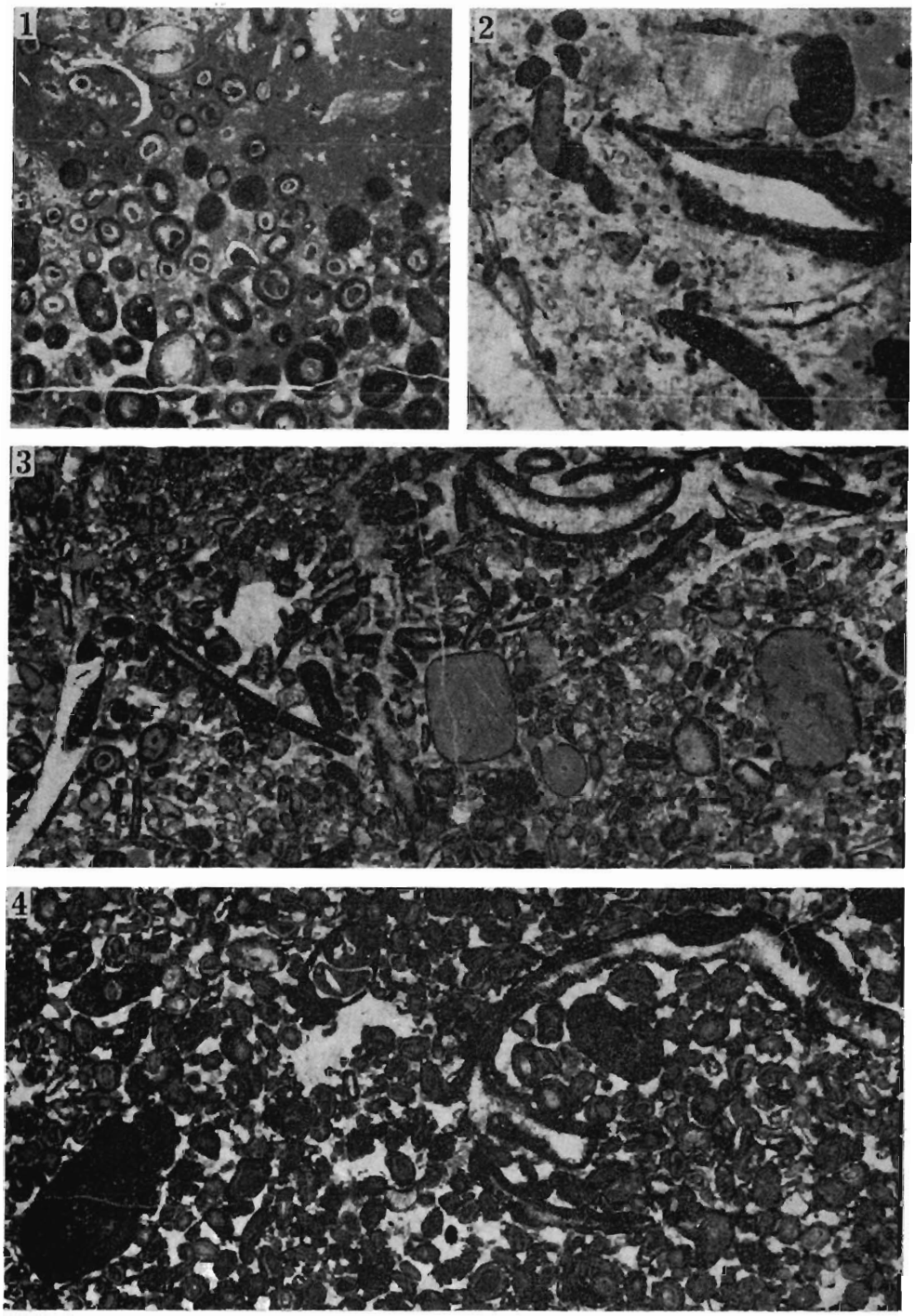


Fig. 9. Hypostratotype section of the Norovica Formation at Tfstie (*d* in Text-fig. *1b* see also Text-figs 7 and 8); explanations the same as for Text-fig. 3



Mt. Norovica section, Mojtin Limestone Member; taken ×10

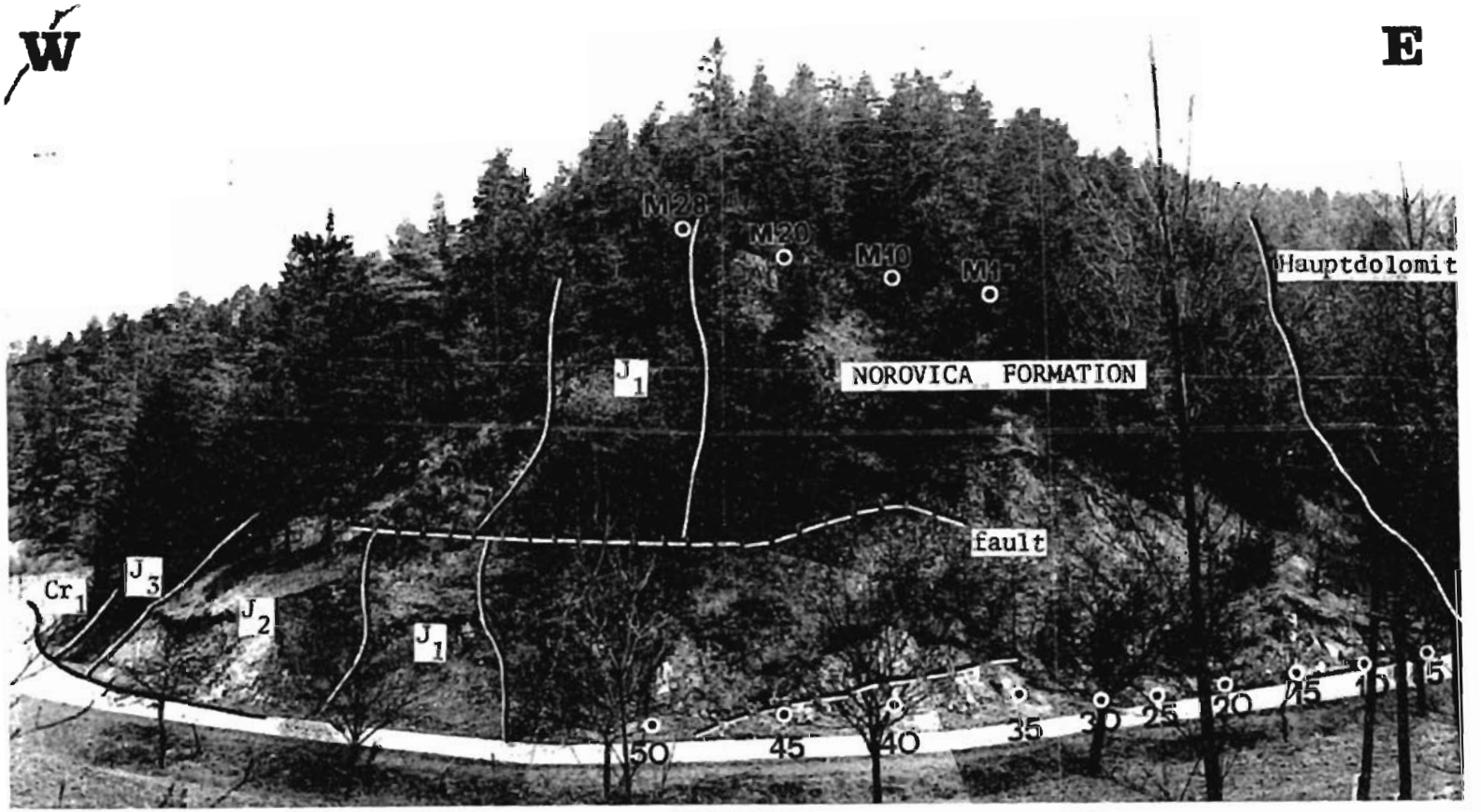
1 — Dolomicrite with organic fragments (mostly pelecypod and crinoid debris); layer *4*
2 — Biopelmicrite composed of strongly crushed bioclasts of pelecypod, crinoid and brachiopod debris as well as of foraminifers *Aulotortus* and pellets; layer *6*
3 — Association of foraminifers *Triasina hantkeni* in biooosparite; layer *14*
4 — Brachiopod (*Rhaetina*) biooosparite; layer *15*
5 — Biooosparite containing crinoid debris and foraminifers *Triasina hantkeni*; layer *15*



Mt. Norovica section (cnt'd), Mojtin Limestone Member; taken ×10

1 — Biooomicrite with foraminifers *Triasina hantkeni* and *Aulotortus sinuosus*; layer *19*
2 — Biointrasparite composed of pelecypod and crinoid debris with onkolitic crusts as well as of intraclasts; layer *24*
3 — Association of foraminifers *Aulotortus friedli* in crinoid-pelecypod-brachiopod biomicrite; layer *25*
4 — Biooosparite containing larger pelecypod, gastropod and crinoid debris with onkolitic crusts as well as ooids; layer *29*

Exposure of the Upper Triassic, Jurassic and Cretaceous sequence in the roadcut Tŕstie-Pružina (c 1 km SW off Tŕstie)



Sampling sites (*5—50* and *M1—M20*) from the hypostratotype section of the Norovica Formation (uppermost Triassic of the Choč unit) are indicated; photo taken in May 1979
J1 Lias, *J2* Dogger, *J3* Malm, *Cr1* Neocomian

LITHOSTRATIGRAPHIC SUBDIVISION OF THE NOROVICA FORMATION

Three members are distinguished in the Norovica Formation after the nature of the sedimentary sequence, the microfacies, and the fauna. These are: the Lower Limestone Member, the Siwa Woda Limestone Member, and the Mojtin Limestone Member (*see* Text-figs 3 and 10, and Pl. 1).

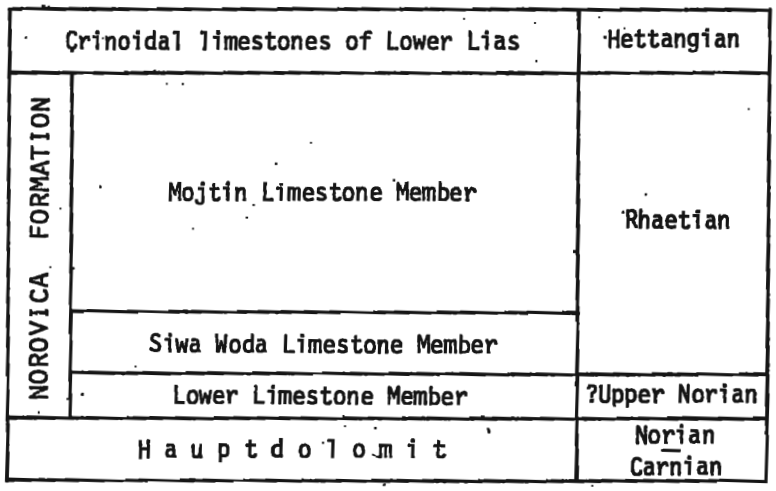


Fig. 10. Lithostratigraphical subdivision of the Norovica Formation

LOWER LIMESTONE MEMBER

This informal unit, most probably the lowermost part of the Norovica Formation, has been recorded only at the base of the hypostratotype section in the Chochołowska Valley (Text-fig. 3 and Pl. 1). It comprises grey to dark-grey laminated micrites with single fossils (Pl. 2, Fig. 1), ranging up to some 80 cm in thickness. The relationship to the overlying members of the Norovica Formation is unclear because of the tectonic nature of the contact. This unit is probably to be assigned to the Upper Norian (Sevatian), as it is overlain by the well documented Lower Rhaetian Siwa Woda Limestone Member (*cf.* Text-figs 3 and 10).

SIWA WODA LIMESTONE MEMBER

This unit includes grey, compact, sandy, biopelsparite limestones (Pl. 2, Fig. 2) with abundant conodonts *Misikella posthernsteini* Kozur & Mock and *Misikella* sp. A *sensu* Gaździcki (1978b), and foraminifers *Aulotortus friedli* (Kristan-Tollmann). The name of the unit is after the Siwa Woda creek in the Chochołowska Valley (Text-fig. 2). The type section of the Siwa Woda Limestone Member is in the hypostratotype section of the Norovica Formation at the foot of Siwiańskie Turnie in the Chochołowska Valley (Text-fig. 3 and Pl. 1). The member attains some 180 cm in thickness. As judged from the occurrence of the conodonts *Misikella posthernsteini* and the foraminifers *Aulotortus friedli*,

the member is to be assigned to the Lower Rhaetian (*cf.* Gaździcki 1978b). The Siwa Woda Limestone Member has thus far not been recorded in the Strážovská hornatina.

MOJTIN LIMESTONE MEMBER

This is the basic subunit of the Norovica Formation; it comprises light-grey to brownish, compact, oolitic and organodetrital limestones of the "Dachstein facies" (Pl. 5, Figs 1—2; Pl. 6, Figs 1—3; and Pls 7—10). The following fossils have been recorded (*cf.* Kochanová 1962, Mahel & *al.* 1968) in the Mojtin Limestone Member in the Mojtinská Valley, Strážovská hornatina:

Brachiopods: *Rhaetina gregaria* (Suess), *R. pyriformis* (Suess), *Zeilleria austriaca* (Zugmayer), *Z. elliptica* (Zugmayer), *Zugmayerella uncinata* (Schafhäutl);
Pelecypods: *Atreta intusstriata* (Emmrich), *Cardita austriaca* (Hauer), *Gervillia inflata* Schafhäutl, *G. praecursor* (Quenstedt), *Lima* cf. *discus* Stoppani, *Liostrea irregularis* (Münster), *Protocardia rhaetica* (Merian), *Placunopsis alpina* (Winkler), *Rhaetavicula contorta* (Portlock);
Corals (reported for the first time): *Phacelostylophyllum robustum* Roniewicz, *Ph. medium* Roniewicz, *Rettophyllia paraclathrata* Roniewicz, *Astraeomorpha crassisepta* Reuss.

There are also abundant and rich involutinid foraminiferal associations dominated by *Triasina hantkeni* Majzon (*cf.* Pl. 4, Figs 2, 4; Pl. 5, Figs 1—2; Pl. 7, Fig. 3; and Pl. 9, Figs 3, 5). The name of the member is after the Mojtinská Valley, Strážovská hornatina, where the type section is designated. Hypostratotype sections are in the Chochołowska Valley and in the Tŕstie region (*cf.* Text-figs 3 and 9). The Mojtin Limestone Member overlies the Siwa Woda Limestone Member in the Chochołowska Valley section (*see* Text-fig. 3 and Pl. 1). The upper boundary of the Mojtin Limestone Member coincides with the upper boundary of the whole Norovica Formation. This member attains up to 50 m in thickness and occurs in all the investigated geological sections of the West Tatra Mts and Strážovská hornatina (*cf.* Text-figs 3—4, 6, and 9). As judged from the distribution of the foraminifers *Triasina hantkeni*, the Mojtin Limestone Member is to be assigned to the uppermost Lower to Upper Rhaetian (*cf.* Gaździcki & *al.* 1979).

CONCLUSIONS

The new Norovica Formation is recognized for the unique uppermost Triassic sequence of the Choč nappe (Hronic) in the West Carpathians. The formation overlies the Hauptdolomit and underlies the Lower Liassic crinoidal limestones. It approximates 50 m in thickness, and ranges in age since the ?Late Norian (Sevatian) through the Late Rhaetian.

The Norovica Formation largely differs from its time equivalents of the high-tatric and sub-tatric (Krížna) units, *i.e.* the Tomanova Formation and the Fatra Formation, respectively (*cf.* Michalik & *al.* 1976, Michalik 1977, Michalik & *al.* 1979).

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LITOLOGIA I STRATYGRAFIA NAJWYŻSZEGO TRIASU JEDNOSTKI CHOCZAŃSKIEJ GÓR STRAŻOWSKICH I TATR ZACHODNICH

(Streszczenie)

W oparciu o profile z Gór Strażowskich na Słowacji oraz dolin Chochołowskie i Lejowej w Polskich Tatrach Zachodnich, przedstawiono następstwo osadów oraz charakterystykę mikrofacjalną utworów najwyższego triasu jednostki choczańskiej (*Hronicum*) Karpat Zachodnich (*por.* fig. 1—9 oraz pl. 1 i 3). Swoiste cechy tych osadów, jak również stwierdzony zespół elementów florystycznych i faunistycznych (*por.* pl. 2 oraz 4—10) stały się podstawą do wyróżnienia w obrębie utworów triasu Karpat Zachodnich nowej jednostki litostratygraficznej, a mianowicie formacji norowickiej. Formację norowicką stanowi około 50 m miąższości sekwencja jasno-szarych zwięzłych wapieni z wkładkami wapieni dolomitycznych i rzadko margli, spoczywającej na dolomicie głównym (*Hauptdolomit*), a przykrytej przez wapienie krynoidowe liasu dolnego (hetang). Stratotypem wyróżnionej formacji jest profil odsłaniający się na stokach Norovicy w Górach Strażowskich (*por.* fig. 5—6), zaś hipostratotypami są profile z Doliny Chochołowskiej i okolic Tŕstie (*por.* fig. 3 oraz 9). Nazwa formacji jest nowa i została zaproponowana pierwszy raz w niniejszej pracy.

W obrębie formacji norowickiej wydzielono trzy ogniwa: ogniwo wapieni dolnych, ogniwo wapieni Siwej Wody, oraz ogniwo wapieni mojtińskich. W wapieniach Siwej Wody i wapieniach mojtińskich stwierdzono obecność konodontów oraz szeregu otwornic o znaczeniu stratygraficznym; są to przede wszystkim konodonty *Misikella posthernsteini* Kozur & Mock, oraz bardzo liczne otwornice *Triasina hantkeni* Majzon. Wymienione mikroskamieniałości określają wiek zawierających je osadów na retyk (*por.* fig. 10). W tej sytuacji jedynie ogniwo wapieni dolnych może obejmować wiekowo górny noryk (sewat).