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## *Tornacia sarjeantii*

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تابع

چکیده

*Daillydium pentaster*, *Papulogabata annulata*, *P. lobata*, *Cymatiosphaera perimembrana*, *C. radiosepta*, *Chomotriletes vedugensis*, *Deltotosoma intonsum*, *Crassiangulina tesselita*, *Tornacia sarjeantii*, *Gorgonisphaeridium ohioense*, *Unellium lunatum*, *Unellium piriforme*, and *Retispora lepidophyta*.

*Gorgonisphaeridium ohioense*, *Daillydium*

*pentaster*, *Unellium lunatum*, *Unellium piriforme*, *Tornacia sarjeantii*

*Tornacia* (LOO)

(FOO)

*T. sarjeantii* range zone

*sarjeantii*

( )

*Tornacia sarjeantii* :

;  
*Cymatiosphaera perimembrana*, *Chomotriletes*  
*vedugensis*, *Gorgonisphaeridium ohioense*,  
*Daillydium pentaster*, *Maranhites britoi*, *Unellium*  
*lunatum*, *U. piriforme*, *Tornacia sarjeantii*

.(Molyneux et al. 1996)

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.(Wicander in Molyneux et al. 1996)

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(Playford & Dring 1981; Wicander & Wood 1981;  
Vanguetaine et al. 1983; Vanguetaine 1986;  
Wicander 1984; 1986; Le Hérissé 2002; Le Hérissé  
& Deunff 1988; Vavrdová 1991; Ottone 1996;  
Higgs et al. 2002; Playford & McGregor 1993;  
Filipiak 2005; González, Playford & Moreno 2005;  
González, Moreno & Playford 2005)

(*sensu lato*)

(Martin 1985; Vanguetaine et al. 1983)

(Brito 1971; Quadros 1988; Wicander 1975)

(Jardiné et al. 1974; Streel et al. 1988)

*Tornacia sarjeantii*

(Playford 1993)

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3- Morphotypes  
4- Cosmopolitan

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1- Cyst  
2- Prasinophytes

1979; Bozorgnia 1973; Coquel et al. 1977;  
Ghavidel-Syooki 1994; 1995; Dashtban &  
Racheboeuf 2001; Hashemi & Fahimi 2006).

(Hashemi & Playford 1998

( )

.(Vanguestaine 1986, fig. 5f)

)

(

A

(Assereto & Gaetani 1964)

B-D

(Stöcklin 1972)

.(Glaus 1965; Allenbach 1966; Stepanov 1967)

( )

Gaetani (1965)

*Ptychomaletoechia elburzensis*, *P.? detidialis*, and

*Productella* zones

(Bozorgnia 1973)

(Assereto 1963)

(Alavi & Bolourchi 1973)

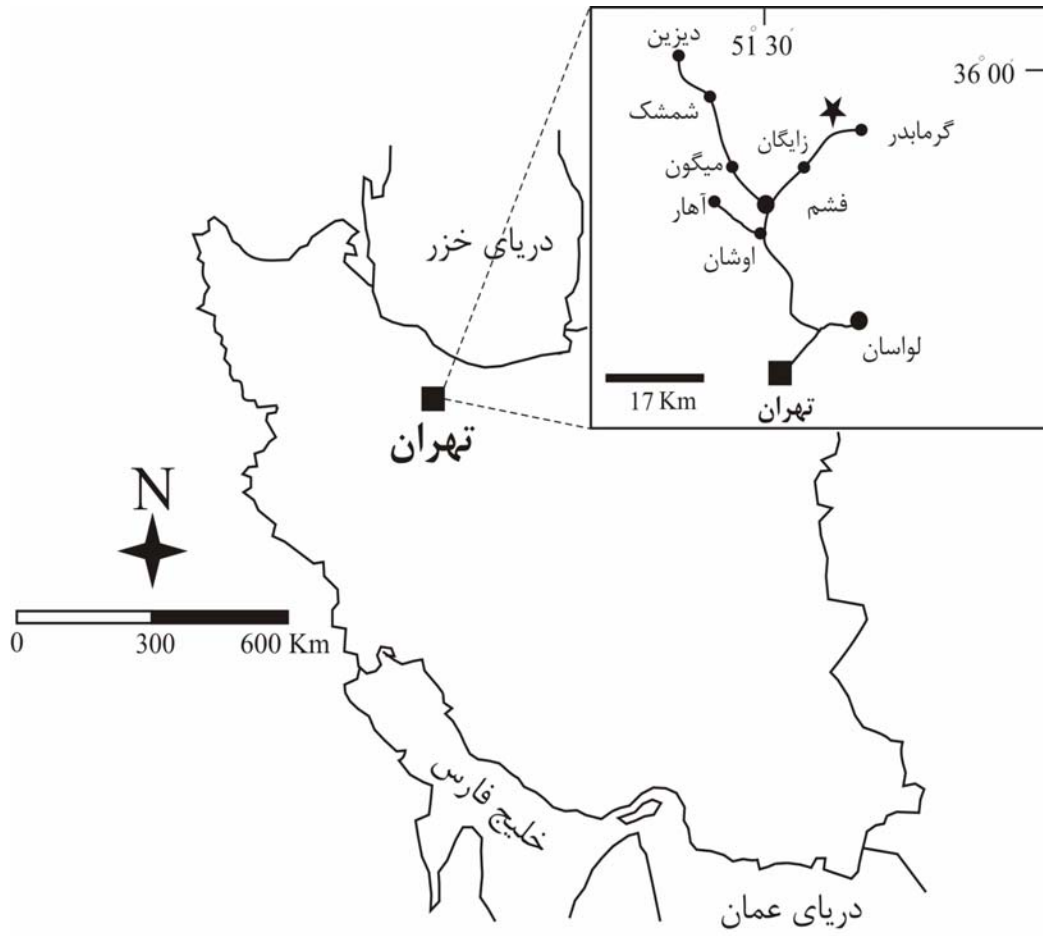
(niveau à plantes

d'âge Famennien supérieur of Sartnaer 1964)

Vanguestaine)

.( )

Gaetani 1965; Sartnaer 1964; Kimyai 1972;



★ موقعیت جغرافیایی برش چینه شناسی مورد مطالعه

(

(Traverse 2007)

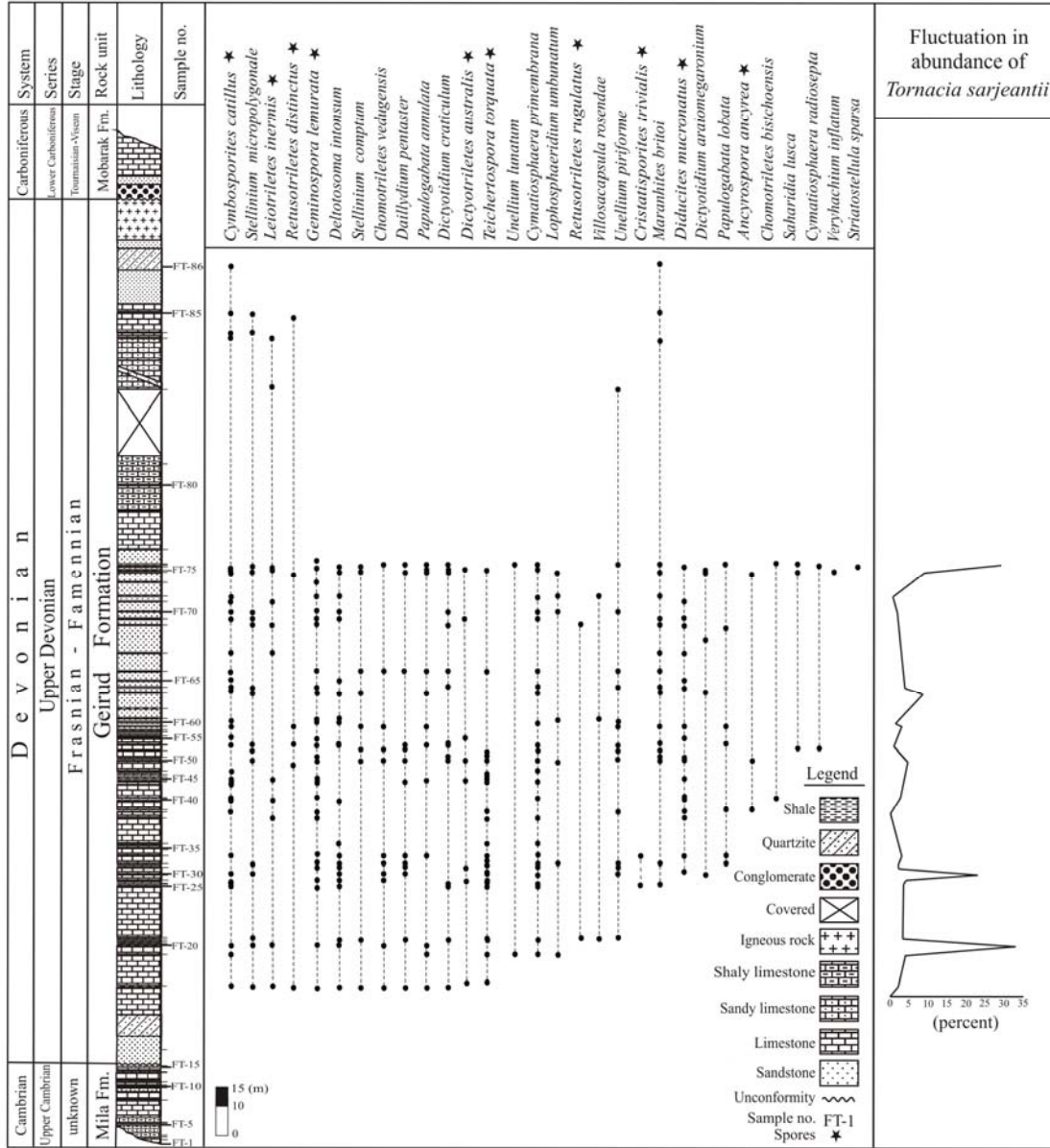
( )

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*Tornacia sarjeantii*

(LOO)

(FOO)

(Playford 1977)

HCL-HF-HCL

)

(Hashemi & Playford 1998;

(Wood et al. 1996; Traverse 2007)

)

(Molyneux et al. 1996)

(

(Wicander & Playford 1985)

) solid

*Ammonidium loriferum* (Deunff) (

) hollow

(

(Tappan 1980; Strother 1996)

*T. sarjeantii* Stockmans & Willière 1966

*T. sarjeantii*

(Plate 1)

( )

*T. sarjeantii* range biozone

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5 -Vesicle  
6 -Psilate  
7- Processes

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1 -Maceration  
2- Concentration  
3 -Long-range  
4 -Long-distance correlation

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.( )

(Ghavidel-Syooki 1994)

( )

/

.(Ghavidel-Syooki 1988)

*T. sarjeantii*

Stockmans &amp; Willière (1966)

Becker et al. (1974)

Vanguetaine (1986)

(McNestry 1988)

(Playford 1976 ; Colbath 1990)

(Gao Lianda 1986)

*Tornacia sarjeantii*

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Hashemi &amp; Playford 1998

( )

*Daillydium pentaster*, *Papulogabata annulata*, *P. lobata*, *Cymatiosphaera perimembrana*, *C. radiosepta*, *Veryhachium inflatum*, *Maranhites britoi*, *Chomotriletes vedugensis*, *C. bistchoensis*, *Deltotosoma intonsum*, *Stellinium micropolygonale*, *S. comptum*, *Unellium piriforme*, *U. lunatum*, *Lophosphaeridium umbunatum*, *Villosacapsula rosendae*, *Saharidia lusca*, *Striatostellula sparsa*, *Dictyotidium craticulum*, *D.*

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 7- Habitats

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 1- First observed occurrence  
 2- Last observed occurrence  
 3- Eilyma  
 4- Hollow  
 5- Excystment  
 6- Cyclopylome

( )  
 (Stockmans & Willière 1960 ; 1962a , b, 1969 ;  
 1974 ; Bain & Doubinger 1965 ; Deunff 1965 ;  
 1981 ; Górká 1974a , b, Vanguetaine 1978 ; 1986 ;  
 Martin 1981, 1982, Loboziak et al. 1983 ;  
 Vanguetaine et al. 1983 ; Amirie 1984 ; Higgs et  
 al. 2002 ; Le Hérissé 2002 ; González, Playford &  
 Moreno 2005)

( )  
 (Daemon 1974; Brito 1978; Pöthe de Baldis 1979)  
 ( )  
 (Jardiné et al. 1972; 1974; Streel et al. 1988)  
 (Playford & Dring 1981; Colbath 1990)  
 (Sheshgova 1971; Lu & Wicander 1988;  
 Ghavidel-Syooki 1995; Hashemi & Playford 1998)

(Vanguetaine et al. 1983; Vanguetaine 1986)  
 (Wicander 1975)

(Jardiné et al. 1974)

(Brito 1971; Quadros 1988)

.( )

(Vf: *Visbysphaera? fecunda*, Vg: *Villosacapsula  
 globosa*, Bm: *Baltisphaeridium medium*, Bb:  
*Baltisphaeridium basiconstrictum*, and Pw:  
 (I-V) *Puteoscortum williereae*)

*araiomegaronium*, *Retusotriletes distinctus*, *R.  
 rugulatus*, *Dictyotriletes australis*, *Ancyrospora  
 ancyrea*, *Teichertospora torquata*, *Geminospora  
 lemurata*, *Leiotriletes inermis*, *Diducites  
 mucronatus*, *Cymbosporites catillus*

.(Molyneux et al. 1996)

*U.*

*lunatum*, *U. piriforme*, *Daillydium pentaster*

.(Vanguetaine 1986; Streel et al. 1988)

(Staplin 1961; Playford 1977; Wicander &  
 Loeblich 1977; Wicander 1974; 1975; 1983; 1986;  
 Molyneux et al. 1984; Wicander & Playford 1985;  
 Turner 1986; 1991; Playford & McGregor 1993)

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1- Euramerica



*Horologinella,*

*Crassiangulina Umbellasphaeridium*

(Vanguetaine et al. 1983; Martin 1985)

Vanguetaine (1986) .

(Vf=I, Vg=II,

Bm+Bb=III, Pw=IV+V)

*P. B. medium, V.fecunda*

*T. sarjeantii* range biozone

*Tornacia*

*sarjeantii, williereae,*

L7

L4-L6

*Gorgonisphaeridium winslowiae*

*T. sarjeantii* range biozone

(O, P, Qs, Qi)

Solimões Maranhão

(Sl, Pl)

.(Brito 1971; Quadros 1988)

(Strunian)

O

Pl, P, Qs, Qi

*Cymatiosphaera labyrinthica, Muraticavea*

*T. sarjeantii* range biozone

*enteichia, Gorgonisphaeridium winslowiae,*

*Navifusa drosera Acriora petala*

.(Wicander 1975)

Me, Ap, Go

Cl

Illizi-Tinrhert

(L4-L7)

.(Jardiné et al. 1974)

		Stages																								
		1	2	3	4	5	6	7																		
Upper Devonian	Strunian	Famennian	<i>Tornacia sarjeantii</i>	L7	O	Sl	Nd																			
							Cl																			
							Me																			
							Ap																			
	Frasnian	<i>Tornacia sarjeantii</i>	L6	P	Pl	Go		Pw	V																	
								Bb	IV																	
								Bm	III																	
								Vg	II																	
								Vf	I																	
								L5	L4	Qi	Qs															
																	L4	Qi								
																										L4
L4	Qi																									

( Brito 1971; Quadros : (Jardiné et al. 1974) :  
 .(Vanguetaine et al. 1983; Martin 1985) : (Wicander 1975) : 1988)

(FOO)

*Tornacia sarjeantii* (LOO) )

*T. sarjeantii* range biozone

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(

( )



Alavi, M. and M.H. Bolourchi, 1973, Explanatory text of the Maku Quadrangle Map, 1: 250,000: Geological Survey of Iran, Tehran.

Allenbach, p., 1966, Geologie und petrography des Damavand und seiner Umgebung (Zentral-Elburz) Iran: Mittiel. Geolog. Inst. der Eidgen. Techn. Hochsch. Und Uni. Zurich, N. F. 63, 144 p.

Amirie, G.H.B., 1984, Phytoplankton aus dem Frasne des bergischen Landes, rheinisches Schiefergebirge: Geologisches Institut Universitaet zu Köln, Sonderveroeffentlichungen, 49, 99 p.

Assereto, R., 1963, The Paleozoic Formations in Central Elburz, Iran (preliminary note): Rivista Italiana di Paleontologia e Stratigrafia, v. 69, no. 4, p. 503-543.

Assereto, R., and M. Gaetani, 1964, Nuovi dati sul Devoniano della catena dell Imam Zadeh Hashim (Elburz Central): Rivista Italiana di Paleontologia e Stratigrafia, v. 70, no. 4, p. 631-636.

Bain, A., and J. Doubinger, 1965, Etude d'un microplancton (acritarches) du Dévonien supérieur des Ardennes: Bulletin du Service de la Carte Géologique d'Alsace et de Lorraine, v. 18, no. 1, p. 15-30.

Becker, G., M.J.M. Bless, M. Streel, and J. Thorez, 1974, Playnology and ostracode distribution in the Upper Devonian and basal Dinantian of Belgium and their dependence on sedimentary facies: Mededelingen Rijks Geologische Dienst, Nieuwe Serie, v. 25, no. 2, 38 p.

Bozorgnia, F., 1973, Paleozoic foraminiferal biostratigraphy of central and east Alborz Mountains, Iran: N. I. O. C., Geol. Labs., Publ. no. 4, 185 p.

Brito, I.M., 1971, Contribuição ao conhecimento dos microfóssies Silurianos e Devonianos da Bacia do Maranhão. V- Acritarcha Herkomorphitae e Prismatomorphitae: Anais da Academia Brasileirade de Ciências, 43 (Suplemento), p. 201-208.

Brito, I.M., 1978, *Maranhites*, um importante fóssil índice do Devoniano Superior (Acritarcha Scutellmorphitae): Boletim IG, Instituto de Geociências, Universidade de São Paulo, v. 9, p. 80-85.

Colbath, G.K., 1990, Devonian (Givetian-Frasnian) organic-walled phytoplankton from the Limestone Billy Hills reef complex, Canning Basin, Western Australia: *Palaeontographica*, Abt. B, 217 (4-6), p. 87-145.

Coquel, R., S. Loboziak, G. Stampfli, and B. Stampfli-Vuille, 1977, Palynologie du Dévonien supérieur et du Carbonifère inférieur dans l'Elburz oriental (Iran nord-est): *Revue de Micropaléontologie*, v. 20, no. 2, p. 59-71.

Daemon, R.F., 1974, Palinomorfos-Guias do Devoniano superior e Carbonífero inferior das Bacias do Amazonas e Parnaíba: *Anais da Academia brasileira de Ciências*, v. 46, no. 3 & 4, p. 549-587.

Dashtban, H., and P. Racheboeuf, 2001, First occurrence of Echinocaridid phyllocarids (Crustacea) in the Famennian of Iran: *Neues Jahrbuch für Geologie und Paläontologie*, Monatshefte, p. 58-94.

Deunff, J., 1965, Acritarches du Dévonien supérieur de la presqu'île de Crozon: *Compte Rendu Sommaire des Séances de la Société Géologique de France*, v. 5, p. 162-164.

Deunff, J., 1981, Observations préliminaires sur le paléophytoplancton de la coupe de Caffiers (Givétien-Frasnien du Boulonnais, France): *Annales Société Géologie du Nord*, v. 100, p. 65-71.

Filipiak, P., 2005, Late Devonian and Early Carboniferous acritarchs and prasinophytes from the Holy Cross Mountains (central Poland): *Review of Palaeobotany and Palynology*, v. 134, p. 1-26.

Gaetani, M., 1965, The geology of the Upper Džadjerud and Lar Valleys (north Iran). II.

Paleontology: brachiopods and mollusks from Geirud Formation, Member A (Upper Devonian and Tournaisian): *Rivista Italiana di Paleontologia e Stratigrafia*, v. 71, no. 3, p. 679-755.

Gao Lianda 1986, Late Devonian and Early Carboniferous acritarchs from Nyalam County, Xizang (Tibet), China: *Review of Palaeobotany and Palynology*, v. 47, no. 1 & 2, p. 17-30.

Ghavidel-Syooki, M., 1994, Upper Devonian Acritarchs and Miospores from the Geirud Formation in Central Alborz rang, Northern Iran: *Journal of Sciences, Islamic Republic of Iran*. v. 5, no. 3, p. 103-122.

Ghavidel-Syooki, M., 1995, Palynostratigraphy and palaeogeography of a Palaeozoic sequence in the Hassanakdar area, central Alborz Range, northern Iran: *Review of Palaeobotany and Palynology*, v. 86, p. 91-109.

Glaus, M., 1965, Die Geologie des Gebietes nördlich des Kandevean-Passes (Zentral-Elburz), Iran: *Mitteilungen Geologisches Institut Eidgenössischen Technischen Hochschule und der Universität Zürich*, v. 48, no. 4, 165 p.

González, F., C. Moreno, and G. Playford, 2005, Upper Devonian biostratigraphy of the Iberian Pyrite Belt, southwest Spain. Part. Two: organic-walled microphytoplankton: *Palaeontographica*. Abt. B, 13 (273), p. 53-86.

González, F., G. Playford, and C. Moreno, 2005, Upper Devonian biostratigraphy of the Iberian Pyrite Belt, southwest Spain. Part. One: Miospores: *Palaeontographica*. Abt. B, 13 (273), p. 1-51.

Górka, H., 1974a, Les acritarches de concrétions calcaires du Famennien supérieur de Lagów

- (Monts de Sainte Croix, Pologne): Acta Palaeontologica Polonica, v. 19, no. 2, p. 225-250.
- Górka, H., 1974b, Quelques informations sur une association d'Acritarches du Famennien de Pologne: Review of Palaeobotany and Palynology, v. 86, p. 131-135.
- Hashemi, H. and G. Playford, 1998, Upper Devonian palynomorphs of the Shishtar Formation, central Iran Basin, east-central Iran: Palaeontographica, Abt. B, 246, p. 115-212.
- Hashemi, H., and M. Fahimi, 2006, *Dictyotidium senticogremium* sp. nov., a new prasinophyte phycocyst from the Upper Devonian of northern Iran. Micropaleontology, v. 52, no. 1, p. 87-93.
- Higgs, K.T., D. Finucane, and I.P. Tunbridge, 2002, Late Devonian and Early Carboniferous microfloras from the Hakkari Province of southeastern Turkey. Review of Palaeobotany and Palynology, v. 118, p. 141-156.
- Jardiné, S., A. Combaz, L. Magloire, G. Peniguel, and G. Vachey, 1972, Acritarches du Silurien terminal et du Dévonien du Sahara algérien: Compte Rendus 7<sup>th</sup> Congrès International de Stratigraphie et de Géologie du Carbonifère, Krefeld, (1971), v. 1, p. 295-311.
- Jardiné, S., A. Combaz, L. Magloire, G. Peniguel, and G. Vachey, 1974, Distribution stratigraphique des acritarches dans le Paléozoïque du Sahara algérien: Review of Palaeobotany and Palynology, v. 18, no. 1 & 2, p. 99-129.
- Kimyai, A., 1972, Devonian plant microfossils from the central Elburz, Iran: Pollen et Spores, v. 14, no. 2, p. 187-201.
- Kimyai, A., 1979, Devonian spores from the Hassanakdar area, Iran: Pollen et Spores, v. 21, no. 4, p. 481-498.
- Le Hérisse, A., 2002, Paleocology, biostratigraphy and biogeography of late Silurian to early Devonian acritarchs and prasinophycean phycocysts in well A161, Western Libya, North Africa: Review of Palaeobotany and Palynology, v. 118, p. 359-395.
- Le Hérisse, A., and J. Deunff, 1988, Acritarches et prasinophytes (Givetien supérieur-Frasnien moyen) de Ferques (Boulonnais-France). In: D. Brice, (Ed.): Le Dévonien de Ferques, Bas-Boulonnais (N. France), Biostratigraphie du Paléozoïque, v. 7, p. 103-152.
- Loboziak, S., M. Streel, and M. Vanguetaine, 1983, Miospores et acritarches de la formation d'Hydrequant (Frasnien supérieur à Famennien inférieur) Boulonnais, France. - Annales de la Société Géologique de Belgique, v. 106, no. 1, p. 173-183.
- LU Li-Chang and E.R. Wicander, 1988, Upper Devonian acritarchs and spores from the Hongguleleng Formation, Hefeng District in Xinjiang, China: Revista Española de Micropalaeontologia, v. 20, no. 1, p. 109-148.
- Martin, F., 1981, Acritarches du Famennien inférieur à Villers-sur-Lesse (Belgique): Institut royal des sciences naturelles de Belgique, sciences de la terre, Bulletin, v. 52, no. 2, p. 1-49.
- Martin, F., 1982, Acritarches et chitinozoaires de la partie supérieure du Frasnien dans un affleurement au nord immédiat de Frasnes (Belgique): Institut royal des sciences naturelles de Belgique, sciences de la terre, Bulletin, v. 54, no. 2, p. 1-17.

Martin, F., 1985, Acritarches du Frasnien supérieur et du Famennien inférieur du bord méridional du Bassin de Dinant (Ardenne belge): Institut royal des sciences naturelles de Belgique, sciences de la terre, Bulletin, v. 55, no. 7, p. 1-57.

McNestry, A., 1988, The palynostratigraphy of two uppermost Devonian-Lower Carboniferous borehole sections in South Wales: Review of Palaeobotany and Palynology, v. 56, no. 1& 2, p. 69-87.

Molyneux, S.G., A. Le Hérisse, and R.E. Wicander, 1996, Paleozoic plankton. In: J. Jansonius, and D.C. McGregor, (Eds.): Palynology: principles and applications, v. 2, chapter 16, p. 493-529. American Association of Stratigraphic Palynologists Foundation.

Molyneux, S.G., L.M. Walter, and B. Owens, 1984, Preliminary account of Late Devonian palynomorph assemblages from the Bedford Shale and Berea Sandstones formations of central Ohio, U.S.A.: Journal of Micropalaeontology, v. 3, no. 2, p. 41-51.

Ottone, E.G., 1996, Devonian palynomorphs from the Los Monos Formation, Tarija Basin, Argentina: Palynology, v. 20, p. 105-155.

Playford, G., 1976, Plant microfossils from the Upper Devonian and Lower Carboniferous of the Canning Basin, Western Australia: Palaeontographica, Abt. B, 158 (1-4), p. 1-71.

Playford, G., 1977, Lower to Middle Devonian acritarchs of the Moose River Basin, Ontario: Bulletin of the Geological Survey of Canada, 279: 87 p.

Playford, G., 1993, Miospores and organic-walled microphytoplankton characteristic of strata contiguous with the Devonian-Carboniferous

boundary: Compte Rendu 12<sup>th</sup> Congrès International Stratigraphie et Géologie du Carbonifère, Buenos Aires (1991), v. 1, p. 127-160.

Playford, G., and R.S. Dring, 1981, Late Devonian acritarchs from the Carnarvon Basin, Western Australia: Special Papers in Palaeontology, v. 27: 78 p.

Playford, G., and D.C. McGregor, 1993, Miospores and organic-walled microphytoplankton of Devonian-Carboniferous boundary beds (Bakken Formation), southern Saskatchewan: a systematic and stratigraphic appraisal: Bulletin of the Geological Survey of Canada, v. 445, 107 p.

Pöthe de Baldis 1979, Acritarcos y quitinozoos del Devonico superior de Paraguay: Palinologia, número extraordinario, 1, p. 161-177.

Quadros, L.P., 1988, Zoneamento bioestratigráfico do Paleozóico inferior e médio (seção marinha) da bacia do Solimões: Boletim de Geociencias da Petrobrás, v. 2, p. 95-109.

Sartenaer, P., 1964, Découverte d'un niveau a plantes d'âge Famennien supérieur dans l'Elburz central (Iran). Rivista Italiana Paleontologia e Stratigraphia, v. 70, no. 4, p. 651-655.

Staplin, F.L., 1961, Reef-controlled distribution of Devonian microplankton in Alberta: Palaeontology, v. 4, no. 3, p. 392-424.

Stepanov, D.L., 1967, Carboniferous stratigraphy of Iran : Compte Rendu 6<sup>th</sup> Congrès International Stratigraphie et Géologie du Carbonifère, Sheffield (1967), v. 4, p. 1505-1518.

Stöcklin, J., 1972, Iran central, septentrional et oriental. In: Lexique stratigraphique international, III, (9b/1), 283 p.

Stockmans, F., and Y. Willière, 1960, Hystriosphères du Dévonien belge (Sondage de l'Asile d'aliénés à Tournai): *Senckenberg Lethaea*, v. 41, p. 1-11.

Stockmans, F., and Y. Willière, 1962a, Hystriosphères du Dévonien belge (Sondage de l'Asile d'aliénés à Tournai): *Bulletin de la Société belge de géologie, de paléontologie et h'ydrologie*, v. 71, no. 1, p. 41-77.

Stockmans, F., and Y. Willière, 1962b, Hystriosphères du Dévonien belge (sondage de Wépion) : *Bulletin de la Société belge de géologie, de paléontologie et h'ydrologie*, v. 71, no. 1, p. 83-99.

Stockmans, F., and Y. Willière, 1966, Les acritarches du Dinantien du sondage de l'Asile d'aliénés à Tournai, Belgique: *Bulletin de la Société belge de géologie, de paléontologie et h'ydrologie*, v. 74, no. 2, p. 462-477.

Stockmans, F., and Y. Willière, 1969, Acritarches du Famennien inférieur: *Académie royal des sciences, des letters et des beaux artes de Belgique, Classe des sciences, Mémoires*, v. 38, no. 6, 63 p.

Stockmans, F., and Y. Willière, 1974, Acritarches de la "Tranchée de Senzeille" (Frasnien supérieur et Famennien inférieur): *Académie royal des sciences, des letters et des beaux artes de Belgique, Classe des sciences, Mémoires*, v. 41, 79 p.

Streel, M., F. Paris, W. Riegel, and M. Vanguestaine, 1988, Acritarch, chitinozoan and spore stratigraphy from the Middle and Late Devonian of northeast Libya. In: A. El-Arnauti, B. Owens, & B. Thusu, (Eds.): *Subsurface palynostratigraphy of northeast Libya*: Garyounis

University Publication, Benghazi (Libya), p. 111-128.

Strother, P.K., 1996, Acritarchs. In: J. Jansonius and D.C. McGregor (Eds.). *Palynology: principles and applications*, v. 1, no. 5, p. 81-106. American Association of Stratigraphic Palynologists Foundation.

Tappan, H., 1980, *The paleobiology of plant protists*: Freeman, San Francisco, 1028 p.

Traverse, A. 2007, *Paleopalynology*. 2<sup>nd</sup> edition. Springer, the Netherlands, 813 p.

Turner, R.E., 1986, New and revised acritarch taxa from the Upper Devonian (Frasnian) of Alberta, Canada: *Canadian Journal of Earth Sciences*, v. 23, no. 5, p. 599-607.

Turner, R.E., 1991, New acritarch taxa from the Middle and Upper Devonian (Givetian-Frasnian) of Western Canada: *Canadian Journal of Earth Sciences*, v. 28, no.9, p. 1471-1487.

Vanguestaine, M., 1978, Acritarches du Famennien supérieur du sondage de Tohogne (Belgique) et corrélation biostratigraphique transcontinentale: *Palinologia*, numéro extraordinario, 1, p. 481-489.

Vanguestaine, M., 1986, Progress récents de la Stratigraphy par Acritarches du Cambro-Ordovicien d'Ardenne, d'Ireland, d'Angleterre, du pays de Galles et de terre-Neuve oriental: *Annales Société Géologie du Nord*, v. 105, p. 65-76.

Vanguestaine, M., T. Declairfayt, A. Rouhart, and A. Smeesters, 1983, Zonation par acritarches du Frasnien supérieur-Famennien inférieur dans les bassins de Dinant, Namur, Herve et Campine (Dévonien supérieur de Belgique): *Annales de la*



Société Géologique de Belgique, v. 106, p. 121-171.

Vavrdová, M., 1991, Latest Devonian miospores and acritarchs from the surface samples of the Ashkídah Formation. In: M.J. Salem, O.S. Hammuda, and B.A. Eliagoubi, (Eds.): The geology of Libya. Elsevier, Amsterdam, v. IV: p. 1285-1296.

Wicander, E.R., 1974, Upper Devonian-Lower Mississippian acritarchs and prasinophycean algae from Ohio, U.S.A.: *Palaeontographica*, Abt. B, 148 (1-3), p. 9-43.

Wicander, E.R., 1975, Fluctuations in a Late Devonian-Early Mississippian phytoplankton flora of Ohio, U.S.A.: *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 17, p. 89-108.

Wicander, E.R., 1983, A catalog and biostratigraphic distribution of North American Devonian acritarchs: American Association of Stratigraphic Palynologists, Contribution Series, no. 10: 133 p.

Wicander, E.R., 1984, Middle Devonian acritarch biostratigraphy on North America: *Journal of Micropalaeontology*, v. 3, no. 2, p. 19-24.

Wicander, E.R., 1986, Lower Devonian (Gedinnian) acritarchs from the Haragan Formation, Oklahoma, U.S.A.: *Review of Palaeobotany and Palynology*, v. 47, no.3 & 4, p. 327-363.

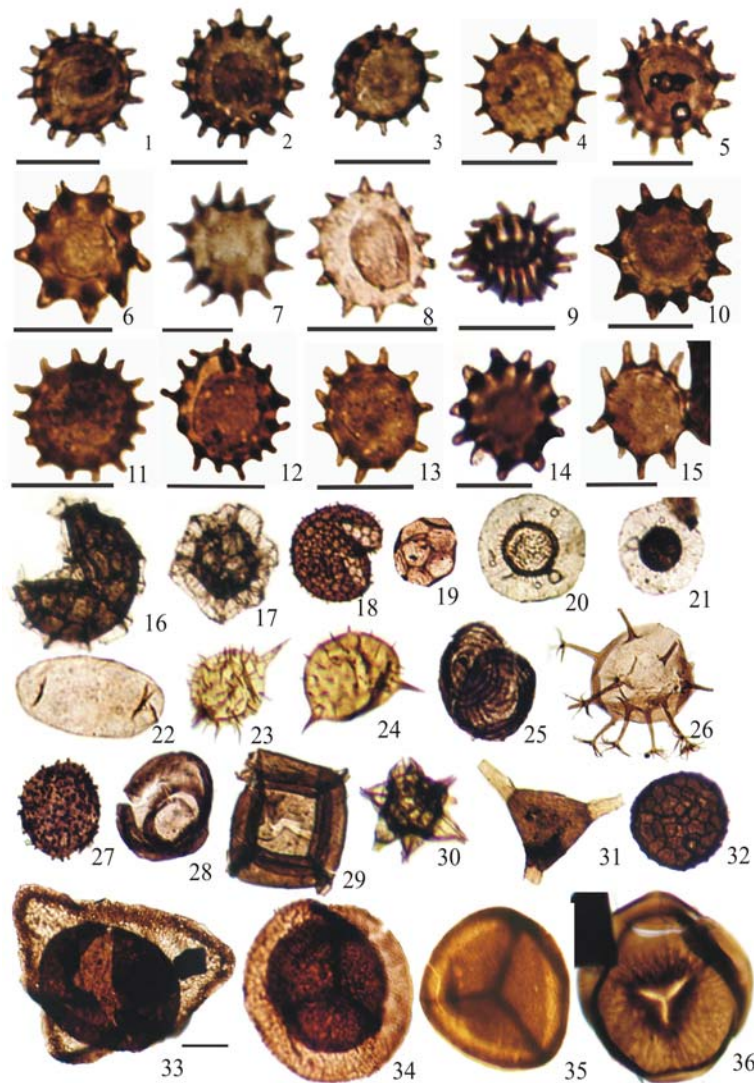
Wicander, E.R., and A.R. Loeblich Jr., 1977, Organic-walled microphytoplankton and its stratigraphic significance from the Upper Devonian Antrim Shale, Indiana, U.S.A.: *Palaeontographica*, Abt. B, 160 (4-6), p. 129-165.

Wicander, E.R., and G. Playford, 1985, Acritarchs and spores from the Upper Devonian Lime Creek Formation, Iowa, U.S.A.: *Micropaleontology*, v. 31, no. 2, p. 97-138.

Wicander, E.R. and G.D. Wood, 1981, Systematics and biostratigraphy of the organic-walled microphytoplankton from the Middle Devonian (Givetian) Silica Formation, Ohio, U.S.A.: American Association of Stratigraphic Palynologists, Contribution Series, no. 8, 137 p.

Wood, G.D., A.M. Gabriel, and J.C. Lawson, 1996, Palynological techniques - processing and microscopy. In: J. Jansonius and D.C. McGregor (Eds.): *Palynology: principles and applications*. American Association of Stratigraphic Palynologists Foundation. v. 1, p. 29-50.

## PLATE 1



## EXPLANATION OF PLATE 1

Scale bar for figures 1-15 and 33 equals 20 $\mu$ m; others  $\times$ 1000.

Figs. 1-15. *Tornacia sarjeantii* Stockmans & Willière 1966. Fig. 16. *Cymatiosphaera perimembrana* Staplin 1961. Fig. 17. *Cymatiosphaera radiosepta* Hashemi & Playford 1998. Fig. 18. *Dictyotidium craticulum* (Wicander & Loeblich) Wicander & Playford 1985. Fig. 19. *Dictyotidium araiomegaronium* Hashemi & Playford 1998. Fig. 20. *Pterospermella hermosita* Cramer 1964. Fig. 21. *Pterospermella* sp. cf. *P. onondagaensis* (Deunff) Eisenack et al. 1973. Fig. 22. *Navifusa exilis* Playford 1981. Fig. 23. *Unellium lunatum* (Stockmans & Willière) Eisenack et al. 1979. Fig. 24. *Unellium piriforme* Rauscher 1969. Fig. 25. *Chomotriletes vedugensis* Naumova 1953. Fig. 26. *Ammonidium loriferum* (Deunff) Hashemi & Playford 1998. Fig. 27. *Lophosphaeridium umbunatum* Hashemi & Playford 1998. Fig. 28. *Saharidia lusca* Playford & Dring 1981. Fig. 29. *Polyedryxium embudum* Cramer 1964. Fig. 30. *Daillydium pentaster* (Staplin) emend. Playford in Playford & Dring 1981. Fig. 31. *Tyligmasoma* sp. A. Fig. 32. *Dictyotriletes australis* de Jersey 1966. Fig. 33. *Teichertospora torquata* (Higgs) McGregor & Playford 1990. Fig. 34. *Diducites mucronatus* (Kedo) Van Veen 1981. Fig. 35. *Geminospora lemurata* Balme emend. Playford 1983. Fig. 36. *Retusotriletes rugulatus* Riegel 1973.