ALBERTIANA

SUBCOMMISSION ON TRIASSIC STRATIGRAPHY

# BEITRAG

zu einer

# MONOGRAPHIE

des

# BUNTEN SANDSTEINS, MUSCHELKALKS

und

# KEUPERS,

und

die Verbindung dieser Gebilde

zu

**EINER FORMATION.**

Von

*Friedrich von Alberti.*

Mit 2 Steintafeln.

Stuttgart und Tübingen,
Verlag der J. G. COTTA'schen Buchhandlung.
1834.



1 AUGUST 1983

# ALBERTIANA

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The primary intention of ALBERTIANA is to promote the interdisciplinary collaboration and understanding among the members of the I.U.G.S. Subcommission on Triassic Stratigraphy. Within this scope, ALBERTIANA serves both as a newsletter for the announcement of general information and as a platform for discussion of new developments in the field of Triassic stratigraphy. ALBERTIANA thus encourages the publication of announcements, literature-reviews, progress-reports, preliminary notes, etc. - i.e. those contributions in which information is presented relevant to current interdisciplinary Triassic research.

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COVER: Title page of Von Alberti's (1834) work in which he introduced the name Trias.

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Non-members of the Subcommission on Triassic Stratigraphy can obtain ALBERTIANA at the cost of US $ 2.50 per issue (bank-cheque to Mr.A.J.Goslinga,Laboratory of Palaeobotany and Palynology, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands).

# ALBERTIANA - A TRIBUTE TO THE FOUNDER OF THE TRIASSIC SYSTEM

C. VIRGILI and H. VISSCHER

Friedrich August von Alberti, the eminent German geologist and founder of the Triassic System, was born on 4 September 1795 at Stuttgart.
In 1809 Alberti entered the "Bergkadettenkorps", in which he received a special training in mining, geology and mineralogy. Von Alberti started his scientific career as a salt miner. In 1815 he went to the saltworks at Sulz. In 1818 he supervised drilling experiments near Jagtsfeld and in 1820 he was appointed inspector of the saltworks at Friedrichshall. In 1823 he successfully drilled a rock-salt deposit near Schwenningen and he established the saltworks at Wilhelmshall.
In 1825 he published his book "Über die Gebirge des Königreiches Würtemberg, in besonderer Beziehung auf Halurgie". He was appointed mining counselor in 1836. From 1852 to 1870 he was manager of the saltworks at Friedrichshall, where from 1854 to 1859 the Friedrichshall shaft was constructed under his direction: the centre of Würtemberg's salt production was shifted from Wilhelmshall to Friedrichshall. He introduced steam heating into the processing of salt. Von Alberti was considered to be one of the foremost saltmining engineers. His major publication, "Halurgische Geologie" (1852) remained for a long time a unique text-book on saltmining.

Together with Quenstedt, Von Alberti bacame also one of the founders of the geology of southwestern Germany. In his book on the geology of Würtemberg (1825) the different rock sequences of what subsequently became the Triassic System were already described in great detail. The most important results of his investigations on these sequences - Buntsandstein, Muschelkalk and Keuper - were published in 1834 in his "Beiträge zu einer Monographie des Bunten Sandsteins, Muschelkalks und Keupers und die Verbindung dieser Gebilde zu einer Formation" (see cover).

This work was based on his own investigations in southwestern Germany, but also data known from other parts of Germany as well as from France, England, Poland and Italy were taken into consideration. On the basis of thorough petrographic and paleontological analyses he introduced the name Trias for all the rocks stratigraphically situated between the Zechstein and the Lias.

It is probably not well-known that Von Alberti concluded that the Triassic could be best subdivided into four, rather than three, rock sequences by giving the Lettenkohle an independent status between the Muschelkalk and the Keuper. Although not widely accepted in Germany, especially in France this four-fold subdivision is still frequently applied with only minor alterations.

In 1864, Von Alberti published a synopsis on the Triassic System: "Überblick über die Trias". By that time the Triassic had already found firm and world-wide acceptance as one of the major units for stratigraphical classification.

Friedrich August von Alberti died on 12 September 1878 at Heilbronn.

On the eve of the 150th anniversary of the Triassic System, it seems appropriate that the I.U.G.S. Subcommission on Triassic Stratigraphy pays tribute to the founder of the System by naming its newly established newsletter ALBERTIANA.

We are glad to introduce to you Dr. M. Boersma, a palaeobotanist of the Laboratory of Palaeobotany and Palynology, Utrecht, who, after a long experience in Carboniferous palaeobotany, is presently engaged in the study of Permian and Triassic plant megafossils. Dr. Boersma has kindly accepted our invitation to become editor of ALBERTIANA. We wish him and ALBERTIANA all the best with respect to the promotion of the interdisciplinary collaboration and understanding, not only among the members of the S.T.S. but also in the world of Triassic research as a whole.

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The death of Dan Patrulius, in November 1982, has robbed the Subcommission on Triassic Stratigraphy of one of its most respected members. He was held in high esteem for his scientific contributions to the geology of Romania as well as for his contributions to international and interdisciplinary co-operation. He will be sadly missed. But he will be remembered, not only for his achievements, but also for his personal qualities of dignity, integrity and friendship.

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# I.G.C.P. PROJECT NO. 4: A MAJOR ACHIEVEMENT IN TRIASSIC RESEARCH - A CHALLENGE TO THE S.T.S.

H. VISSCHER

In March 1983, Prof.Dr. H. Zapfe, Vienna, sent the following letter to the representatives of the various countries taking part in the UNESCO/I.U.G.S. International Geological Correlation Programme Project No. 4: "Triassic of the Tethys Realm":

> "As you know, IGCP Project 4 has expired by the end of 1982. We received however a recommendation by the IGCP Board, to carry on with the Project "on extended term", with no limit of this status concerning its duration. This category of Projects has been created to enable the working groups to continue to collaborate under the IGCP umbrella beyond the effective lifetime of the Project. We are also entitled to continue to use the IGCP symbol on publications. However no more UNESCO/IUGS funds are available for Projects on extended term, which means that no Meetings can be held any more. Still I would like to recommend you to carry on with the activities in your countries.
>
> At the recent Board Meeting in Paris in February, a Triassic Project was proposed by the People's Republic of China and also accepted by the Board. The title of the Project is: "Permo-Triassic Events of the Eastern Tethys and their intercontinental correlation, involving the whole Tethys, Gondwana and Circum-Pacific Realms with emphasis on the organic evolution and tectonic development." I suppose that in the meantime you will already have received an invitation by Chinese side to join the Project. I myself became advised by the IGCP Board to join the Chinese Project with an Austrian Working Group and not to propose a separate new Project. It is of course entirely up to you to join the Chinese Project as well.
>
> On this occasion I would like to take the opportunity to thank all representatives of the countries having participated in Project 4 very much for their fruitful collaboration during all these years and also to forward my thanks to all colleagues of your Working Group I hope that this long lasting co-operation will also last in the future."

The Subcommission on Triassic Stratigraphy feels that Prof. Zapfe has laid all students of the Triassic under a deep debt of gratitude. Established in 1973, his Project No. 4 soon developed into what turned out to be one of the most successful research-projects of the I.G.C.P.. Prof. Zapfe's intimate knowledge of the Triassic, his personal acquaintance with many of the actors playing a role in the world of Triassic research, and his active interest in multidisciplinary approaches formed a firm basis for bringing together people from many countries and representing a wide scala of disciplines. He stimulated and guided the exchange of thoughts. He levelled the political and philosophical barriers that could block the passage to fruitful international and interdisciplinary collaboration.

| THETYS (TROPICAL) L. KRYSTYN | | | CANADA (TEMPERATE) E.T. TOZER | | | USSR (BOREAL) Stratigr. Commitee USSR, 1980 | | |
|---|---|---|---|---|---|---|---|---|
| ANISIAN / LADINIAN | LONGOBARDIAN | *Frankites ? regoledanus* | 2 | *F. sutherlandi* | LADINIAN | *Nathorstites lenticularis* | UPPER | LADINIAN |
| | | *Protrachyceras archelaus* | 1 | *M. maclearni* | | *Indigirites krugi* | | |
| | | | | *M. meginae* | | | | |
| | | *Protrachyceras gredleri* | | *P. poseidon* | | | | |
| | FASSANIAN | *Eoprotrachyceras curionii* | | *E. subasperum* | | *Longobardites oleshkoi* | LOWER | |
| | ILLYRIAN | *Nevadites - Zone* | | *F. chischa* | ANISIAN UPPER | *Frechites humboldtensis* | UPPER | ANISIAN |
| | | *Parakellnerites - Zone (Ticinites polymorphus + A. avisianum = "C." reitzi)* | "U." | *G. deleeni* | | *Gymnotoceras rotelliforme* | | |
| | | *Paraceratites trinodosus* | "L." | | | | | |
| | PELSON | *Balatonites balatonicus* | 3 | *A. varium* | ANISIAN MIDDLE | *Arctohungarites kharaulakhensis* | MIDDLE | |
| | BITHYNIAN | *Anagymnotoceras ismidicum* | 2 | | | *Czekanowskites decipiens* | | |
| | | *Nicomedites osmani* | 1 | | | | | |
| | AEGEAN | *"Aegeiceras ugra"* | 2 | *L. caurus* | ANISIAN LOWER | *Lenotropites tardus* | LOWER | |
| | | | 1 | | | *Grambergia taimyrensis* | | |
| SKYTHIAN / SPATHIAN | | ? | | *K. subrobustus* | SPATHIAN | *Olenekites spiniplicatus* / *K. subrobustus* | UPPER | OLENEKIAN |
| | | *Tozericeras pakistanum* | | *K. pilaticus* | | *Parasibirites grambergi* | | |
| | | *Tirolites cassianus* | | | | *Dieneroceras demokidovi* | | |
| NAMMALIAN / SMITHIAN | | *Wasatchites spiniger + A. pluriformis + A. prahlada* | 2 | *W. tardus* | SMITHIAN | *Wasatchites tardus* | LOWER | |
| | | *Meekoceras gracilitatis* | 1 | *E. romunderi* | | *Hedenstroemia hedenstroemi* | | |
| DIENERIAN | | *Flemingites rohilla* | 3 | *V. sverdrupi* | DIENERIAN | *Vavilovites ssp.* | UPPER | INDUAN |
| | | *Gyronites frequens* | 2 | *P. candidus* | | | | |
| | | | 1 | | | | | |
| GANGETIAN | | *Ophiceras connectens + Ophiceras tibeticum* | | *P. strigatus* | UPPER (GANG.) (ELLESM.) GRIESBACH. | *Ophiceras nielseni* | LOWER | |
| | | | | *Oph. commune* | | | | |
| | | *Otoceras woodwardi* | | *O. boreale* | LOWER | *Otoceras boreale* / *Otoceras indigirense* | | |
| | | ? | | *O. concavum* | | *Otoceras concavum* | | |

| TETHYS (TROPICAL) L. KRYSTYN | | | | CANADA (TEMPERATE) E.T TOZER | | | USSR (BOREAL) Stratigr. Commitee USSR, 1980 | | |
|---|---|---|---|---|---|---|---|---|---|
| RH. | Choristoceras marshi (orz)[1] | Choristoceras marshi | | Ch. crickmayi | UPPER | NORIAN | Tosapecten efimovae | UPPER | NORIAN |
| SEVAT. RHAETIAN | | Vandaites stuerzenbaumi | | | | | | | |
| | Rhabdoceras suessi (orz)[1] | Sagenites reticulatus | | C. amoenum | | | Monotis ochotica | | |
| | | Sagenites quinquepunctatus | | G. cordilleranus | | | | | |
| NORIAN ALAUNIAN (U. NOR.) | Halorites macer | "catenate Haloriten" | 4 | H. columbianus | MIDDLE | | "Monotis" sculiformis | MIDDLE | |
| | | Amarassites s. semiplicatus | 3 | | | | | | |
| | Himavatites hogarti | Himavatites hogarti | 2 | | | | | | |
| | | Himavatites watsoni | 1 | | | | | | |
| | Cyrtopleurites bicrenatus | (unnamed subzones on Timor) | 2 | D. rutherfordi | | | Otapiria ussuriensis | | |
| | | | 1 | | | | | | |
| LACIAN (L. NOR.) | Juvavites magnus | no subdivision yet | 3 | J. magnus | LOWER | | Pinacoceras verchojanicum | LOWER | |
| | | | 2 | | | | | | |
| | | | 1 | | | | | | |
| | Malayites paulckei | unnamed subzone | 3 | M. dawsoni | | | | | |
| | | Malayites paulckei | 2 | | | | | | |
| | | Malayites tingriensis | 1 | | | | | | |
| | Guembelites jandianus | Dimorphites selectus | 2 | S. kerri | | | | | |
| | | Dimorphites n. sp. 1 | 1 | | | | | | |
| KARNIAN TUVALIAN | Anatropites-Zone | Gonionotites italicus | | "K. macrolobatus" | UPPER | KARNIAN | Sirenites yakutensis | UPPER | KARNIAN |
| | | Discotropites plinii | | "Upper T. welleri" | | | | | |
| | Tropites subbullatus | Tropites subbullatus | | | | | | | |
| | | Projuvavites crasseplicatus | | "Lower T. welleri" | | | | | |
| | Tropites dilleri | no subdivision yet | | T. dilleri | | | Neosirenites pentastichus | | |
| JULIAN CORDI | Austrotrachyceras austriacum | "Neoprotrachyceras oedipus" | Mans | A. obesum | LOWER | | Neoprotrachyceras semkanense | | |
| | | Austrotrachyceras triadicum | 1 | | | | | | |
| | Trachyceras aonoides | Trachyceras aonoides | 2 | T. desatoyense | | | Protrachyceras omkutchanikum | | |
| | | Trachyceras aon | 1 | | | | Nathorstites tenuis | | |

The impact of Project No. 4 on modern Triassic research will continue to influence future investigations. We trust that Prof. Zapfe, now retired from university life, will continue to be active in the world of Triassic research for many years to come.

The activities of Project No. 4 have formed a decade of intense and sustained effort to understand geo- and biodynamic developments during Triassic times. The vast amount of results are a major achievement in Triassic research. The main object of the Project was the establishment of a Triassic time scale for the Tethys realm adapted to a modern level of knowledge. The resulting scheme has become a challenge to the Subcommission on Triassic Stratigraphy:

During the final workshop meeting of Project No. 4 (Vienna, 1982) a preliminary draft of a Triassic time scale, essentially based on ammonoid biostratigraphy, was discussed. Initially representing a time scale for the Tethys realm compared with the stratigraphy of Canada, during the meeting also the subdivision proposed by the Stratigraphical Committee of the U.S.S.R. could be added. It was decided to invite the S.T.S. to accept the proposed scheme as a basis for formal discussion of the many problems related to world-wide Triassic chronostratigraphical subdivision and correlation.

At the S.T.S. meeting, organized in conjunction with the I.G.C.P.-workshop, this invitation was accepted.

A first general discussion of the scheme clearly revealed the existence of controversial views among the S.T.S. members present, notably with regard to (a) the ammonoid zones applied, (b) the position of biostratigraphical and chronostratigraphical boundaries, (c) stage and substage nomenclature, and (d) the status of some of the chronostratigraphical units.

It was decided to continue the discussion by means of written communication. It was agreed that ALBERTIANA should function as a medium for stimulating the discussion. Therefore the proposed scheme, in its latest version (after Zapfe, 1983, see p. 24 of the present issue of ALBERTIANA), is presented here without further comments. IT WILL BE THE TASK OF THE MEMBERS OF THE S.T.S. TO PROVIDE THEIR JUDGEMENT ON EVERY POSSIBLE DETAIL OF THE SCHEME. Also the working groups and the commissions for the study of scientific topics should give their comments on the proposed scheme. Constructive criticism by non-members of the S.T.S. is, of course, equally desired and welcomed.

Apart from the many boundary problems, from a chronostratigraphical point of view, the S.T.S. wishes to give priority to the following issues: (a) the subdivision and nomenclature of the Lower Triassic, (b) the status of the Cordevolian Substage, and (c) the status of the Rhaetian Stage.

All relevant comments will be brought together in ALBERTIANA. The S.T.S. intends to produce a first formal comment to be presented at its meeting during the International Geological Congress, Moscow, 1984. If necessary, it will be attempted to organize an earlier S.T.S. meeting in order to discuss the principal issues of the scheme among a number of specialists, before a formal opinion of the Subcommission can be formulated.

# PRELIMINARY NOTE ON THE HALOBIA - BIOSTRATIGRAPHY IN THE PELAGIC UPPER TRIASSIC OF THE CENTRAL MEDITERRANEAN AREA (SICILY, SOUTHERN APENNINES, YUGOSLAVIA, GREECE)

PAOLA DE CAPOA BONARDI

In the Central Mediterranean area, during the Triassic several seaways were developed as embayements of the Palaeo-Tethys, resting up on a continental crust, perhaps attenuated (Scandone, 1975; Laubscher & Bernoulli, 1977). During the Late Triassic the sediments of these basins were mainly constituted by *Halobia* limestones, now represented in Sicily, Lucania (Southern Apennines), Crna-Gora (Yugoslavia) and Pindos (Greece) (fig. 1).

The study of these sediments has been carried out during the last fifteen years (De Capoa Bonardi, 1970; Cafiero & De Capoa Bonardi, 1980a, b; 1982). An evaluation of the vertical distribution of 23 species of *Halobia* has been based on a survey of 43 sections in the whole area and the collection and analysis of more than 1500 specimens. The richest in fossils are the sections from Sicily, particularly Mt. Cammarata in the Sicani Group.

The biostratigraphic data now allow the institution of nine *Halobia* zones, the chronostratigraphy of which is based on conodonts and on the rare cephalopods associated. The recognized zones (fig. 2) are characterized as follows:

1. *Halobia lenticularis* zone (total range zone)

Locality - Mt. Cammarata (Sicani Group, NW Sicily)

Definition - The zone is characterized by the association of *Halobia lenticularis* (Gemmellaro) with *Halobia rugosa* Gümbel, *H. radiata radiata* Gemellaro and *H. radiata hyatti* Kittl. The last two species seem to be present only in the lower part of the *H. lenticularis* Zone; also *H. rugosa* is restricted to the lower-middle part. *Halobia* cf. *superba* Mojsisovics and *H.* cf. *austriaca* Mojsisovics together with *Hoplotropites* sp. and the conodonts *Gondolella polygnatiformis* Budurov & Stefanov, *Epigondolella nodosa* (Hayashi) sensu Krystyn, *E. parva* (Kozur), *E. permica* (Hayashi) sensu Krystyn are also found. The base and the top of *H. lenticularis* Zone are defined by the first and the last occurrence of *H. lenticularis*, respectively.

Geographical distribution - The *H. lenticularis* Zone has only been entirely recognized in the Mt. Cammarata and Mt. Triona successions (Sicani Group, NW Sicily). I found some of the species typical of this zone (*H. lenticularis*, *H. radiata radiata*, *H. rugosa*) also in other Sicilian (Capo Grosso, Mt. Judica, Yugoslavian (Bijela, Banic-Obalica) and Greek (Kriakura) successions. In the Kriakura succession *Halobia austriaca* is present at the bottom and top of the strata bearing *H. radiata radiata*.

Stratigraphical extent - The *H. lenticularis* Zone extends throughout the Uppermost Carnian (Tuvalian 3); its base is perhaps in Tuvalian 2, its top in Lacian 1.

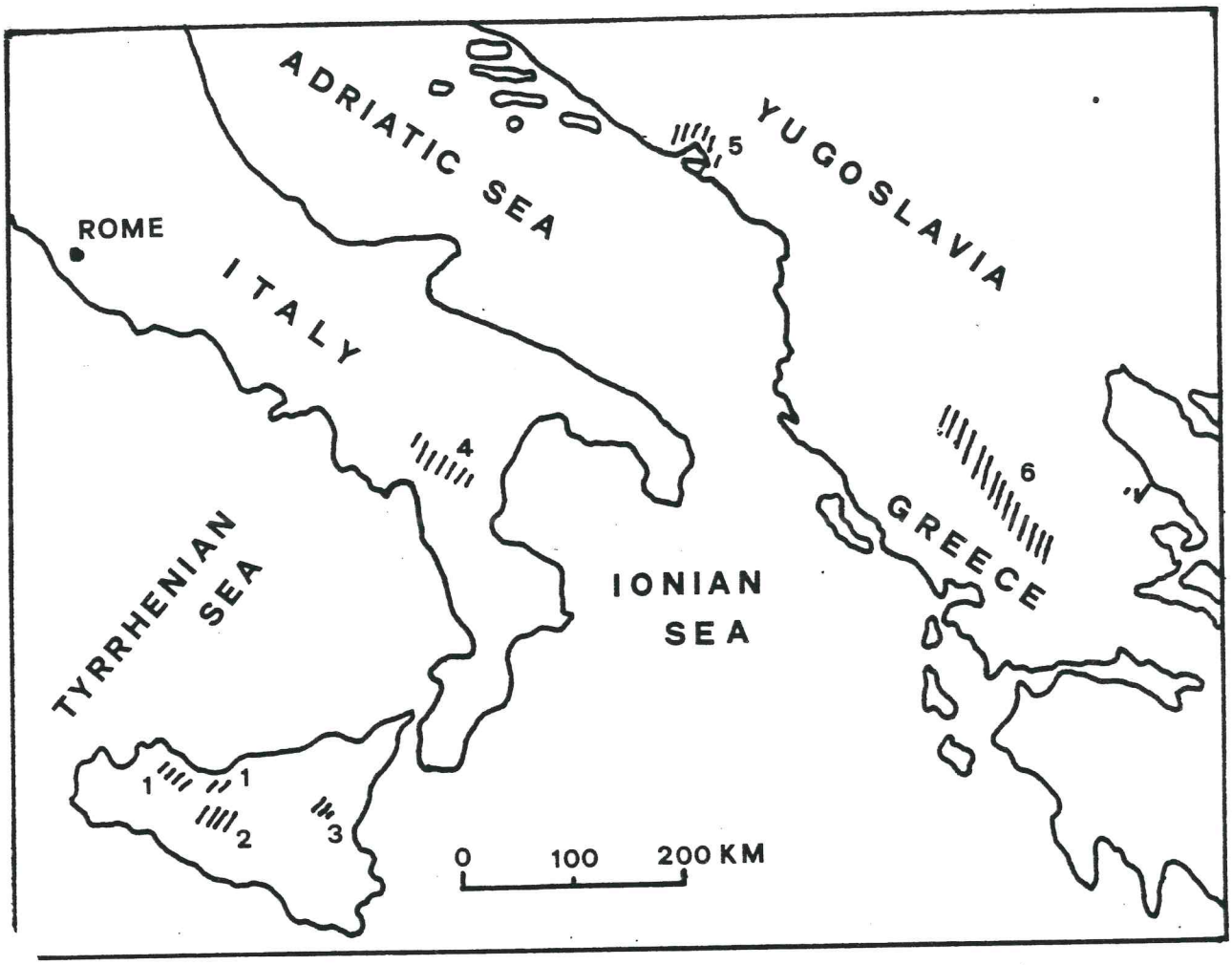


Fig.1. Central Mediterranean areas with Upper Triassic *Halobia* limestones.

1 - Imerese basin 2 - Sicano basin 3 - unified Imerese-Sicano basin
4 - Lagonegro basin 5 - Budva-Kotor basin 6 - Pindos basin

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Contributions for the next issue of ALBERTIANA should reach the Editor or the Secretary General before December 1st., 1983.

DO NOT FORGET TO SEND YOUR COMMENTS ON THE TRIASSIC TIME-SCALE PROPOSED BY I.G.C.P. PROJECT NO. 4.

The lay-out of contributions should be preferably comparable to that of the contributions in the present issue of ALBERTIANA.

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(2) *Halobia styriaca* Zone (total range zone)

Locality - Mt. Cammarata,(Sicani Group, NW Sicily).

Definition - The zone is characterized by the presence of *Halobia styriaca* (Mojsisovics), sometimes in association with *H. beyrichi* (Mojsisovics). The conodonts *Epigondolella abneptis* (Huckriede) sensu Krystyn and *E. nodosa* are also present. The base and the top of *H. styriaca* Zone are defined by the first and the last occurrence of *H. styriaca*, respectively.

Geographical distribution - The *H. styriaca* Zone has been recognized in NW Sicily (Mt. Cammarata, Mt. Triona) and NE Sicily (Mt. Scalpello), in Lucania (i Cozzi, Sorgente Acero), in Crna-Gora, Yugoslavia (Lastva, Bijela, Rebro). In Turkey (Lower Antalya nappe) a Lower Norian (Lacian 1) *H. styriaca* has been reported (Marcoux, pers.comm., see also Allasinaz et al., 1974).

Stratigraphical extent - Lower Norian (Lacian 1).

(3) *Halobia mediterranea* Zone (total range zone)

Locality - Mt. Cammarata (Sicani Group, NW Sicily).

Definition - The zone is characterized by the association of *Halobia mediterranea* Gemmellaro with *Halobia charlyana* Mojsisovics, *H. pusilla* Cafiero & De Capoa Bonardi, *H. austriaca*, *H. superba*, *H. beneckei* Gemmellaro and *H. salinarum* Bronn. *H. charlyana* and *H. pusilla* are characteristically restricted to the lower part of the zone; *H. beneckei* and *H. salinarum* to the upper part. *Halobia* cf. *superba* and *H.* cf. *austriaca* are also present. The base and the top of the zone are defined respectively by the first and the last occurrence of *H. mediterranea*.

Geographical distribution - The whole *H. mediterranea* Zone is represented only in the Mt. Cammarata section. In other sections are present *H. mediterranea* (Mt. Triona, NW Sicily; Mt. Judica, Mt. Scalpello, NE Sicily; Mt. Lama, Mt. Nicola, Lucania, together with *H. charlyana* and *H. pusilla*), or *H. beneckei* (Bijela, Yugoslavia). *H. salinarum* has been found only in the Mt. Triona section.

Stratigraphical extent - Lower-Middle Norian (Lacian 1 - Alaunian 1).

(4) *Halobia mojsisovicsi* Zone (local range zone)

Locality - Mt. Cammarata (Sicani Group, NW Sicily)

Definition - The zone is characterized by the presence of *Halobia mojsisovicsi* Gemmellaro. Its base and top are defined by the first and the last occurrence of *H. mojsisovicsi*, respectively.

Geographical distribution - The *H. mojsisovicsi* Zone has been recognized only in the Mt. Cammarata and Mt. Triona sections (NW Sicily).

Stratigraphical extent - Middle Norian (Alaunian 1).

(5) *Halobia rajkae* Zone (local range zone)

Locality - Mt. Cammarata (Sicani Group, NW Sicily)

Definition - The zone is characterized by the presence of *Halobia rajkae* Cafiero & De Capoa Bonardi. Its base and top are defined by the first and the last occurrence of this species, respectively.

Geographical distribution - Until now *H. rajkae* is known only from Mt.Cammarata.

Stratigraphical extent - Middle Norian (Alaunian 1).

(6) *Halobia darwini* Zone (local range zone)

Locaility - Mt. Cammarata (Sicani Group, NW Sicily)

Definition - The zone is characterized by the presence of *Halobia darwini* Cafiero & De Capoa Bonardi. The conodonts *Epigondolella permica* and *E. postera* (Kozur & Mostler) sensu Krystyn are also present. Its base and top are defined by the first and the last occurrence of *H. darwini*, respectively.

Geographical distribution - *H. darwini* Zone is until now only known in the Mt. Cammarata succession.

Stratigraphical extent - Middle Norian (Alaunian 1).

(7) *Halobia halorica* Zone (total range zone)

Locality - Mt. Triona (Sicani Group, NW Sicily)

Definition - The zone is characterized by the presence of *Halobia halorica* Mojsisovics. In the Mt. Cammarata succession the conodonts *Epigondolella abneptis*, *E. permica*, *E. postera* have been found; in some Yugoslavian successions (Bijela, Lacica) also *E. bidentata* Mosher and *E. multidentata* Mosher are present. The base and the top of the zone are defined by the first and the last occurrence of *H. halorica*, respectively.

Geographical distribution - The zone has been recognized in Sicani Group, NW Sicily (Mt. Cammarata, Mt. Triona); in Lucania (Mt. Sirino, Mt. Lama, Burrone Carraruncedde, Mt. Castagnereto, Mt. Gianni Griecu, Sasso di Castalda); in Crna-Gora, Yugoslavia (Bijela, Lacica); in Pindos, Greece (Kriakura).

Stratigraphical extent - Middle Norian (Upper part of Alaunian 2).

(8) *Halobia norica* Zone (total range zone)

Locality - Mt. Triona (Sicani Group, NW Sicily)

Definition - The zone is characterized by the presence of *Halobia norica* Mojsisovics, frequently associated with *Halobia lineata* Mojsisovics. At Mt. Cammarata (NW Sicily) and Lacica (Yugoslavia) the conodonts *Epigondolella abneptis*, *E. permica*, *E. postera* are present; in the Bijela succession (Yugoslavia) *Gondolella navicula steinbergensis* (Mosher) and *Epigondolella bidentata* have been found. The base and the top of the zone are defined by the first and the last occurrence of *H. norica*, respectively.

Geographical distribution - The *H. norica* Zone has been recognized in NW Sicily (Mt. Triona, Mt. Cammarata) and NE Sicily (Mt. Scalpello); in Lucania (Mt. Sirino, Mt. Lama, Mt. Castagnereto, Mt. Vulturino, Burrone Carraruncedde, Sasso di Castalda, Campagna); in Crna-Gora, Yugoslavia (Bijela, Rebro, Lacica); in Pindos, Greece (Moscophiton).

Stratigraphical extent - Middle Norian (Upper part of Alaunian 2).

(9) *Halobia distincta* Zone (local range zone)

Locality - Mt. Cammarata (Sicani Group, NW Sicily)

Definition - The zone is characterized by the presence of *Halobia distincta* Mojsisovics. The conodonts *Epigondolella bidentata* and *E. postera* have been found. Its base and top are defined by the first and the last occurrence of *H. distincta*, respectively.

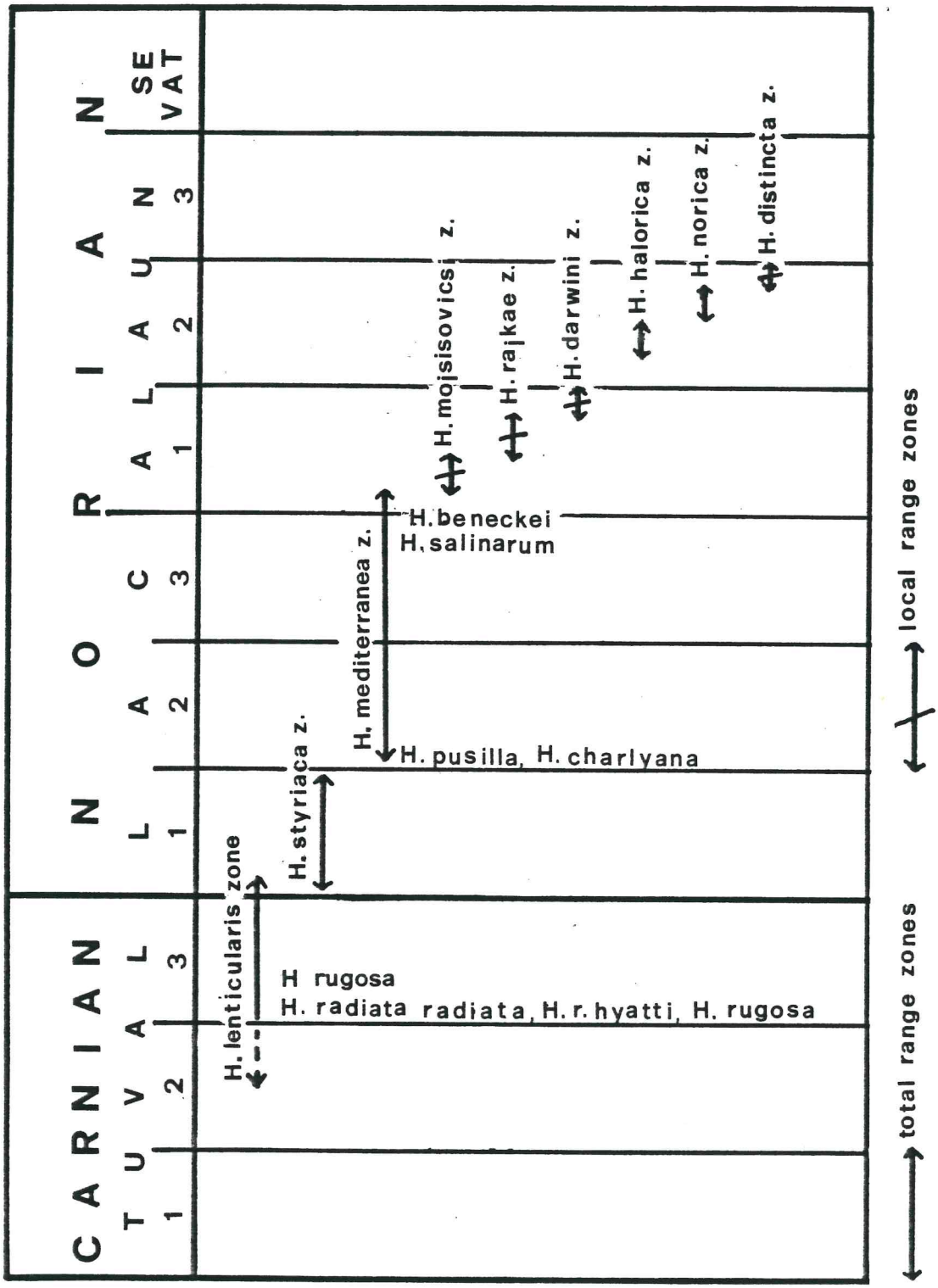


Fig.2. Stratigraphical extent of the recognized *Halobia* zones.

Geographical distribution - The *H. distincta* Zone is known until now only at Mt. Cammarata.

Stratigraphical extent - Middle Norian (top of Alaunian 2).

References

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The Chairman of the S.T.S., Dr. Carmina Virgili, has been nominated "Secretaria de Estado de Universidades e Investigación" in the Government of Spain. We wish her all the courage and wisdom to carry out her new responsible task. We hope, however, that she may find time to remain active in the promotion of Triassic affairs.

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# TRIASSIC CONODONT BIOFACIES AND PROVINCES

K.J. BUDUROV, V.J. GUPTA, M.N. SUDAR & G.I. BURYL

The revision of Triassic platform and blade-like conodonts, which defined the stable conodont taxons with accurately determined stratigraphic ranges and horizontal distribution, enabled standard conodont zonations of any realm in which conodonts "lived" during the Triassic.

It provided a basis, with further detail study of any characteristic of Triassic platform and blade-like conodont taxa that may have remained uncovered by the revision, for separation in the realm of conodont provenance and accurate definition of the four basic conodont biofacies: *Neogondolella-Paragondolella*, *Parachirognathus-Furnishius*, *Carinella+Pseudofurnishius*, and *Gladigondolella*.

I. *Neogondolella-Paragondolella* conodont biofacies

This biofacies has a global development and characterizes each area where the Triassic conodont "life" was developed (Tethyan-Pacific, Germanic and Balkanide conodont provinces). It occurs throughout the Triassic, also partly succeeded from the Permian and including all conodont elements of the genera: *Anchignathodus*, *Neogondolella*, *Neospathodus*, *Paragondolella*, *Epigondolella*, *Metapolygnathus*, *Ancyrogondolella* and *Misikella*.

II. *Parachirognathus-Furnishius* conodont biofacies

This biofacies is developed within the Tethyan-Pacific conodont province and occurs in upper Lower Triassic (Smithian). This conodont biofacies consists of almost only *Parachirognathus* and *Furnishius* elements, and *Foliella* and probably also *Platyvillosus* in its upper parts.

III. *Carinella+Pseudofurnishius* conodont biofacies

This biofacies is present in the Tethyan-Pacific and Balkanide conodont provinces, in the range from the Upper Fassanian and nearly through the Langobardian. It consists of representatives of the genera *Carinella* and *Pseudofurnishius* which occur either single or both single and associated.

IV. *Gladigondolella* conodont biofacies

This biofacies has a limited distribution, only in Alpine-Mediterranean and Himalayan-Pacific regions of the European and Asian realms, the Tethyan-Pacific conodont province. It consists of *Gladigondolella* elements and ranges from the Upper Scythian to the Lower Carnian. Within the interval, this conodont biofacies corresponds to representatives of *Neogondolella*, *Paragondolella* and *Epigondolella* from the *Neogondolella-Paragondolella* conodont biofacies.

The presence and persistence of the identified conodont biofacies in the determined area and both vertical and horizontal distribution of their components, projected in standard conodont zones, were used in determining the following three conodont provinces: Tethyan-Pacific, Germanic and Balkanide, during the Triassic.

1. Tethyan-Pacific conodont province

An extensive, global province including the areas covered by the Tethys in the west and the Pacific in the east. These are the present territories of Europe (Alpine-Mediterranean regions, Sephardic realm), Asia (Near East, Himalayan regions, eastern and southeastern coast, islands, etc.). SW part of North America and Arctic regions (North British Columbia, Northern Arctic Islands). The Tethyan-Pacific conodont province existed through the Triassic with the conodont elements of all the four conodont biofacies either in succession or in mutual correspondence.

2. Germanic conodont province

This province is situated within the Germanic basin of Central and Northern Europe (Germany, partly Poland). Representatives of only *Paragondolella* and *Neogondolella* from the *Neogondolella-Paragondolella* conodont biofacies are the only found from the Upper Bithynian to the Upper Langobardian when conodonts existed in these areas. This basin was a part of the Tethyan-Pacific conodont province until the Lower Illyrian, and existed after it as an autonomous province basically characterized by highly specific elements of *Neogondolella* ("*Germani* evolution type" composed of phylomorphogenetic sequence *N. mombergensis* - *N. haslachensis* - *N. watznaueri*).

3. Balkanide conodont province

This province is situated on the territory of Bulgaria (central and western Bulgaria), partly Roumania, and probably Yugoslavia (only Eastern Serbia in part). Conodonts of the *Neogondolella-Paragondolella* and *Carinella* (excluding *Pseudofurnishius*) conodont biofacies existed in this province from the Upper Bithynian to the end of the Langobardian. This area existed as an independent conodont province only for a short time equivalent to *N. bakalovi*-R.-Z. (Upper Fassanian - Lower Langobardian),while both before and after this interval it was part of the Tethyan-Pacific conodont province.

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Three multicoloured palaeogeographical maps and an isopach map of the Triassic have been incorporated in P.A. Ziegler's (1982) "Geological Atlas of Western and Central Europe", published by Shell (distributor: Elsevier Scientific Publishing Company). The maps (Scythian, Anisian-Ladinian, Karnian-Norian) are unique since they integrate published information with geological and geophysical data acquired by the Shell group in the course of exploration activities in the onshore and offshore basins of Western Europe.

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# STUDIES OF THE PERMIAN - TRIASSIC BOUNDARY IN EASTERN ASIA BY A CHINESE-JAPANESE RESEARCH GROUP

Y. BANDO

An international joint research project on the Permian and Triassic boundary in eastern Asia was proceeded by specialists of the Nanjing Institute of Geology and Paleontology, Academia Sinica, and Japanese universities from April, 1981, to March, 1983. This Chinese-Japanese Research Group includes Sheng Jin-Zhan (Nanjing Inst. Geol. Paleont. = NIGP), Chen Chu-Chen (NIGP), Wang Yi-gang (NIGP), Rui lin (NIGP), Lio Zhuo-Tin (NIGP), K. Nakazawa (Kyoto Univ.), K. Ishii (Himeji Inst. Geol.), K. Nakamura (Hokkaido Univ.), and Y. Bando (Kagawa Univ.).

In this joint research, we have attained to the following main results:

(1) A conformable relation between the Permian and Triassic strata in Eastern Tethys is observed in Kashmir and South China; the Permo-Triassic transition shows a continuous sedimentation without any time-stratigraphic gap.

(2) In South China, the Lower Triassic formations begin from the Mixed beds at the basal part.

(3) There are no reworked fossils in the Mixed beds; the fossils in the Mixed beds constitute a mixed fauna consisting of Permian and Triassic types.

(4) The bed corresponding to the Mixed bed I (lowest part of Mixed beds), in which the mixed fauna with elements such as *Pseudogastrioceras*, *Otoceras* and *Pseudosageceras* occur, is considered to be missing in the Salt Range, Transcaucasia and Iran.

(5) The Mixed bed II (middle part of Mixed beds) of South China is only correlated with the lower part of the Main Dolomite Unit of the Kathwai Member (lower part of the Mianwali Formation) in the Salt Range of Pakistan.

(6) Concerning the age of the $E_1$ bed (lowest part of the Khunamun Formation), Chinese and Japanese specialists have different opinions, viz. "Lowermost Triassic and Uppermost Permian"respectively.

(7) The Chanhsingian Stage for the uppermost Permian and the Griesbachian Stage for the lowest Triassic are both preferred as the standard stage names in the Tethyan Realm; however, the standard stage name for the Pre-Changhsingian is under consideration.

# WORLD PERMO-TRIASSIC MEGAPLANT GENERA: CLASSIFICATION AND DISTRIBUTION

J.M. ANDERSON

An international co-operative project on the classification of the World Permo-Triassic megaplant genera is aimed at:

(a) To bring together in accessible standardised form the available information on the classification and distribution of World Permo-Triassic megaplant genera. Note that petrified stem genera are excluded. They mostly occur in different geological strata and are very inadequately known.

(b) To critically reassess the phytogeographic realms and provinces for the Permian and Triassic. This will be attempted at stage (± 5 million year) intervals, on the most recently available Pangaea reconstructions and based on quantitative analysis of generic distributions following a degree square grid.

(c) To assess the broad trends of evolution and colonisation followed by plant life during the unique 100 m. year Pangaeic phase of earth history. In particular to consider the extent of the biotic crisis at the Palaeozoic-Mesozoic (Permian-Triassic) boundary. To what extent can these patterns be explained by changing topography, latitude and climate?

(d) Companion volume on tetrapods. This volume is being prepared concurrently with, and follows the same format as the megaplant volume. It will appear in press about 1 year after the present volume. In it the interdependent evolutionary and biogeographic patterns observed in the terrestrial plant and animal kingdoms will be evaluated.

An outline of the contents of the project follows:

(1) Individual geological maps for each supercontinent and geological period (e.g. Gondwana Trias) showing megaplant sampling/plotting areas (regions and subregions) and phytogeographic provinces. Accompanying tables list and name the regions and subregions and qualify the latter for quantity, quality and published coverage of available collections; number of productive zones and localities; area covered by these localities.

(2) Correlation charts of world Permo-Triassic megaplant bearing horizons.

(3) Individual classified generic lists for each superregion and geological period (e.g. Southern African Trias). Each genus is qualified for reliability, organ, author and date, origin of type species, geographic and stratigraphic occurrence.

(4) Composite classified world Permi-Triassic generic list (excluding synonyms and nomina nuda) with geographic and stratigraphic occurrence of each genus.

(5) Composite alphabetical world Permi-Triassic generic list (including synonyms and nomina nuda), with authors, dates, origin of type species, organ.

(6) A series of Pangaea reconstructions attempting to illustrate the interwoven evolving distribution patterns of plant and animal life, landscape and climate.

Part I (Triassic) of the project is hoped to be completed in 1984. A copy of a more detailed outline of the project can be obtained from J.M. Anderson (address see p. 26), or from the Editor of ALBERTIANA.

# AN IMPORTANT RUSSIAN CONTRIBUTION TO TRIASSIC PALAEOBOTANY

M. BOERSMA

Review of: I.A. DOBRUSKINA, 1982. Triassic Floras of Eurasia. Transactions Acad.Sci.USSR, Geol.Inst., 356: 196 pp. "Nauka", Moscow (in Russian, with Latin index and English contents).

This important publication is without any doubt an essential prerequisite for palaeobotanists working on Triassic megafossil floras. The book consists of three parts. Part I deals with the distribution of Eurasian Triassic floras in space and time. In part II lists are presented of described and figured plant remains from the Triassic of Eurasia. In part III some of the major form genera and species of the Russian Triassic are described.

The extensive bibliography comprises some 500 references, among which 170 papers and books in Russian. It seems that the manuscript was completed relatively long before the year of publication, since only 50 of the references cited have been published after 1975.

The work includes 24 full-page Plates of standard to good quality with numerous photographs of the taxa described in part III, mainly *Pleuromeia*, *Ferganodendron*, *Scythophyllum* and *Vittaephyllum*. Given the title of the book, a broader scope of illustrations would have added to its already high value.

The Latin index of fossil plant genera and species provides with a survey of the plant kingdom as fossilized in the Eurasian Triassic. Some omissions may be observed, e.g. *Persicopteris* and *Scalaroxylon*.

The palaeogeographic, stratigraphic and taxonomic information is elucidated by 8 Tables and 28 Figures.

In Table 1 the floras known up to the present from the relevant geographical regions are placed according to their chronostratigraphical position. In Table 2 the main biostratigraphical units of Upper Permian, Triassic and Lower Jurassic are compared with the chronostratigraphical time-scale. In Table 3 the stratigraphic position is given of important fossil plant localities within the "Buntsandstein", East of the river Rhine. Table 4 shows the stratigraphical and geographical position of important localities of fossil plant remains within the "Keuper". In Tables 5-7 revisions are given of some plant remains from the Basel region, northern Switzerland, Raibl and Lunz, respectively. In Table 8 a survey is given of the plants recognized so far from the Mal'tsevsk suite in the Kuzbass.

Figure 1 gives information on the relative proportion of the eight major plant groups within the important Eurasian plant fossil deposits in the Norian/Rhaetian and Ladinian/Carnian. The Figures 2-6 and 16-25 provide with the geographical position of the main Triassic plant localities within Eurasia and the remaining part of the world. In the Figures 7-15 and 26-28 schematical drawings are given of relevant plant megafossils. Emphasis is given on the intraspecific variability within taxa, e.g. *Pleuromeia*, *Maria*, *Kalantarium*.

The work deserves a quick translation in one of the western languages to make it easier accesible for those palaeobotanists not familiar with Russian. It may be expected that future revised editions will cope with the bibliographic and taxonomic omissions, inevitably linked with a work on a king-size topic like the Triassic floras of Eurasia. We owe Dr. Dobruskina a lot for this magnificent contribution to the study of megafossil plant reamins.

# LADINIAN - CORDEVOLIAN PALYNOSTRATIGRAPHY OF THE WESTERN DOLOMITES

J.G.L.A. VAN DER EEM

Abstract of unpublished doctorate thesis (1982), based on investigations carried out at the Laboratory of Palaeobotany and Palynology, Utrecht, to be published in the Review of Palaeobotany and Palynology (1983) under the title "Aspects of Middle and Late Triassic Palynology. 6. Palynological Investigations in the Ladinian and Lower Karnian of the Western Dolomites, Italy". (A limited number of copies of the original thesis is still available from the Laboratory of Palaeobotany and Palynology; contact the Editor of ALBERTIANA).

A palynostratigraphical investigation in the Buchenstein Group, the Wengen Group, the San Cassiano Formation and the Raibl Group of the Western Dolomites has resulted in a palynological characterization of the Ladinian Stage and the Cordevolian Substage of the Karnian in the classic type-region of these units of Triassic chronostratigraphical subdivision.

Seven successive phases, each recognized on the basis of patterns in the gradual income and disappearance of palynological taxa can be used for characterizing the chronostratigraphical classification units with an accuracy of at least the Substage-level: the *thiergartii-vicentinense* phase (Upper Anisian, Illyrian Substage), the *plurianulatus-novimundanus* phase and the *plurianulatus-secatus* phase (Lower Ladinian ; approximately Fassanian Substage), the *secatus-dimorphus* phase and the *secatus-vigens* phase (Upper Ladinian, approximately Longobardian Substage), the *vigens-densus* phase (Lower Karnian, Cordevolian Substage) and the *densus-maljawkinae* phase (Middle Karnian, Julian Substage).

A palynological concept of the Ladinian and Cordevolian is reasonably in agreement with the classic concept of the units. Boundaries, however, do not coincide with lithostratigraphical boundaries. It remains difficult to correlate the palynological information with alternative concepts based on ammonoid zonation outside the type-region of the Ladinian. Palynostratigraphically it is unrealistic to consider the Cordevolian to be a synonym of the Julian.

Quantitative analyses suggest arid climatic conditions. Local humid environments progressively increased during the Ladinian but gradually disappeared during the Cordevolian. Local humid environments may explain the occurrence of southern (Gondwana) elements in the assemblages.

The following new taxa and new combinations are formally introduced: *Bocciaspora* nov.gen., *Sellaspora* nov.gen., *Gordonispora* nov.gen., *Lycopodiacidites* nov.spec., *Sellaspora rugoverrucata* nov. spec., *Sellaspora foveorugulata* nov.spec., *Kyrtomisporis ervii* nov.spec., *Bocciaspora blackstonensis* (De Jersey) nov.comb., *Gordonispora fossulata* (Balme) nov. comb., *Gordonispora lubrica* (Orłowska-Zwolińska) nov. comb., *Weylandites magmus* (Bose et Kar) nov.comb., *Partitisporites tenebrosus* (Scheuring) nov. comb., *Partitisporites maljawkinae* (Klaus) nov. comb., and *Partitisporites quadruplicis* (Scheuring) nov.comb. . The morphon concept is applied to informally unite morphologically closely related species within the group of the Circumpolles.

# SCIENTIFIC MEETING ON TRIASSIC EVAPORITES, NANCY, 16 - 17 NOVEMBER 1982.

G. BUSSON

A scientific meeting was organized by the Laboratoires de Géologie Sédimentaire of the University of Nancy, France. The main topic of the meeting was "Le Trias évaporitique de France et des pays limitrophes". The following 17 papers were presented:

G. Busson: Le Trias en tant que formation salifère.

A. Baud & J. Mégard-Galli: Stratigraphie et paléogéographie du Trias des Alpes occidentales et nord-occidentales. Le problème des évaporites.

N. Vatin-Pérignon: Volcanisme basaltique alcalin triasique et environnement sédimentaire (Massif des Écrins, Pelvoux - Alpes francaises).

D. Giesler: Le Muschelkalk moyen évaporitique de Lorraine. Données géométriques, sédimentologiques et géochimiques.

M.-C. Adloff, J. Doubinger & D. Geisler: Études palynologiques dans le Muschelkalk moyen de Lorraine: aspects stratigraphiques et paléoécologiques.

F. Recroix: Un bassin marginal sur la bordure cévenole: la région d'Alès (Gard).

C. Appia-Lamache: Le Trias évaporitique du bassin du Sud-Est de la France. Étude des forages pétroliers profonds et des sondages miniers de la bordure du Massif Central.

L. Courel, M. Durand & M.-J. Lienhardt: Les différents épisodes évaporitiques du Trias du Sud-Est de la France. Inventaire et essai de réflexion sur la position des évaporites dans l'espace et dans le temps.

F. Orti Cabo: Sur les conditions de dépôt, la diagenèse et la structure des évaporites triasiques dans l'Est de l'Espagne.

R. Curnelle: Approche tectono-sédimentaire du Trias d'Aquitaine.

B. Moine: La composition géochimique des insolubles dans le Trias évaporitique.

M.H. Ben Ismaïl: Les évaporites du Trias et du Lias - Dogger inférieur du Sud tunisien à la lumière des données de sondages (y compris les plus récentes) et de l'étude des affleurements.

Y. Besnus: Étude géochimique et métallogénique sur des faciès "marnes noires" du Trias du SE du Massif Central (France).

V. Perthuisot & H. Rouvier: Minéralisations de Pb-Zn à la périphérie de diapirs à matériel triasique.

C. Marchal: Gémétrie du gite évaporitique keupérien de Lorraine - Champagne. Application à la reconnaissance de l'évolution paléogéographique du bassin de sédimentation.

M. Herry: Corrélations diagraphiques dans le Keuper évaporitique de Bresse. Rapports et différences avec la Lorraine et la Champagne.

J. Gérard: Trias évaporitique de la Mer du Nord méridionale. Paléogéographie et évolution séquentielle.

The text of the papers will be published in an issue of the periodical "Sciences de la Terre" (Nancy).

# ANNOTATED TRIASSIC LITERATURE, 1983, 1

M. BOERSMA

Under this heading new relevant literature on the Triassic research received by the editor or the secretary general of the S.T.S. will be briefly annotated.

Brugman, W.A., 1983. Aspects of Early and Middle Triassic palynology. 1. On *Dyupetalum vicentinense* nov. sp. from the Upper Anisian of the Southern Alps. Review Palaeobot. Palynol. 39: 47-64, 2 figs., 6 pls. (with English and Italian summaries).

Pollen grains are described and figured of *Dyapetalum* Jansonius et Hills, 1979 emend. Brugman. The morphology, taxonomy, the stratigraphical and geographical distribution of the new species *D. vicentinense* are extensively discussed.

Conway, B.H. & Cousminer, H.L., 1983. Transfer of *Sarjeantia triassica* (Dinophyceae) to *Aratrisporites fimbriatus* (Sporites, Monoletes). Grana, 22(1): 35-38, 2 figs. (with English summary).

*Sarjeantia triassica* Horowitz, 1975 (Dinophyceae) from the Lower Saharonim Formation (Anisian-Ladinian) in Zohar 8 borehole, southern Israel, shows a morphology representative of *Aratrisporites fimbriatus* (Klaus, 1960) Playford & Dettmann, 1965 (Sporites, Monoletes).

Gaździcki, A., 1983. Foraminifers and Biostratigraphy of Upper Triassic and Lower Jurassic of the Slovakian and Polish Carpathians. Palaeontologia Polonica, 44: 109-169, 21 figs., 15 pls. (with English and Polish summaries).

Benthonic foraminifer assemblages have been studied that are related to lagoon areas and biostromal elevations in shelf zones with predominating carbonate sedimentation. In taxonomic composition and stratigraphic distribution the assemblages do not differ from contemporaneous assemblages known from other parts of the Tethys realm. A sequence of three foraminifer zones is recognized. This zonation is correlated with standard ammonoid and conodont zonations. Evolutionary trends in Involutinidae and Ammodiscidae are analysed.

Gaździcki, A. & Stanley Jr., G.D., 1983. First report of Involutinidae (Foraminifera) in marine Triassic rocks of North America. N.Jb.Geol.Paläontol. Monatsh., 2: 80-90, 6 figs. (with English and German summaries).

Tethyan assemblages in Middle Triassic deposits of Nevada (western North America) require a reevaluation of Middle Triassic paleobiogeography.

Grauvogel-Stamm, L. & Duringer, P., 1983. *Annalepis zeilleri* Fliche 1910 emend., un organe reproducteur de Lycophyte de la Lettenkohle de l'Est de la France. Morphologie, spores in situ et paléoécologie. Geol.Rundschau, 72 (1): 23-51, 5 figs., 6 pls. (with German, English, French and Russian summaries).

Dispersed lycopsid sporophylls attributed to the Lepidodendrales are described from the middle part of the Lettenkohle of Wasselonne (Bas-Rhin, France). The extracted microspores and megaspores are assigned to the genera *Aratrisporites* Leschik and *Tenellisporites* Potonié, respectively.

The large distribution of the spores shows the world-wide occurrence of Lycophytes, especially the lepidodendralean stock. The described remains witness the permanent settlement of a swampy terrestrial flora at the border of a marine environment after an intertidal phase.

Jafar, S.A., 1983. Siginificance of Late Triassic calcareous Nannoplankton from Austria and Southern Germany. N.Jb.Geol.Paläontol.Abh., 166(2): 218-259, 12 figs (with German and English summaries).

A rich nannoflora is recorded mainly from the Norian and Rhaetian (*Rh. suessi* and *Ch. marshi* ammonoid zones) of the eastern Alps. 4 Genera, 10 species and 5 subspecies are newly described. Using combined light and scanning electron microscopic technique, nannofossils incertae sedis and genuine coccoliths are recognized. Implications on current Jurassic zonation are discussed with reference to a few evolutionary lineages across the Triassic-Jurassic boundary. Abundant remains of possible calcareous bacteria are documented.

Schäfer, P. & Senowbari-Daryan, B., 1983. Die Kalkalgen aus der Obertrias von Hydra, Griechenland (The calcareous algae of the Upper Triassic of Hydra, Greece). Palaeontographica, B, 185(4/6): 83-142, 8 figs, 10 pls., 1 table (with English and German summaries).

Calcareous algae have been studied from the Upper Pantokrator Limestones (Karnian to Rhaetian). The heterogenous carbonate complex is described and interpreted as being composed of basin, marginal platform and extended platform deposits. The reconstruction of the depositional environment shows a progradation of the platform margin towards the South. The algae (Cyanophyta, Rhodophyta and Chlorophyta) occur in carbonates deposited in shallow water. Both Paleozoic and Mesozoic floral elements occur. The Porostromata are distinguished into 9 morphological/ecological groups and are compared with recent Cyanophyta and Chlorophyta. Several new taxa have been described and figured.

Zapfe, H. (ed., 1983). Neue Beiträge zur Biostratigraphie der Tethys-Trias/ New contributions to the Biostratigraphy of the Tethyan Triassic. Österr. Akad. Wiss. Schriftenr. erdwiss. Komm., 5: 1-294, numerous figs., pls. and tables.

This important volume contains 13 papers plus an introduction and a final report on the research project "Triassic of the Tethys Realm" (IGCP Proj.4) by the editor. The papers and the final report will be dealt with separately in alphabetical sequence:

(1) Balogh, K., Dobosi, K., Góczán, F., Haas, J., Oravecz, J., Oravecz-Scheffer, A., Szabó, I. & Végh-Neubrandt, E. Report on the Activities of the Triassic Working Group in Hungary. In: Zapfe, H. (ed., 1983): 17-36, 8 figs.

Triassic sediments have been studied in the Transdanubian Central Mountains and in Northern Hungary. Important new information has been obtained with regard to the Permian/Triassic boundary in marine facies. In the Hungarian part of the "South Gemerides" a new elaboration on a scale 1 : 10.000 is going on. The investigation is in an initial stage.

(2) Besems, R.E. Aspects of Middle and Late Triassic Palynology. 3. Palynology of the Hornos-Siles Formation (Prebetic Zone, Province of Jaén, Southern Spain), with additional information on the macro- and microfaunas. In: Zapfe, H. (ed., 1983): 37-56, 3 figs., 3 pls., 4 tables (with English, German and Spanish summaries).

The palynological assemblages belong to the *Camerosporites secatus* phase (Ladinian/Karnian). On the basis of the qualitative / quantitative distribution of xerophytic palynomorphs, as well as the faunal record, a more detailed subdivision on the substage-level has been attempted. The tectonic origin of the carbonate intercalations of the so-called "Muschelkalk" facies is demonstrated.

(3) Fallahi, M., Gruber, B. & Tichy, G. Gastropods and Bivalves from the Uppermost Part of the Nayband Formation (Upper Triassic) near Baqirabad (Esfahan, Iran). In: Zapfe, H. (ed., 1983): 57-82, 4 figs., 2 pls. (with German and English summaries).

The presence of *Monotis salinaria* (Bronn) enables a dating of the Uppermost Nayband Fm as Upper Norian. Some new species are described; viz. the gastropods *Stephanozyga binodosa* and *Purpuroidea dilopho-signata* and the bivalve *Prosogyrotrigonia iranica*. The Iranian Triassic fauna contains Alpine as well as Southeast Asian elements; the Alpine elements are more frequently represented than hitherto assumed.

(4) Gupta, V.J. Triassic Conodonts from Ladakh and Spiti. In: Zapfe, H. (ed., 1983): 83-92, 6 pls.

The recorded conodonts have a close similarity with those from the Tethys realm. Zonation based on conodonts is compared with sections rich in ammonites, bivalves and brachiopods. The conodont fauna suggests a typical Mediterranean character, i.e. the predominance of multielements of *Gladigondolella tethydis* and the occurrence of taxa characteristic of the alpine region and the Balkans.

(5) Herak, M., Sćavničar, B., Sušnjara, A., Đurđanović, Ž., Krystyn, L. & Gruber, B. The Lower Triassic of Muć - Proposal for a standard section of the European Upper Scythian. In: Zapfe, H. (ed., 1983): 93-106, 3 figs. (with English summary).

A lithostratigraphic unit in the Zmijavac valley (Muć, Mt.Svilaja, Croatia, Yugoslavia) without breaks of sedimentation and rich in fossils (ammonoids, pelecypods, gastropods, foraminifers and conodonts) is proposed as a standard section of the Upper Scythian within the Werfen facies of the Western Tethys area. Two biostratigraphic zones have been distinguished, characterized by *Tirolites cassianus* and *Tirolites carniolicus*, respectively .

(6) Kovács, S. On the evolution of *excelsa*-stock in the Upper Ladinian-Carnian (Conodonta, genus *Gondolella*, Triassic). In: Zapfe, H. (ed.,1983): 107-120, 1 fig., 6 pls. (with English summary).

The evolution of the *excelsa*-stock in the Upper Ladinian-Carnian went on in two directions. At the beginning of the Longobardian substage *G. foliata inclinata* n.subsp. evolved from *G. excelsa*. In the Upper Longobardian it branched in two directions: (1) the *G. foliata foliata - G. tadpole* line, (2) the *G. polygnathiformis* line, which continued in the Norian *G. navicula* group, *G. noah* (Hayashi, 1968) is regarded as a junior synonym of *G. polygnathiformis* Budurov & Stefanov, 1965). Three new species are described: *G. szabói*, *G. tornaënsis* and *Metapolygnatus longobardicus*.

(7) Kristan-Tollmann, E. Ostracoden aus dem Oberanis von Leidapo bei Guiyang in Südchina. In: Zapfe, H. (ed., 1983): 121-176, 8 figs., 19 pls. (with German and English summaries).

Marine ostracods are described from the Leidapo subformation (Qingyan Fm). 30 Species have been encountered, 24 of them being new. The six species already known have been found also in the European Tethys, two in sediments of Anisian age, the remaining four in younger Triassic beds. In the fauna well sculptured Bairdoppilatinae are dominant among the larger forms, and *Judahella*, *Renngartenella* and *Movschovitschia* among the small ones. It is stressed that part of the ostracods hitherto considered characteristic for the Upper Triassic no longer can be regarded such. The same holds for part of the foraminiferal fauna until now considered to be confined to the lower part of the Upper Triassic and present in this fauna of Upper Anisian age.

(8) Kristan-Tollmann, E. & Tollmann, A. Überregionale Züge der Tethys in Schichtfolge und Fauna am Beispiel der Trias zwischen Europa und Fernost, speziell China. In: Zapfe, H. (ed., 1983): 177-230, 10 figs., 14 pls., 2 tbs. (with German and English summaries).

New observations on facies, position, sequences and fauna of the Triassic in the Tethys region of southern China enable a comparison of Triassic formations and fauna in the overall Tethys realm. It is stressed that an astonishing great number of species - planctonic, benthonic and sessile - occur throughout the Tethys realm. Moreover, a lot of formations with distinct lithological characteristics and at time-equivalent levels may be found throughout the whole of this vast area. Finally, opinions on the origin of the Triassic fauna are given. On the basis of Triassic ocean-currents and other data it is concluded that British Columbia and adjacent coastal zones along the American Pacific have been the place of origin of the Triassic faunas of the Pacific, Tethys and Arctic. It is discussed along which routes the faunas reached their destination.

(9) Krystyn, L. Das Epidaurus-Profil (Griechenland) - ein Beitrag zur Conodonten-Standardzonierung des tethyalen Ladin und Unterkarn. In: Zapfe, H. (ed., 1983): 231-258, 4 figs., 8 pls. (with English summary).

From the ammonoid-controlled Hallstatt limestone sequence of Epidaurus (Greece) a conodont zonation is presented covering the Ladinian and Lower Karnian. 20 Species of platform conodonts are described, among which *Gondolella eotrammeri* n.sp. . 8 Zones have been established: 2 assigned to the Upper Anisian, 4 to the Ladinian and 2 to the Lower Karnian. Within some of the zones, subzones have been recognized. On the stage and substage level correlation between ammonoid and conodont zones has been achieved. Most of the zones are defined by the first appearance of the nominate species, only one by the extinction of a species. The Anisian-Ladinian stage boundary is defined between the *eotrammeri*- and *trammeri*-zone; the Ladinian-Karnian stage boundary between the *diebeli*- and *tadpole*-zone.

(10) Krystyn, L. & Siblik, M. *Austriellula robusta* n.sp. (Brachiopoda) from the Upper Carnian Hallstatt limestone of Timor (Indonesia). In: Zapfe, H. (ed., 1983): 259-266, 4 figs., 1 pl. (with German and English summaries).

*Austriellula robusta* n.sp. is described from an ammonoid-controlled Upper Hallstatt limestone of Timor (Indonesia). A large number of specimens has been collected. The specimens reach relatively large dimensions. The species is characterized by a remarkable difference in the convexity between pedicle and brachial valves and by high and subangular plication.

(11) Michalik, J. & Gaździcki, A. Stratigraphic and environmental correlations in the Fatra- and Norovica-Formation (Upper Triassic, Western Carpathians). In: Zapfe, H. (ed., 1983): 267-276, 4 figs. (with English summary).

Two Formations are compared: the marine Fatra-Fm which is bounded by extensive shallows in the Hronic, where the Norovica Fm originated. The informal and formal lithostratigraphical division and the most important biostratigraphical features are dealt with in detail.

(12) Siblík, M. Triassic brachiopods of the Northern Alps and their generic attributions. In: Zapfe, H. (ed., 1983): 277-286.

A review is given of the present generic assignment of the Triassic brachiopod species reported from the Northern Alps.

(13) Virgili, C., Sopeña, A, Arche, A., Ramos, A. & Hernando, S. Some observations on the Triassic of the Iberian Peninsula. In: Zapfe, H. (ed., 1983): 287-294, 2 figs. .

The main results are given of the Spanish working-group for the I.G.C.P. Project No. 4 "Triassic of the Tethys Realm":

(a) Within the Muschelkalk a Meditteranean, Iberian and Hesperian type may be distinguished according to the marine influence and the absence or number of calcareous levels.

(b) According to palynological data the basal Buntsandstein has an Upper Permian (Thuringian) age in several places of the Iberian ranges.

(c) Sedimentation and tectonics are clearly related because Triassic basins are limited by active faults related to the Hercynian and older fault systems, reactivated in these times. Some evidence has been obtained as to these faults having been active until Ladinian times because only Muschelkalk facies of Karnian age cover them without being affected.

(d) Sedimentological research has shown many different environments, from alluvial fan facies to several transitional and marine facies.

(14) Zapfe, H. Das Forschungsprojekt "Trias of the Tethys Realm" (I.G.C.P. Project No. 4). Abschlussbericht. In: Zapfe, H. (ed., 1983): 7-16.

Main object was the establishment of a Triassic time scale in the entire Tethys realm adapted to a modern level of knowledge. This time scale is compared with the Triassic stratigraphy of Canada and the USSR (Fig. 1). Many important regional studies in all countries participating in the Project and in the whole Tethys are plotted on a map (Fig. 2). From 1973 to 1982, 184 publications emanated from the Project. Numerous studies enlarged the knowledge of Triassic palaeontology. Progress has been made in the lithostratigraphical classification of the Triassic. Progress also in Triassic micro-palaeontology; especially mentioned the considerable and important palynological results. A review is given of all the activities, e.g. Workshop Meetings, invitations of scientists from Eastern Europe and developing countries for the purpose of studies at West-European Institutes.

Zhou, Zhiyan (Chow, T.Y.), 1983. *Stalagma samara*, a new podocarpaceous conifer with monocolpate pollen from the Upper Triassic of Hunnan, China. Palaeontographica, B, 185(1/3): 56-78, 7 figs., 12 pls., 1 table (with English summary).

*Stalagma samara*, gen. et sp. nov., a fertile shoot with female cones, is described and figured, together with leaves, *Desmiophyllum hunnanense* sp. nov., and unnamed male cones. The male cones contain monocolpate pollen similar to that found inside the ovules. The female cones have cone scales somewhat like those of living *Dacrydium* in having a separated epimatium and a single inverted ovule which becomes detached. The ovule, however, is flat and winged. The leaves resemble those of *Podocarpus* (sect. *Nageia*). *Stalagma* seems, in all, to be one of the oldest representatives of the Podocarpaceae. The large cone (about 5 cm long, more than 1 cm wide) supports the idea that modern podocarp cones are reduced. Hitherto, monocolpate pollen was unknown in conifers, though it is known in other gymnosperm classes.

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An extensive account of the studies of M.H. Ben Ismaïl on the Triassic evaporites of Tunesia (compare p. 19) has been published in 1982 under the title: "Le Trias et le Jurassique inférieur et moyen évaporitiques de l'extrême-sud tunisien - Étude de sondages profonds et de terrain - Synthèses paléogéographiques" (Documents du GRECO 52, Nature et genèse des faciès confinés, no. 2, XIV + 198 pp, 5 figs, 9 pls; available from GRECO 52, c/o G. Busson, address see p. 26).

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In the light of the Laboratory's role as one of the few training centres for stratigraphical palynology in Europe, and as a result of the expanding need for accurate palynostratigraphical data, the Laboratory of Palaeobotany and Palynology has become engaged in a wide range of services which assist universities, government agencies and companies in their geological research.

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