ABOUT THE MIDDLE ASIA JURASSIC FLORA

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ABSTRACT

The Jurassic flora of Middle Asia is widely spread. In this region the deposits of the Lower part of Lower Jurassic, Upper part of Lower Jurassic, Aalenian-Bajocian and Bajocian-Bathonian containing fossil plants are known. In these Jurassic deposits the higher plants are represented by lycopods, horsetails, ferns and gymnosperms.

THE Jurassic continental deposits with fossil plants are widely spread in Middle Asia. These deposits drew attention of the investigators because of their being coal bearing.

We find the former imprints and descriptions of the Jurassic plants of Middle Asia in the "Materials for Geology of Turkestan" by G. D. Romanowsky (1878). Later some collections of Jurassic plants from Middle Asia were sent for study to the great investigator of that time, the English palaeobotanist Prof A. C. Seward (1907).

After 1920, the Jurassic flora of Middle Asia was studied by Brick (1925, 1935, 1937, 1941, 1953), Prynada (1931), and Turutanova-Ketova (1930, 1931, 1950). The attention of these investigators was drawn to the large coal deposits of Kirgizija, Tadghikistan gnd Kazakhstan.

In 1933, Prof A. N. Kryshtofovich published theoretical work "Angar formation: Baikal Group", where he summarized the Middle Asia material.

A big palaeobotanical material was collected after 1945. The leaf impressions of the Jurassic plants and the carbonic woods were studied by Genkina (1966), Gomolitzky (1961, 1962, 1964, 1965, 1969, 1974), Gomolitzky, Pavlov and Lobanova (1972), Iminov (1968), Junusov (1972, 1975, 1977), Khudaiberdyev (1961), Khudaiberdyev, Gomolitzky, and Lobanova (1971), Khudaiberdyev and Junusov (1976), Luchnikov (1967), Nematulaev and Khudaiberdyev (1968), Nikishova (1970), Sixtel (1952, 1953), and Sixtel and Khudaiberdyev (1968).

The deposits of the Lower part of Lower Jurassic (Southern Fergana, Northern Kirgizija), Upper part of Lower Jurassic (Gissar, Southern, Eastern & Northern Fergana, Northern Kirgizija), Aalenian-Bajocian (Gissar, Eastern & Northern Fergana, Northern Kirgizija) and Bajocian-Bathonian (Gissar) with fossil plants (Table 1) are known in Middle Asia.

The Middle Jurassic plants are more diversified in Middle Asia area. The Aalenian-Bajocian richest flora has 109 species, 29 of which are known only from this flora. The Bajocian-Bathonian flora is poorer than the former one in the number of species (55) but it is sufficiently characteristic, as 22 species are restricted to this flora only. The more ancient floras of the Early Jurassic have respectively 27 and 71 species, of which 9 and 11 are characteristic to them.

It is possible to draw the conclusion that more favourable conditions for the development of plants in the Jurassic period in Middle Asia were during the Aalenian-Bajocian.

The Early Jurassic flora of Middle Asia has common species with the *Thaumatopteris* Zone of Greenland (Harris, 1961a) as: *Osmundopsis plectrophora* Harris, *Phlebopteris braunii* (Goepp.) Hirm. et Hoerh., *Dictyophyllum nilssonii* (Brongn.) Goepp., *Ginkgo hermelenii* Hartz, *Sphenobaiera spectabilis* (Nath.) Florin, *Stenomischus athrous* Harris; Hettangian of Sassendorf (Kräusel, 1958, 1959) — *Phlebopteris braunii* (Goepp.) Hirm. et Hoerh., *Sphenobaiera spectabilis* (Nath.) Florin and Sinemurian of Nurnberg (Gothan, 1914) — *Anomozamites gracilis* Nath., *Nilssonia acuminata* (Presl) Goepp., *Schizolepis braunii* Schenk, *Podozamites distans* (Presl) Braun. The species *Equisetum beanii* (Bunb.) Harris, *Marattia muensteri* (Goepp.) Delle, *Coniopteris hymenophylloides* (Brongn.) Sew., *Cladophlebis argutula* (Heer) Font., *Cladophlebis suluktensis* Brick, *Pachypteris lanceolata* Brongn., *Ptilophyllum acutifolium* Morr.,

TABLE 1 – JURASSIC PLANTS FROM THE MIDDLE ASIA

STRATIGRAPHICAL DISTRIBUTION / NAME OF SPECIES	LOWER JURASSIC							MIDDLE JURASSIC		AALENIAN-BAJOCIAN				BAJOCIAN-BATHONIAN
	LOWER PART		UPPER PART											
	Southern Fergana Formation "A" of Sulyukta and Shurab, Upper horizon of Kamysh-Bashi	Northern Kirgizija Koktui Formation	Gissar Sandjar Formation	Southern Fergana Lower Shurab horizon	Eastern Fergana Kokkija Formation	Northern Fergana Sarikamish Formation	Northern Kirgizija Dzhil Formation	Southern Fergana Upper Shurab horizon	Angren Angren Formation	Gissar Gurud Formation	Eastern Fergana Tuyuc and Chaartash formations	Northern Fergana Kichkil and Tumanjak formations	Northern Kirgizija Aksaisk Formation	Gissar Degibadam Formation
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Lycopodites falcatus Lindl. et Hutt.											+			
Neocalamites carrerei (Zeill.) Halle		+		+	+		+				+		+	
Neocalamites hoerensis (Schimp.) Halle		+					+				+			
Neocalamites issykkulensis Tur.-Ket.		+					+						+	
Schizoneura ferganensis Krysht.	+										+			
Lobatannularia nordenskiolaii Krysht. et Pryn.		+		+			+	+	+		+		+	
Equisetum beanii (Bunb.) Harris				+				+	+	+	+	+	+	+
Equisetum laterale Phill.				+				+			+			
Equisetites longifolia Brick								+			+			
Annulariopsis inopinata Zeill.				+				+						
Marattiopsis hoerensis (Schimp.) H. Thomas			+	+			+				+			
Marattia muensteri (Goepp.) Dalle				+	+			+			+			+
Marattia suluklensis Gomolitzky	+													
Osmundopsis plectrophora Harris				+							+			
Todites princeps (Presl) Gothan				+	+		+			+	+		+	
Tuarella petrovii Gomolitzky														+
Klukia exilis (Phill.) Racib.											+			
Klukia westii Jacob et Shukla														+
Coniopteris angustiloba Brick				+				+		+	+			+
Coniopteris embensis Pryn.											+			+
Coniopteris ferganensis Pryn.									+	+	+			
Coniopteris fursenkoi Pryn.												+		
Coniopteris hymenophylloides (Brongn.) Sew.				+		+		+	+	+	+	+		+
Coniopteris latifolia Brick								+			+			
Coniopteris porcina Brick						+					+			
Coniopteris spectabilis Brick				+						+	+	+		+
Eboracia lobifolia (Phill.) H. Thomas				+				+	+	+	+	+		+
Gonatosorus sphenopteroides Brick	+										+			
Phlebopteris braunii (Goepp.) Hirm. et Hoerh.	+		+	+										
Phlebopteris pankratievii Gomolitzky										+				
Phlebopteris polypodioides Brongn.			+											
Clathropteris elegans Oishi						+					+			
Clathropteris obovata Oishi	+	+		+		+	+				+		+	
Dictyophyllum nilssonii (Brongn.) Goepp.		+	+											
Hausmannia forchhammeri Bartholin			+	+										
Cladophlebis aktaschensis Tur.-Ket.								+			+		+	
Cladophlebis argutula (Heer) Font.									+		+			
Cladophlebis bidentata Tur.-Ket.							+						+	
Cladophlebis concina (Presl) du Toit.				+										
Cladophlebis crenata Font.														+
Cladophlebis delicatula Yabe et Oishi				+				+						
Cladophlebis denticulata (Brongn.) Font.	+			+		+		+	+	+	+		+	+
Cladophlebis haiburnensis (Lindl. et Hutt.) Brongn.				+		+	+	+	+	+	+		+	
Cladophlebis magnifica Brick							+				+			
Cladophlebis nebbensis (Brongn.) Nath.			+	+			+	+	+	+	+		+	
Cladophlebis stenolopha Brick											+			
Cladophlebis sulcata Brick			+								+			
Cladophlebis suluetensis Brick				+			+	+			+		+	
Cladophlebis whitbiensis Brongn.				+		+	+	+	+	+	+		+	+
Pachypteris lanceolata Brongn.														+
Sagenopteris phillipsii (Brongn.) Presl.										+				+
Williamsonia haydenii Sew.										+				
Williamsoniella burakoviae Tur.-Ket.														+
Anomozamites gracilis Nath.								+						
Anomozamites minor (Brongn.) Nath.						+		+			+		+	
Anomozamites nilssonii (Phill.) Sew.								+						+
Nilssoniopteris angrenica Gomolitzky									+					
Nilssoniopteris taeniata Samyl.									+					+
Nilssoniopteris vittata (Brongn.) Florin										+				
Otozamites graphicus (Leck.) Phill.										+				+
Pterophyllum angrenica Gomolitzky									+					
Pterophyllum schenkii Zeill.										+	+			
Ptilophyllum acutifolium Morr.										+	+			+
Ptilophyllum cutchense Morr.														+
Ctenis afghanensis Jacob et Shukla														+
Ctenis angrenica Gomolitzky									+					
Ctenis constrictus Jacob et Shukla														+
Ctenis gigantea Brick										+	+			
Ctenis kirgisica Brick											+			
Ctenis samylinae Gomolitzky										+				
Cycadolepis orbicularis Gomolitzky														+
Nilssonia acuminata (Presl) Goepp.								+						
Nilssonia brevis Brongn.														+
Nilssonia compta (Phill.) Brong.										+	+			+
Nilssonia dentata Brick			+	+				+		+				
Nilssonia hissarica Gomolitzky														+
Nilssonia incisoserrata Harris										+				+
Nilssonia mediana (Leck. et Bean) Fox-Strang.								+			+			
Nilssonia minor Harris			+							+				
Nilssonia muensteri (Presl) Nath.					+						+			
Nilssonia orientalis Heer			+			+		+		+				+
Nilssonia polymorpha Schenk														+
Nilssonia princeps (Oldh. et Morr.) Sew.											+			
Nilssonia pterophylloides Nath								+						
Nilssonia schmidtii (Heer) Sew.											+			
Nilssonia serrata Pryn.				+				+	+					
Nilssonia simplex (Nath.) Makarew.					+						+			
Nilssonia vittaeformis Pryn.			+	+						+				+
Pseudoctenis lakhtajanii Gomolitzky														+
Turkelia angustifolia Gomolitzky														+
Taeniopteris asiatica Brick				+		+		+		+	+			
Taeniopteris crassinervis (Feistm.) Arber											+			
Taeniopteris ferganensis Brick				+				+		+	+		+	
Macrotaeniopteris virgulata (Zeill.) Pryn.							+			+				
Ginkgo digitata (Brongn.) Heer				+		+		+			+			

TABLE 1 — JURASSIC PLANTS FROM THE MIDDLE ASIA — *Contd.*

Stratigraphical distribution / Name of species	Lower Jurassic							Middle Jurassic		Aalenian-Bajocian				Bajocian-Bathonian
	Lower part		Upper part											
	Southern Fergana Formation "A" of Sulyukta and Shurab, Upper horizon of Kamysh-bashi	Northern Kirgizija Koktui Formation	Gissar Sandjar Formation	Southern Fergana Lower Shurab horizon	Eastern Fergana Kokkija Formation	Northern Fergana Sarikamish Formation	Northern Kirgizija Dzhil Formation	Southern Fergana Upper Shurab horizon	Angren Angren Formation	Gissar Gurud Formation	Eastern Fergana Tuyuc and Chaartash formations	Northern Fergana Kichkil and Tumanjak formations	Northern Kirgizija Aksaisk Formation	Gissar Degibadam Formation
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ginkgo hermelinii Hartz			+											
Ginkgo huttonii (Sternb.) Heer				+		+		+					+	+
Ginkgo kokinensis Gomolitzky	+													
Ginkgo lepida Heer				+			+	+	+	+	+			
Ginkgo sibirica Heer				+		+		+	+	+				+
Ginkgo suluktensis Gomolitzky	+													
Baiera ahnertii Krysht.				+					+	+	+			
Baiera concinna (Heer) Kaw.								+		+				
Baiera gracilis Bunb.				+						+				
Baiera pusilla Heer								+						
Sphenobaiera longifolia (Pomel) Florin				+				+	+		+			
Sphenobaiera paucipartita (Nath.) Florin					+									
Sphenobaiera pulchella (Heer) Florin		+		+			+	+			+			+
Sphenobaiera spectabilis (Nath.) Florin		+		+					+		+			
Czekanowskia latifolia Tur.-Ket.		+	+	+	+		+	+	+	+	+	+		+
Czekanowskia rigida Heer				+		+	+	+	+	+	+	+	+	+
Czekanowskia setacea Heer				+			+	+			+		+	
Hartzia tenuis Harris	+													
Phoenicopsis angustifolia Heer				+	+			+	+	+	+			
Eretmophyllum ketoviae Gomolitzky														
Pseudotorellia nordenskioldii (Nath.) Florin									+	+	+			
Pseudotorellia vachrameevii Gomolitzky										+				
Hissaria brickiae Gomolitzky														+
Hissaria lanceolata Gomolitzky														+
Drepanolepis turkestanica Tur.-Ket.								+		+				
Schizolepis braunii Schenk				+										
Schizolepis moelleri Sew.				+	+						+			
Swedenborgia major Harris														
Podozamites angustifolius (Eichw.) Heer		+					+							
Podozamites distans (Presl) Braun			+											
Podozamites eichwaldii Schimp.										+	+			
Podozamites lanceolatus (Lindl. et Hutt.) Schimp.		+		+	+	+	+	+	+	+	+	+	+	+
Cycadocarpidium erdmannii Nath.				+	+						+			
Ferganiella lanceolata Brick	+							+			+			
Araucariles cutchensis Feistm.										+				+
Brachyphyllum expansum (Sternb.) Sew.										+				+
Brachyphyllum mamillare Brongn.										+				+
Pagiophyllum peregrinum (Lindl. et Hutt.) Sew.													+	
Podocarpophyllum dorofeevii Gomolitzky														+
Podocarpophyllum singulare Gomolitzky									+					
Thomasiocladus zamioides (Leck.) Florin														+
Taxus harrisii Florin									+					
Torreya longifolia Gomolitzky										+				
Torreya moelleri Florin														+
Tomharrisia kurbatovii Gomolitzky										+				
Tomharrisia ramosa Florin										+				+
Storgaardia hissarensis Gomolitzky										+				
Taxocladus elongata Pryn.														+
Taxocladus oblusata Pryn.										+				
Bilsdalia anguslifolia Florin										+				
Bilsdalia dura Harris			+											
Pityocladus ferganensis Tur.-Ket.									+					
Pityocladus kobukensis Sew.	+													+
Pityophyllum nordenskioldii (Heer) Nath.		+	+	+	+	+		+		+	+	+		+
Pityospermum incakiana (Heer) Nath.										+				
Haiburnia sveshnikovae Gomolitzky				+										
Elatides falcata Heer								+			+			
Elatides kelociae Gomolitzky														+
Elatides muensteri (Schenk) H. Thomas				+				+		+				
Carpolithes cinctus Nath.	+		+	+	+		+	+	+	+				+
Carpolithes karatavicus Tur.-Ket.										+				
Carpolithes minor Pryn.							+							
Carpolithes oviformis Pryn.										+	+			
Allicospermum xystum Harris														+
Stapfidiophora secunda Harris	+													
Samaropsis reniformis Gomolitzky	+													
Samaropsis rotundata Heer				+		+								
Stenomischus athrous Harris	+													
Stenorhachis dubius Antevs				+									+	
Stenorhachis lepida (Heer) Sew.				+	+			+			+			
Stenorhachis scanicus Nath.				+				+		+				
Ginkgo asiae-mediae (Chudajb.) Chudajb.														
Protoginkgoxylon catenatum (Shultze-Mot.) Chudajb.												+		
Podocarpoxylon spicatiformis Natschokin									+					
Phyllocladoxylon gothani (Stopes) Shimakura									+					
Phyllocladoxylon choracense (Holden) Kräusel								+						
Phyllocladoxylon ferganense Chudajb.								+						
Phyllocladoxylon hexyoense Shimakura								+						
Protopodocarpoxylon araucarioides Schultze-Mot.									+					
Protopodocarpoxylon blevillense (Lign.) Eckhold								+	+					
Protopodocarpoxylon jurassicum Eckhold									+					
Protopodocarpoxylon schurabense Chudajb.								+	+					
Protophyllocladoxylon araucarioides (Holden) Kräusel									+					
Protophyllocladoxylon uzbekistanicum Jun.									+					
Circoporoxylon woburnense (Stopes) Kräusel									+					
Protocedroxylon gregussii (Shilkina) Shilkina et Chudajb.								+	+					+
Protocedroxylon holdenae (Kräusel) Shilkina et Chudajb.									+					
Protocedroxylon polyporosum (Shilkina) Shilkina et Chudajb.									+					
Protocedroxylon scoticum (Holden) Sew.								+	+					
Protocedroxylon transiens (Goth.) Eckhold								+						
Xenoxylon barberi (Sew.) Kräusel								+	+			+		+
Xenoxylon latiporosum (Gram.) Goth.								+						
Xenoxylon kopeiense Chang								+	+					
Xenoxylon sulijuclense Shilkina et Chudajb.								+						
Sahnioxylon angrenicum Chudajb. et Jun.									+					

Ptilophyllum cutchense Morr., *Nilssonia mediana* (Leck. et Bean) Fox-Strang., *Nilssonia polymorpha* Schenk, *Nilssonia vittaeformis* Pryn., *Phoenicopsis angustifolia* Heer are common for Aalenian-Bajocian floras of Middle Asia and Karach Formation of Daghestan (Vasina & Doludenko, 1968), and *Equisetum beanii* (Bunb.) Harris, *Equisetum laterale* Phill., *Klukia exilis* (Phill.) Racib., *Coniopteris hymenophylloides* (Brongn.) Sew., *Clathropteris obovata* Oishi, *Cladophlebis aktaschensis* Tur.-Ket., *Cladophlebis haiburnensis* (Lindl. et Hutt.) Brongn., *Pachypteris lanceolata* Brongn., *Anomozamites nilssonii* (Phill.) Sew., *Otozamites graphicus* (Leck.) Phill., *Nilssonia mediana* (Leck.) Fox-Strang., *Ginkgo digitata* (Brongn.) Heer, *Ginkgo huttonii* (Sternb.) Heer, *Baiera gracilis* Bunb., *Brachyphyllum mamillare* Brongn., *Bilsdalea dura* Harris — for Bajocian-Bathonian floras of Middle Asia and Yorkshire (Harris, 1961b, 1964, 1969, 1974).

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