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Definition of the Pragian/Emsian Stage boundary

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The boundary for the Pragian-Emsian Stage Global Stratotype Section and Point (GSSP) in the Lower Devonian has been ratified by the ICS and the IUGS and is placed in a section at the Zinzil'ban Gorge in the Kitab State Geological Reserve, 170 km SSE of Samarkand, Uzbekistan, near the base of the Zinzil'ban Beds. The position of the boundary was selected by the Subcommission on Devonian Stratigraphy in 1989 to coincide with the level at which the phylogenetic successor to the conodont Polygnathus pireneae *appeared, that is the species then named* Polygnathus dehiscens *but in this report, because of uncertainties regarding the holotype of* Polygnathus dehiscens, *the name Polygnathus kitabicus is used because the type material for the latter came from the GSSP, although it is thought by some to be a junior synonym of* Po. dehiscens. *The evolutionary series associated with these changes has already been published. The GSSP is located very soon after a global sea level rise and the onset of changed conditions. Rich faunas of other fossil groups occur in the Zinzil'ban Formation. Several species of monograptids and several genera of brachiopods occur above the GSSP and new subspecies of dacryoconarid genera and of brachiopods occur above the GSSP. Also appearing above the GSSP level is the tabulate coral* Favosites regularissimus *which is the name-giver for the* Regularissimus *Zone widely traced in Asia. This account documents the record. Since the acceptance of this GSSP has concluded decisions on all the Devonian system, series and stage boundaries, comments are made on the problems that remain, especially those resulting from the fact that most of the GSSP's have been defined in pelagic facies, leaving outstanding their correlation into neritic and terrestrial facies where auxillary stratotypes are required to provide a better international chronostratigraphic framework for future international scientific work on the Devonian System.*

Introduction

This report describes the recommendations of the Subcommission on Devonian Stratigraphy (SDS) and International Commission on Stratigraphy (ICS) on the basal Emsian GSSP, ratified by IUGS in August 1996. This recommendation brings to a conclusion decisions on all the system, series and stage boundary GSSP's for the Devonian System: the problems that remain, particularly the establishment of auxilliary sections in neritic and terrestrial facies are discussed in a final section. The previous decisions on System, Series and Stage boundaries have been reported earlier as follows: base of Devonian and of the Lochkovian Stage (Martinsson (ed) 1977); base of the Pragian Stage (Chlupáč and Oliver 1989); base of Emsian Stage (described herein); base of Middle Devonian and the Eifelian Stage (Ziegler and Klapper 1985; Ziegler and Werner (eds) 1985); base of the Givetian Stage (Walliser and others 1995); base of the Upper Devonian and base of the Frasnian Stage (Klapper and others 1987); base of the Famennian Stage (Klapper and others 1993); base of the Carboniferous (Paproth and others 1991). There have been summary reviews by House (1988) and by Chlupáč and Oliver (1991) and, with the completion of Devonian boundary definition with this report, a full and updated report on all Devonian boundaries and their characterisation by most fossil groups is in preparation for publication in the *Courier Forschungsinstitut Senckenberg*. Since these boundaries were defined in pelagic facies, some discussion is given at the close of this contribution on the problem of standards and recommendations of auxilliary stratotypes for neritic and terrestrial facies.

As a result of discussion over a number of years, the SDS by 1989 had agreed that the most useful level for defining the base of the Emsian would be the appearance of the conodont *Polygnathus dehiscens* Philip and Jackson in the lineage *Po. pireneae* Boersma to *Po. dehiscens* (or *Po. kitabicus* as used here), the evolutionary entry of definitive characters being held to be time specific. Since the type area for the name Emsian, around Ems in Germany, is in neritic facies, a serviceable boundary could not be proposed there because of the absence of pelagic faunas which the SDS regarded as the most useful for international correlation. Although a globally useful GSSP had been proposed for the base of the Pragian in the vicinity of Prague in Bohemia, sequences in that area about the Pragian-Emsian boundary had proved unsatisfactory for proposal of a GSSP based on pelagic faunas. Though data and proposals for potential candidate sections for a GSSP for the base of the Emsian were considered from several parts of the world, only one formal submission was finally forthcoming: the Zinzil'ban Gorge section in the Kitab Geological State Reserve, Uzbekistan. This clearly demonstrates the superior nature of the Zinzil'ban sections. The type section was visited by the SDS in 1978 and subsequently by a special SDS party. It was included in field trips of the International Geological Congress, Moscow 1984, as Excursion 100, "The Middle Palaeozoic of the Southern Tien Shan" (Kim and others 1984).

The SDS has previously remarked in submissions that, for the Devonian, faunas of pelagic sequences offer the best means for internationally precise correlation. Such groups are represented in the proposed sequence. Widespread international correlation seems best facilitated by the recommended horizon and section.

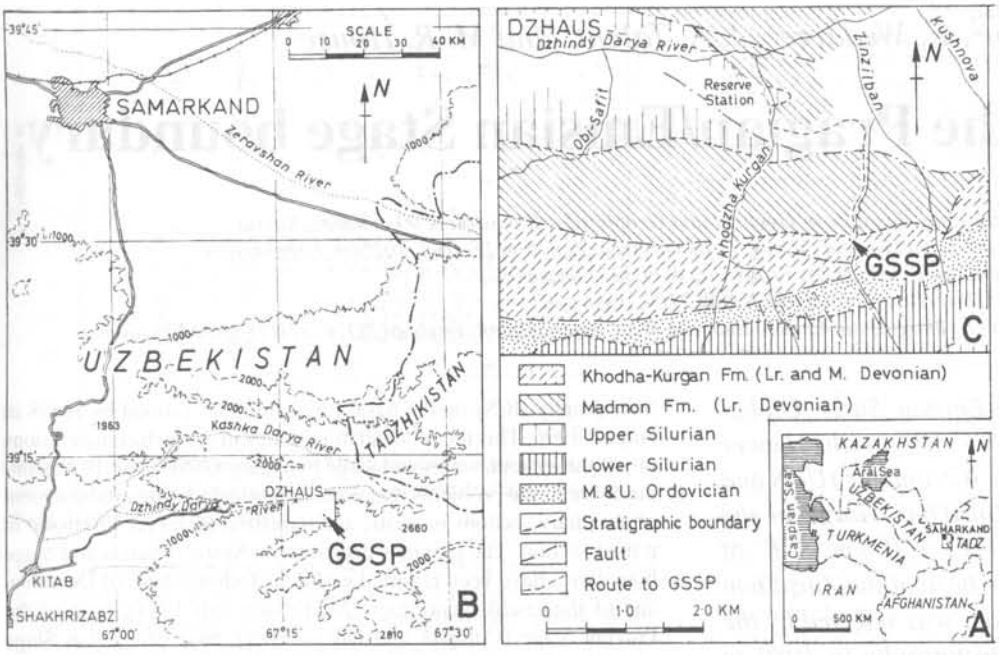

Figure 1 Maps showing the position of the Kitab State Geological Reserve in Uzbekistan (southern Tien Shan) and the position of the GSSP proposed for the base of the Emsian. Geological map modified from Kim and others, 1978.

Recommended stratotype

The approved recommendation level for the GSSP to define the base of the Emsian stage is at the base of Bed 9/5 in the Zinzil'ban Section in Uzbekistan about 170 km south-southeast of Samarkand at 67°18′20″ east and 39°12′ north. The Zinzil'ban Gorge is within the 52 km² Kitab State Geological Reserve (Zapovednik) in Uzbekistan. The location of the section is shown on Figure 1. Exposures through the proposed GSSP occur in the continuous face on the western wall of the Zinzil'ban Gorge (Figures 1-4). The succession forms part of a virtually continuous outcrop extending through most of the Lower Devonian into the early Middle Devonian.

In 1979 the Kitab State Geological Reserve was gazetted by the Uzbek Government as a reserve for the preservation of its superb geology as well as to encourage scientific research on the geology of the area. Laboratory facilities are available at the Reserve Station (Figure 1c) known as Zapovednik village for a maximum of about 40 visitors. The situation is thus ideal: blending conservation with a very positive attitude towards research. Access is easy: by plane from Moscow or Tashkent to Shakryshabz or Samarkand, then by a ca. 45 km paved road to the Zapovodnik village, from whence the section can be reached by road and pack-track, a distance of about 4km (Figure 1).

The proposed GSSP occurs in a relatively uniform sequence of dark micritic limestones characterized by lack of significant abrupt faunal change such as would support the view that major diastems are not present (Figures 2, 3). An association of benthic and pelagic facies noted above provides potential for correlation into other facies. Although noticeably thinner-bedded than the underlying Madmon Formation (Figure 2), there is no evidence of diastems within the sequences through the proposed GSSP. The suggested Global Stratotype Horizon at the base of Bed 9/5 is located 35 cm above the top of the Madmon Formation. The boundary between the Khukar and Zinzil'ban Beds at the GSSP level should not be confused with the lithostratigraphic boundary between the Madmon and Khodzha Khurgan Formations between Units 8 and 9 (Figure 3).

Beds through the boundary interval yield a mixture of benthic and pelagic organisms, thus providing potential for correlations to be made into exclusively benthic as well as exclusively pelagic faunas. Conodont data relative to the GSSP have already been published (Yolkin and others 1989, 1994); conodonts occur in relative abundance in almost all beds. Data on distribution of benthic fauna have been published (Kim and others 1984) and are summarised on Figure 3. Note that Yolkin and others (1994) paper refines the measurements and numbers of the type section used in 1978 and 1984. A considerable part of the shelly fauna has been formally documented (Kim and others, 1988).

There are minor dislocations in the massive Madmon Formation (Figure 2) well below the proposed GSSP, but the section forming the basis for the GSSP is remarkably free from structural complication. The conodonts, having a conodont alteration index (CAI) of 3.5, indicate incipient metamorphism.

On an accompanying diagram (Figure 3) the occurence of a wide range of taxa in beds above and below the GSSP is indicated. These should enable precision to be obtained by the study of other groups. It may be noted that graptolites continue a short way above the boundary; these may represent the last known occurences of the

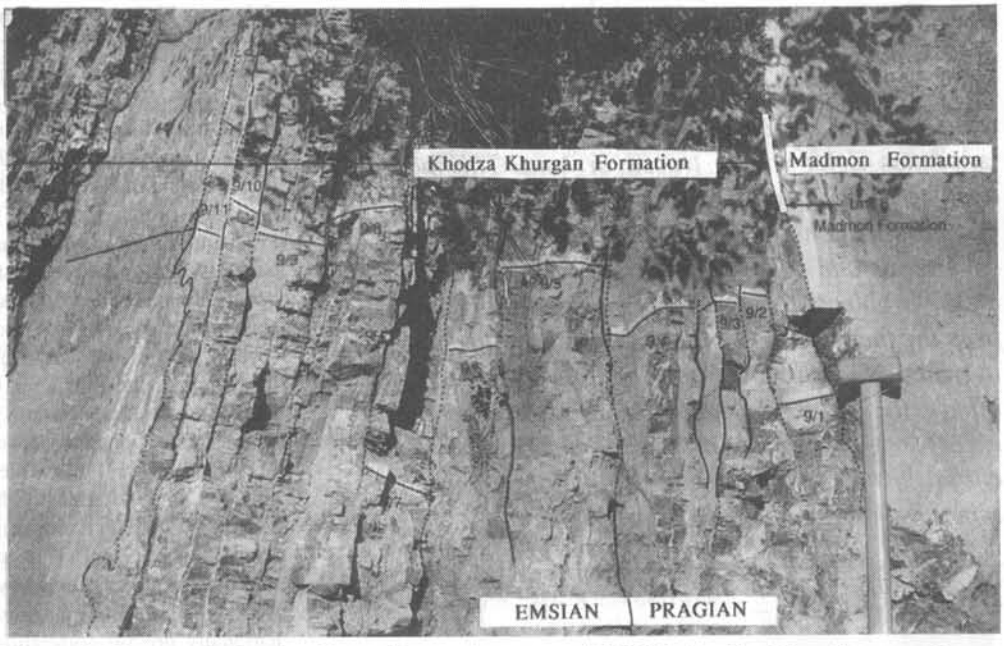

Figure 2 Photograph showing the position of the proposed GSSP in the Zinzil'ban Gorge section between Beds 95/4 and 95/5.

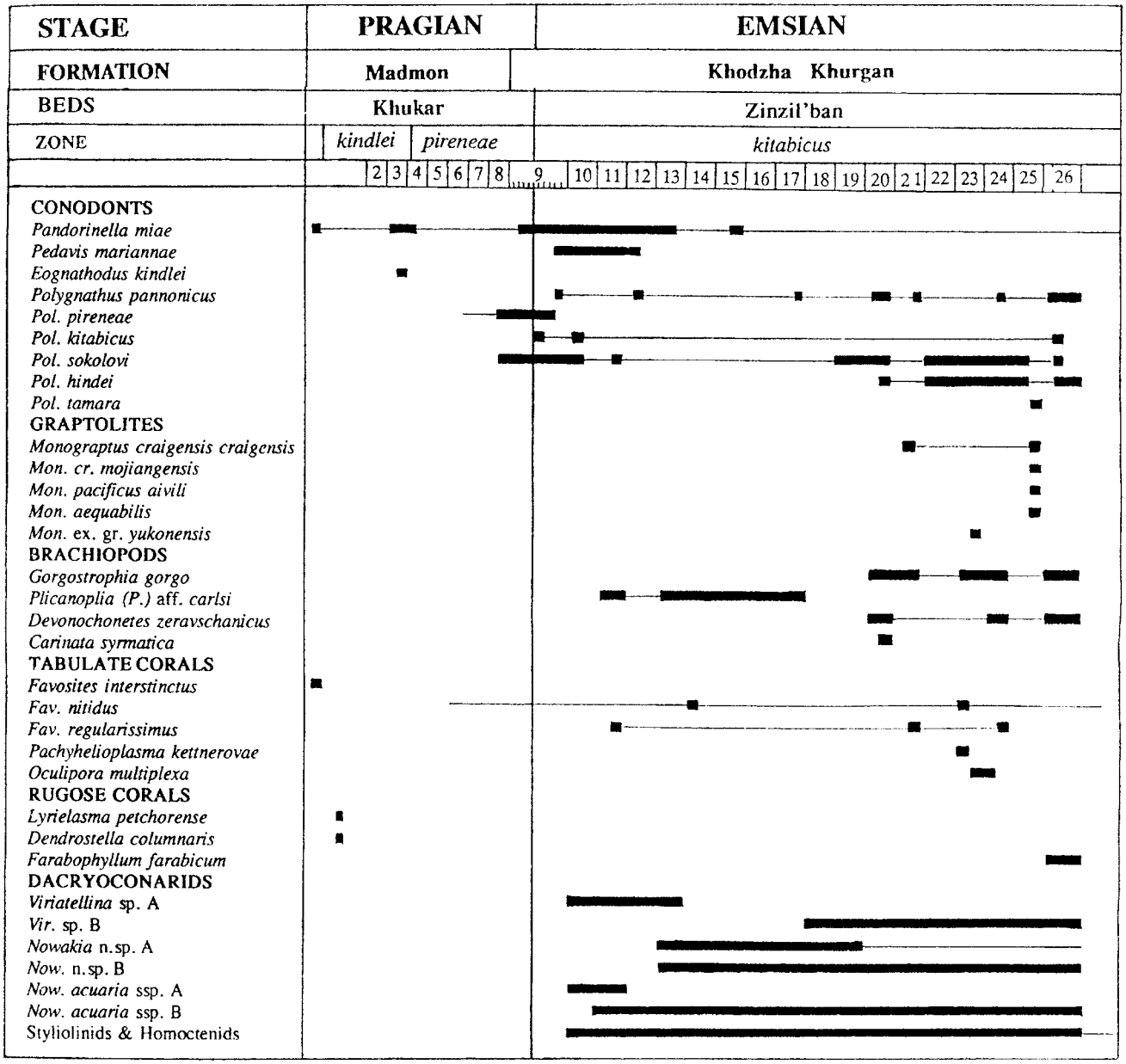

***Figure 3** Log showing the large scale section of the Zinzil'ban Gorge and the record of graptolites, brachiopods, conodonts, corals and dacryoconarids. Note that the bed numbering given in the detailed sequence presented both in the 1978 and 1984 has been revised to the numbering shown here; as a result Bed 9 goes down to the base of the Zinzil'ban Beds.*

group. Also coiled goniatites appear a little above the boundary. Very useful dacryoconarids are associated with the critical beds.

The succession is included in the folded and thrust sequences of the Tien Shan ranges. The beds are steeply inclined. Nevertheless the actual successions are readily demonstrable not only in the Zinzil'ban Gorge section, but also in the adjacent Khodzha Khurgan Gorge and there are other sections in the area. Metamorphism is slight and not untypical of that to be expected of Mid-Palaeozoic sequences.

It seems likely, however, that for magnetostratigraphy and geochronometry, most advances will come from other successions which can be correlated with the GSSP using the precise biostratigraphic tools provided by the work on the type section.

Conodont record

The critical incoming fauna for the boundary level is represented in Bed 9/5 of the Zinzil'ban section corresponding to the entry of *Polygnathus dehiscens* as determined, illustrated and published by Yolkin and others (1989, p.237-246). Following lengthy discussion at a meeting held in Washington in July 1989, the Zinzil'ban section received a majority vote; this was subsequently confirmed by an SDS postal ballot and by the ratification of the International Commission on Stratigraphy (ICS) and the IUGS.

Subsequently, because it was argued that there was some ambiguity in the definition of *Po. dehiscens*, a new specific name was proposed for a specimen from the GSSP section, *Po. kitabicus*. This was proposed to avoid any ambiguity in the defining characteristics of the critical form (Philip and Jackson, 1967, Klapper and Johnson, 1975). Although some conodont workers regard this new taxon as a subjective junior synonym of *Po. dehiscens*, *Po. kitabicus* is used in this report since it forms the basis of the only detailed published work on the GSSP section (Yolkin,Weddige and others 1994, Yolkin, Izokh and others 1994). Also, during the course of subsequent work on the section, some slight modification to the original bed numbering was adopted; attention is drawn to this is on Figure 4.

Because of the ensemble of distinctive characters, and rapid evolution, the *Po. pireneae* to *Po. kitabicus* lineage can be traced

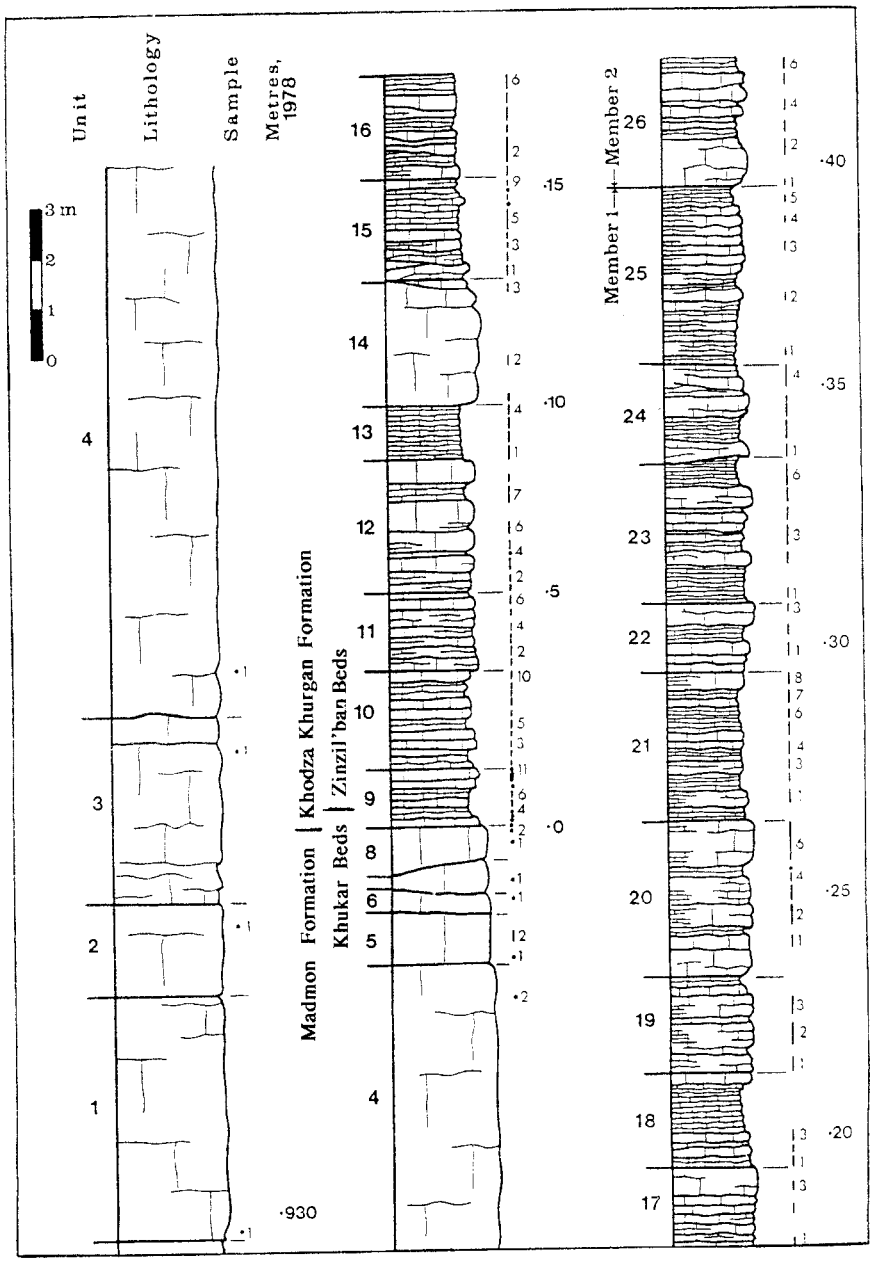

Figure 4 Lithological column of the upper part of the Madmon Formation (units 1–8) and the lower part of the Khodzha-Kurgan Formation (units 9–25). Here are indicated the conodont sampling levels (Yolkin and others 1989, 1994) and the alignment with earlier bed numbering (Kim and others 1982, 1984).

internationally with ease and the incoming of forms referable to the defining species can be readily determined. Both species are quasi-global in distribution, occuring in sequences in Spain (Boersma, 1974), Australia (Mawson, 1987; 1995; Mawson and Talent, 1994, Mawson and others, 1992), North America (Klapper and Johnson, 1975, Lane and Ormiston, 1979) and China (Hou and others, 1978) as well as central Asia in Tajikistan (Bardashev and Ziegler, 1992) and Uzbekhistan. The GSSP has a broad spectrum of other faunal elements in the succession giving the potential for documentation of other groups across the boundary although further work is needed to refine this potential.

Though there is globally a dearth of instructive or well documented sequences for the definition of the base of the *pireneae* Zone, this is of no moment for the GSSP. *Po. pireneae* occurs continuously through the critical interval, Beds 8 and 9, within which *Po.kitabicus* makes its appearance at Bed 9/5. A remarkable diversification in polygnathids (Figure 5) may prove useful in recognition of the earliest Emsian.

Brachiopod record

The brachiopods in the GSSP section enter above the boundary (Figure 3) so that a sequence is not demonstrated there. From evidence in Spain and Germany (Carls and Valenzuela-Rios 1993) it seems clear that the new level will move well-known Siegenian brachiopod faunas into the Emsian. Such incongruities between old neritic and new pelagic boundaries have been usual in the process of boundary definition for the Devonian over the years; this has emphasised the importance of establishing auxilliary stratotypes in facies other than pelagic as a next stage in the work of the SDS.

Dacryoconarid record

In current terminology the GSSP boundary lies within the Zone of *Nowakia acuaria* (Chlupáč 1995). Note that Alberti (1993) refers this species to the genus *Turkestanella*. But it is clear that there are several subspecies within the *acuaria* group which should enable a more precise chronology to be established. Ranges of new subspecies recognised in the GSSP section are given on Figure 3. Alberti (1996) has listed a succession of named subspecies of *acuaria* but their relation to the GSSP level is not clear. In Czechia, *Guerichina strangulata* and *Nowakia acuaria* cross the boundary (Chlupáč 1995) and are documented in the Stydlé vody and Mramorka sections (Weddige 1989).

Graptolite record

Monographic treatment of the graptolites from the GSSP sequence is still not available but the present records are shown on Figure 3. In the standard Barrandian section of Czechia, forms identified as *Monograptus yukonensis* range up into levels with probable *Po. dehiscens*, and queried *Monogr. atopus* and *Monogr. pacificus* are recorded with last members of *Monogr. yukonensis* at a level taken to be above the GSSP level (Chlupáč 1995). Chlupáč regards the new boundary as "basically unfortunate" and has outlined the problems of "first occurences" of *Po. kitabicus* (=*dehiscens*) which might not be coeval but this ignores the fact that definitive recognition of the boundary depends on the evolutionary sequence of *Po. pireneae* to *Po. kitabicus* (=*dehiscens*) rather than the isolated first occurence of the latter; such a sequence has not yet been demonstrated in Czechia.

Goniatite record

Goniatites are not relevant to the definition of the boundary. However, it should be noted that the entry of the first coiled ammonoids occurs with the early Emsian transgression and rather higher in the *dehiscens* Zone; the relay like replacement of the last graptolites with the entry of the first coiled ammonoids is remarkable as is their sudden international distribution (House 1996).

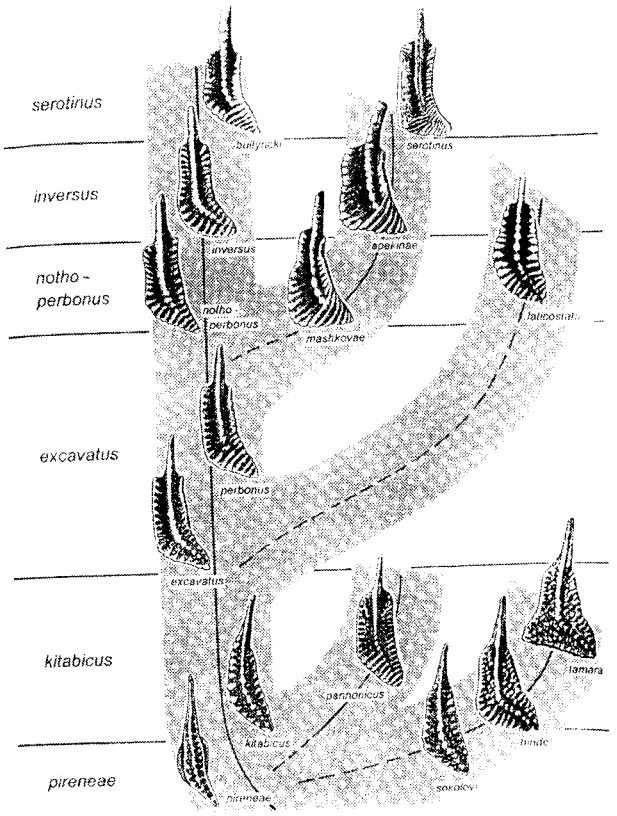

Figure 5 Diagram illustrating the evolution of polygnathid conodont taxa, and particularly the entry of Polygnathus kitabicus at the GSSP level at the boundary of the pireneae and kitabicus Conodont Zones (modified from Yolkin and others, 1994)

Geochronology

Due to the absence of volcanic or ash bands, possibilities for geochronometry are not good at the GSSP, but refined placing of the boundary level in other areas using the proposed conodont boundary give ample opportunity for this in other areas.

Magnetostratigraphy

Work on magnetostratigraphy of the section has been undertaken and is due to be published shortly.

Sequence stratigraphy

As has been already remarked, the boundary between the Madmon and Khodzha-Kurgan Formations shows a change in bedding with the entry of thin-bedded units; this is thought to correspond to a global sea-level rise which will be important when seismo-stratigraphic terminology is established in the Devonian. This level is assumed to correspond to the global eustatic rise at the base of Depophase Ib in the terminology of Johnson and others (1985). This should provide a tool for seismic stratigraphical work in other areas.

Framework for the solution of international problems in the the Devonian

The definition of GSSP's for all the system, series and stage divisions has provided a precise framework for modern geological work on all aspects of the Devonian System. The recommended boundaries, however, have all been in pelagic or near-pelagic facies. In order to stabilise international nomenclature, it is urgent that auxilliary sections are established in neritic and terrestrial facies. For some boundaries a correlation with neritic facies was well advanced at the time of decision making, but clarification of decisions by international agreement is required. The SDS has worked closely with IGCP 328 in furthering such correlations using microvertebrates (Turner and Blieck 1996), an approach which seems particularly promising, and the SDS has always encouraged palynological work. It is in these areas that progress is most likely to be made. Finally, there is the fact that, as now defined, the Famennian and Emsian stages represent substantial time divisions in the Devonian which may usefully have internationally agreed formal subdivisions.

References

Alberti, G.K.B. 1993. Dacryoconaride und homectinide Tentaculiten des Unter- und Mittel-Devons, Teil I. Courier Forschungsinstitut Senckenberg, v.158, 229pp.

Alberti, G.K.B. 1996. Reports by the Membership: G.K.B. Alberti. Subcommission on Devonian Stratigraphy, Newsletter No. 12, p. 43.

Bardashev, I.A. and Ziegler, W. 1992. Conodont biostratigraphy of Lower Devonian deposits of the Shishkat section (southern Tien-Shan, Middle Asia). Courier Forschungsinstitut Senckenberg, v. 154, 1–29.

Boersma, K.T. 1974. Description of certain Lower Devonian platform conodonts of the Spanish central Pyrenees. Leidse geologische Mededelingen, v. 49, 283–301.

Carls, P. and Valenzuela-Rios, J.I. 1993. Materials near the redefined base of the Emsian Stage. Subcommission on Devonian Stratigraphy Newsletter, No. 10, p. 30.

Chlupáč, I. 1995. Evaluation of some Devonian standard boundaries. Nova Acta Leopoldina, NF. v. 71(291), pp. 41–52.

Chlupáč, I. and Oliver, Jr., W.A. 1989. Decision on the Lochkovian-Pragian Stratotype (Lower Devonian). Episodes, v. 12, pp. 109–112.

Chlupáč, I. and Oliver, Jr., W.A. 1991. Defining the Devonian. Lethaia, v. 24, pp.119–122.

Garcia-Alcalde, J. and Truyöls-Massoni, M. 1994. Lower/Upper Emsian versus Zlichovian/Dalejan. Newsletters on Stratigraphy, v. 30, pp. 83–89.

Hou, H.F. and others (eds) 1988. Devonian stratigraphy, palaeontology and sedimentary facies of Longmenshan, Sichuan. 487 pp., 184 pls. Geological Publishing House, Beijing.

House, M.R. 1983. Devonian eustatic events. Proceedings of the Ussher Society, v. 5,pp.396–405

House, M.R. 1988. International definition of Devonian System boundaries. Proceedings of the Ussher Society, v. 7, pp. 41–46.

House, M.R. 1996. Juvenile goniatite survival strategies following Devonian extinction events. Geological Society Special Publications, No. 102, 163–185.

House, M.R., Kim, A.I., Talent, J.A. and Yolkin, E.A. 1993. Proposal for a Global Stratotype Section and Point (GSSP) for the Pragian-Emsian boundary. Subcommission on Devonian Stratigraphy Newsletter, No. 10, pp. 63–69.

Johnson, J.G., Klapper, G. and Sandberg, C.A. 1985. Devonian eustatic fluctuations in Euramerica. Geological Society of America Bulletin, v. 98, pp.138–146.

Klapper, G., Feist, R., Becker, R.T. and House, M.R. 1993. Definition of the Frasnian/Famennian Stage boundary. Episodes, v. 16, pp. 433–441.

Klapper, G., Feist, R. and House, M.R. 1987. Decision of the Boundary Stratotype for the Middle/Upper Devonian Series boundary. Episodes, v. 10, pp. 97–101.

Klapper, J. and Johnson, D.B. 1975. Sequence in conodont genus Polygnathus in Lower Devonian at Lone Mountain. Geologica et Palaeontologica, v. 9, pp. 65–83.

Kim, A.I, Elkin, E.A., Erina, M.V., Korsakov, V.S. and Tsoy, R.V. 1984. Excursion 100, The Middle Paleozoic of the Southern Tien Shan. *in* Uzbekistan Excursions: 033, 035, 088, 100. Guide-Book, International Geological Congress, XXVIIth Session, pp. 128–156.

Kim, A.I, Erina, M.V. and Yolkin, E.A. 1982. Biostratigraphy of the Lower and Middle Devonian in Central Asia. *in* Biostratigraphy of the Lower and Middle Devonian boundary deposits. Transactions of the field session of the International Subcommission on Devonian Stratigraphy, Samarkand, 1978. Leningrad, Nauka, pp. 85–92.

Kim, A.I., Yolkin, E.A., Erina, M.V. and Gratsionova, R.T. 1978. Type sections of Lower and Middle Devonian boundary beds in Central Asia. In: A Guide to Field Excursions. Field Session of the International Subcommission on Devonian Stratigraphy, Samarkand, USSR, 1978. Tashkent. 54 pp. (In Russian)

Martinsonn (ed), 1977. The Silurian-Devonian boundary. International Union of Geological Sciences (A), v. 5, E. Schweitzerbart'tsche Verlagsbuchhandlung. Stuttgart. 349 pp.

Mawson, R. 1987. Early Devonian conodont faunas from Buchan and Bindi, Victoria, Australia. Palaeontology, v. 30, pp. 251–297.

Mawson, R. 1995. Early Devonian polygnathid conodont lineages with special reference to Australia. Courier Forschungsinstitut Senckenberg, v. 182, pp. 389–398.

Mawson, R. and Talent, J.A. 1994. Age of Early Devonian submarine fan deposits and isolated megaclasts, east-central Victoria. Proceedings of the Royal Society of Victoria, v. 106, pp. 31–70.

Mawson, R., Talent, J.A., Brock, G.A. and Engelbretsen, M.J. 1992. Conodonts across the Pragian-Emsian boundary (Early Devonian) in southeastern Australia. Proceedings of the Royal Society of Victoria, v. 104, pp. 23–56.

Paproth, E., Feist, R. and Flajs, G. 1991. Decision on the Devonian-Carboniferous boundary stratotype. Episodes, v. 14, pp. 331–336.

Philip, G.M. and Jackson, J.H. 1967. Lower Devonian subspecies of the conodont *Polygnathus linguiformis* Hinde from southeastern Australia. Journal of Paleontology, v. 41, pp. 1262–1266.

Turner, S. and Blieck, A. (eds) 1996. The Gross Symposium. Modern Geology, v. 20 (3,4).

Walliser, O.H., Bultynck, P., Weddige, K., Becker, R.T. and House, M.R. 1995. Definition of the Eifelian-Givetian Stage boundary. Episodes, v. 18, pp. 107–115.

Weddige. K. 1989. The dehiscens boundary in the Barrandium. Document E presented to the Devonian Subcommission on Stratigraphy, Washington. 1 p.

Yolkin, E.A., Apekina, L.S., Erina, M.V., Izokh, N.G., Kim, A.I., Talent, J.A., Walliser, X.O.H., Weddige, K., Werner, R. and Ziegler, W. 1989. Polygnathid lineagesacross the Pragian-Emsian Boundary, Zinzil'ban Gorge, Zerafshan, USSR. Courier Forschungsinstitut Senckenberg, v. 110, pp. 237–246.

Yolkin, E.A. and Izokh, N.G. 1988. Zonalnye vidy konodontov v tipovykh vykhodakh telengitskogo nadgorizonta (devon: Salair), pp. 3-17. In: Yolkin, E.A. and Kanygin, A.V. (Eds) Fauna i stratigrafiya paleozoya Srednei Sibiri i Urala, Novosibirsk, Nauka.

Yolkin, E.A., Izokh, N.G., Sennikov, N.V., Yazikov, A.Y., Kim, A.I. and Erina, M.V.1994. Vazhneishie global'nye sedimentologicheskie i biologicheskie sobytiya devona yuzhnogo Tyan'Shanya i yuga Zapadnoi Sibiri. Stratigrafiya. Geologicheskaya Korrelyatsiya, v. 2, pp.24–31.

Yolkin, E.A., Weddige, K., Izokh, G. and Erina, M.V. 1994. New Emsian conodont zonation (Lower Devonian). Courier Forschungsinstitut Senckenberg, v. 168, pp. 139–157.

Ziegler, W. and Klapper, G. 1985. Stages of the Devonian System. Episodes, v. 8, pp. 109.

Ziegler, W. and Werner, K. (eds). 1985. Devonian Series Boundaries-results of worldwide studies. Courier Forschungsinstitut Senckenberg, v. 75, 415 pp.

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