MIDDLE AND UPPER DEVONIAN MIOSPORE ZONATION OF EASTERN EUROPE

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Ce travail représente le résultat d'études collectives et extensives de miospores dévoniennes trouvées dans diverses régions de l'Europe orientale. 14 zones et 21 subzones, principalement des acmé-zones, sont décrites et illustrées. Elles sont caractérisées par des zones d'assemblages de miospores correspondant à un intervalle stratigraphique allant de la base du Dévonien moyen au Dévonien supérieur (Famennien moyen).

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ABSTRACT

The present work is a result of collective and extensive studies of Devonian miospores found in various regions of Eastern Europe. 14 zones and 21 subzones, mainly acme-zones, are described and illustrated. These are characterized by zonal miospore assemblages which comprise a stratigraphic interval from the base of the Middle Devonian to the Upper Devonian (Middle Famennian).

Key words: Miospores, Biostratigraphy, Middle Devonian, Upper Devonian, Russian Platform.

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INTRODUCTION

Miospore zonation of the Devonian deposits in Eastern Europe was first worked out by a large group of palynologists of the former Soviet Union in 1984 (PALYNOLOGICAL MEETING, 1984). In 1989, these miospore zones were used as biostratigraphic units in the compilation of the Unified Stratigraphic Devonian Scale of the East European Platform (RZHONSNITSKAYA & KULIKOVA, 1991). The recently obtained palynological data have now made it possible to amend and refine the scale of zonal differentiation with more detail. In this study, the "Soviet" palynologists have used the morphological classification described by POTONIÉ & KREMP (1954) instead of the earlier adopted classification by NAUMOVA (1953).

To complete this study an *ad-hoc* group was established, whose objective was to collate and to synthesise all the palynological data obtained in the various regions of Eastern Europe : Pripyat Depression (Belarus), Central Devonian Field and Central regions of the East European Platform, Volga river valley near Volgograd, Timan-Pechora Province, Volga-Ural region (Russia) and Dnieper-Donetsk Depression (Ukraine) (Fig. 1).

The Unified Devonian Chronostratigraphic Scale of the East European Platform (RZHONSNITSKAYA & KULIKOVA, 1991) is used in this study with the amendments based on the changes of miospore assemblages (Fig. 2).

FIGURE 1
Location map of the studied regions

The boundaries of some stratigraphic units, in particular the bases of the Eifelian, the Givetian and the Frasnian, do not exactly conform to the ones proposed by the International Subcommission on Devonian Stratigraphy. The Frasnian stage is divided into Early [*C. optivus* – *S. krestovnikovii* (OK) Zone and *G. semilucensa* – *P. donensis* (SD) Zone], Middle [*A. ovalis* – *V. grumosus* (OG) Zone] and Late [*C. deliquescens* – *V. evlanensis* (DE) Zone] Frasnian. The Frasnian/Famennian boundary is drawn at the base of the *C. vimineus* – *G. vasjamica* (VV) Zone which is only identified in the most complete sections of some regions. The Famennian deposits are divided into Early [*C. vimineus* – *G. vasjamica* (VV) Zone, *C. cristifer* – *D. zadonica* (CZ) Zone and *L. immensus* (Im) Zone], Middle [*C. varicornata* (CVa) Zone] and Late [*D. versabilis* – *G. famenensis* (VF) Zone and *R. lepidophyta* – *H. explanatus* (LE) Zone] Famennian.

The lowermost and uppermost intervals of the Devonian section are not considered in this paper. The Lower Devonian interval has not been documented by new materials while the Late Famennian interval has been comprehensively described by Avkhimovitch (in press) in the Pripyat Depression (Belarus).

1. — DESCRIPTION OF THE PALYNOLOGICAL ZONES AND SUBZONES

The zonal index species were chosen for various reasons : lateral widespread and abundant occurrence (acme-zone), restriction to a definite (sometimes narrow) stratigraphic interval, characteristic first appearance or extinction,... A stratigraphic range of selected miospores is given in Figure 3.

Retusotriletes clandestinus (RC) Zone
(Pl. 1)

Age : Late Emsian

It was established as the second phytostratigraphic zone in the western slope of the Ural and near the Ural (TCHIBRIKOVA & NAUMOVA, 1974). Afterwards it was renamed *R. clandestinus* Zone (ARKHANGELSKAYA, 1980). The "Middle Devonian" Takatin and Viazov deposits are assigned to this zone in the western slope of the Ural and in some areas near the Ural (TCHIBRIKOVA, 1972; ARASLANOVA, 1976; ARKHANGELSKAYA, 1985). The lowermost Ryazsk Horizon in the Central regions of the Russian Platform (ARKHANGELSKAYA, 1985) and lower parts of the Vitebsk Horizon in Belarus also belong to this zone which corresponds to the Takatin and Viazov Horizons of the Unified Stratigraphic Scale.

The zonal miospore assemblage is characterized by abundant species of the genera *Retusotriletes, Apiculiretusispora, Dibolisporites*, many of which have indistinct area and numerous plicae. The zonal species *R. clandestinus* is a typical representative at this level. Miospores with filmy outer coatings are not abundant in this zone. Species of the genus *Emphanisporites* occur in the western parts.

In the eastern part, this zone is divided into two subzones.

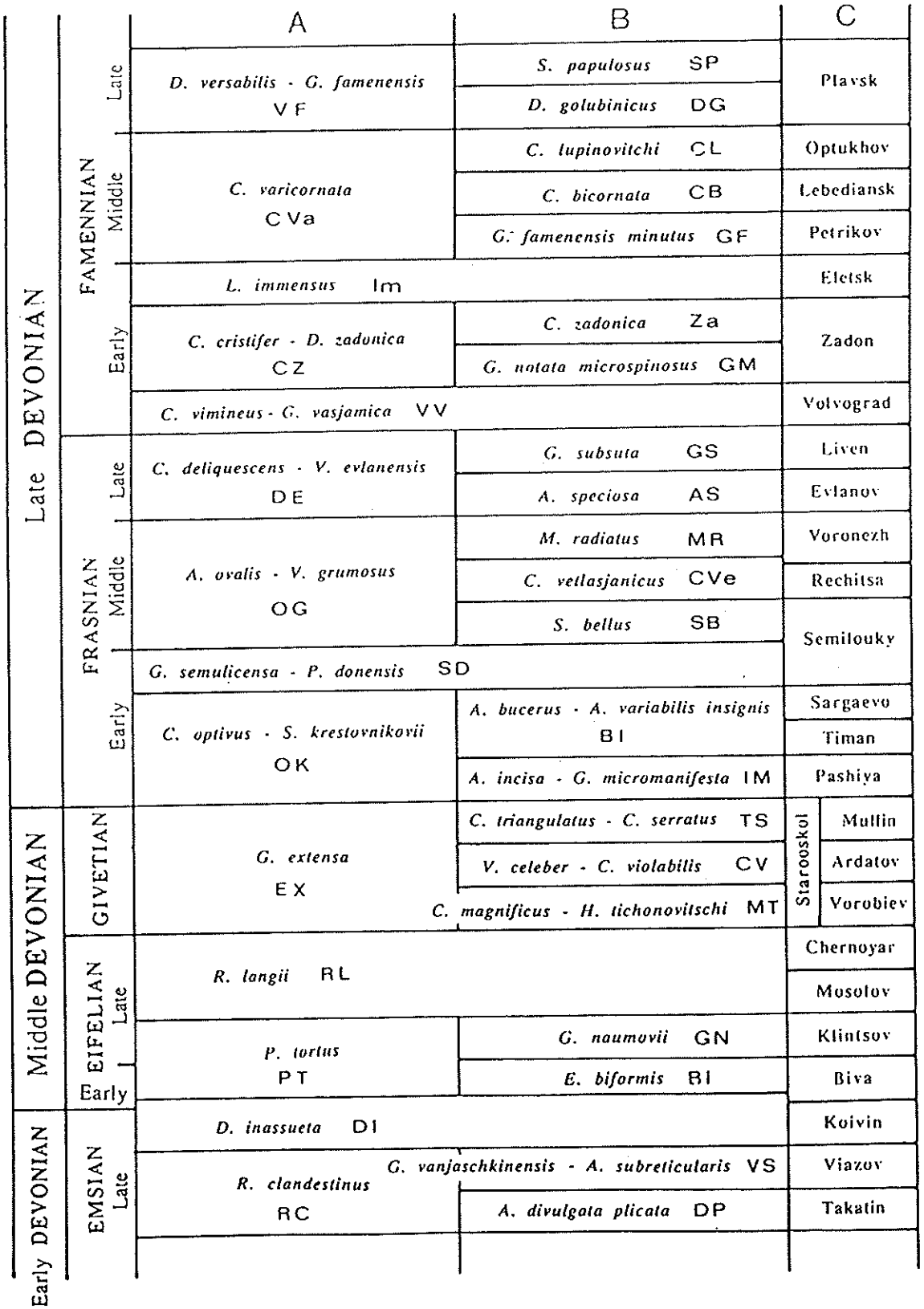

FIGURE 2

Middle and Late Devonian miospore zonation of the East European Platform

A : Assemblage or acme-zones
B : Assemblage or acme-subzones
C : Unified Devonian Chronostratigraphic Scale
of the East European Platform, after RZHONSNITSKAYA & KULIKOVA (1991)

FIGURE 3
Stratigraphic range of selected miospores
A : Chronostratigraphy
B : Biostratigraphy
N.B. *Verrucosisporites scurrus* = *Lophozonotriletes scurrus* and *Diducites hopericus* = *Spelaeotriletes hopericus* in the text

Membraboculisporis radiatus
Bulbosisporites bulbosus
Kedoesporis imperfectus
Diducites mucronatus
Diducites hopericus
Verrucosisporites evlanensis
Cymbosporites acanthaceus
Cheilinospora polymorpha var. lepidus
Cymbosporites eximius
Grandispora subsuta
Speleotriletes microgranosus
Geminospora notata var. microspinosus
Bulbosisporites volgogradicus
Cristatisporites imperpetuus
Converrucosisporites curvatus var. medius
Lophozonotriletes fursenkoi
Corbulispora vimineus
Geminospora vasjamica
Pustulatisporites famenensis
Diaphanospora zadonica
Auroraspora limpida
Diaphanospora macrovarius
Cyrtospora cristifer
Convolutispora zadonica
Diducites vishenensis
Ancyraspora orlovica
Carnispora monocornata
Cristatisporites lupinovitchi
Lophozonotriletes lebedianensis
Lagenisporites immensus
Auroraspora luteola
Auroraspora macra
Diducites commutatus
Diducites compactus
Diducites poljessicus
Knoxisporites dedoleus
Speleotriletes papulosus
Convolutispora cancellothyris
Carnispora bicornata
Grandispora famenensis var. minutus
Carnispora tricornata
Hymenospora intertextus
Discernisporites golubinicus
Diducites versabilis
Grandispora distinctus
Grandispora echinata
Grandispora famenensis
Retispora lepidophyta var. macroreticulata
Grandispora facilis
Grandispora lupata
Lophozonotriletes proscurrus
A
B
Early DEVONIAN
Middle DEVONIAN
Late DEVONIAN
Late EMSIAN
Early EIFELIAN
Late EIFELIAN
GIVETIAN
Early FRASNIAN
Middle FRASNIAN
Late FRASNIAN
Early FAMENNIAN
Middle FAMENNIAN
Late FAMENNIAN
DP
VS
RC
DI
BI
GN
PT
RL
MT
CV
EX
TS
IM
BI
OK
SD
SB
CVe
MR
OG
AS
GS
DE
V
V
GM
ZA
CZ
IM
GF
CVa
CB
CL
DG
SP
VF

Apiculiretusispora divulgata plicata (DP) Subzone, (Pl. 1, fig. 1-9).

The Takatin Horizon occurring in the western slope of the Ural and in the east of the Russian Platform conforms to this subzone. It is characterized by the presence of the subzonal and zonal species as well as *Retusotriletes naumovae, Apiculiretusispora aculeolata, A. microaculeolata, A. absurda* and *Dibolisporites capitellatus*.

Corals of the *Favosites regularissus* Zone have been identified in this subzone (KAMALETDINOV & KAMALETDINOV, 1960). This subzone can be palynologically correlated with the lower portion of the Barrandian Daleje Shales in Czechoslovakia (TCHIBRIKOVA, 1982).

Grandispora endemica vanjaschkinensis – Azonomonoletes subreticularis (VS) Subzone (Pl. 1, fig. 10-19)

This subzone corresponds to the Viazov Horizon occurring in the western slope of the Ural and in the eastern part of the Russian Platform. It is noted for abundant monolete miospores, among which *Azonomonoletes subreticularis* and *A. microtuberculatus* are the most characteristic. Large *Grandispora endemica* var. *vanjaschkinensis* and *G. longa* var. *antiquus* are also common.

Conodonts of the *Polygnathus serotinus* Zone have been ascertained in this subzone in the Ural (KHALYMBADJA *et al.*, 1985).

Diaphanospora inassueta (DI) Zone
(Pl. 2-3)

Age : Late Emsian – Early Eifelian

This zone was established by ARKHANGELSKAYA (1972). The zonal assemblage has been traced over the larger part of Eastern Europe. It occurs in the Koivin Horizon and the lower portion of the Biya Horizon in the east of the Russian Platform and the western slope of the Ural, in the lower and larger portion of the Ryazsk Horizon in the Central regions, in the Vitebsk Horizon in Belarus and the Rezekne Horizon in the Baltic region (TCHIBRIKOVA, 1962; ARASLANOVA, 1971; ARKHANGELSKAYA, 1985). In the Unified Stratigraphic Scale it corresponds to the Koivin and lower portion of the Biya Horizons.

Species of the genera *Dibolisporites, Apiculiretusispora* and *Retusotriletes* with distinct curvaturae are typical of the miospore assemblages. The index species *Diaphanospora inassueta* as well as accompanying species *D. impolita* have a wide occurrence and have not been found below and above the boundaries of the zone. *Punctatisporites tortuosus, Lanatisporites hispidus, Retusotriletes tenerimedium, Stenozonotriletes incessus, Grandispora endemica, Calyptosporites tener, Archaeozonotriletes ignoratus, Rhabdosporites mirus* and *Gneudnaspora divellomedium* are characteristic species of the zone. *Apiculiretusispora sterlibaschevensis, Archaeozonotriletes polymorphus* var. *takatinicus* are particularly abundant in the east. *Grandispora* cf. *douglastownense, G. parviconica, G. ludza* and *Hystricosporites mitratus* have been discovered at this level in Belarus.

Conodonts of the undifferentiated *Polygnathus costatus patulus – P. costatus partitus* Zones have been identified within the DI Zone in the western slope of the Ural (KHALYMBADJA *et al.*, 1985).

Periplecotriletes tortus (PT) Zone
(Pl. 4-5)

Age : Early – lower Late Eifelian

This zone was established by ARKHANGELSKAYA (1972). It is widespread over the entire territory of Eastern Europe. It corresponds to the upper portion of the Ryazsk and Morsov Horizons in the Central regions and Volga region near Volgograd (ARKHANGELSKAYA, 1985; UMNOVA, 1987; BATANOVA *et al.*, 1968), to the upper portion of the Biya and lower portion of the Afonin Horizons in the east of the Russian Platform (ARASLANOVA, 1971; TCHIBRIKOVA, 1977), to the Adrov, Osveya and lower portion of the Gorodok Horizons in Belarus (KEDO & OBUKHOVSKAYA, 1981). The uppermost Biya and Klintsov Horizons are referred to this zone in the Unified Stratigraphic Scale.

The zonal assemblage is characterized by the appearance and constant presence of *Periplecotriletes tortus* and *Calyptosporites velatus* together with abundant miospores of the genera *Apiculiretusispora* and *Dibolisporites*. Occasional specimens of *Rhabdosporites langii* are also present in this zone.

Over a larger part of the territory, this zone is divided into two subzones.

Elenisporis biformis (Bi) Subzone (Pl. 4)

This subzone is distinguished by the presence of the index species *E. biformis, Acinosporites acanthomammillatus* as well as *Sinuosisporites sinuosus, Rhabdosporites mirus* and *Gneudnaspora divellomedium*. The latter species cease to exist at this level.

Grandispora naumovii (GN) Subzone (Pl. 5)

This subzone has been identified by the presence of the index species *Grandispora naumovii*, together with *Hystricosporites setigerus* and *Perotrilites bifurcatus*. *Rhabdosporites langii* is constantly found in this subzone although in small numbers. Species of the genera *Dibolisporites, Apiculiretusispora* and *Periplecotriletes* become less numerous.

The lower Bi Subzone can be correlated with the *Calyptosporites velatus – Rhabdosporites langii* Assemblage Zone of RICHARDSON & MCGREGOR (1986). The Upper GN Subzone may conform to the *Densosporites devonicus – Grandispora naumovii* Assemblage Zone.

Rhabdosporites langii (RL) Zone
(Pl. 6)

Age : Late Eifelian

This zone was first established by ARKHANGELSKAYA (1972) in the eastern regions of the Russian Platform. It conforms to the Mosolov and Chernoyar Horizons in the Central regions, the upper portion of the Afonin Horizon (ARKHANGELSKAYA, 1985), the upper portion of the Gorodok and Kastiukovitchy Horizons in Belarus (KEDO & OBUKHOVSKAYA, 1981) and the Kiarnav Horizon in Lithuania (VAITEKUNENE, 1983).

The zonal assemblage is characterized by the maximum occurrence of the index species *R. langii* plus the presence of *Cirratriradites monogrammos, C. punctomonogrammos, Retispora archaeolepidophyta, Densosporites devonicus*

and *Grandispora inculta*. There are numerous species of the genera *Camarozonotriletes* and *Diatomozonotriletes*. *Lophozonotriletes scurrus, Convolutispora tegula* and *Acanthotriletes variaculeatus* first appear in the upper portion of this zone.

Conodonts of the *Polygnathus kockelianus* Zone have been discovered in the deposits of this zone in the Central regions as well as Conodonts of the lower portion of the *Polygnathus ensensis* Zone (Aristov & Ovnatanova, 1985).

Based on the spore composition, this zone may be regarded as an upper (?) portion of the global *Densosporites devonicus – Grandispora naumovii* Assemblage Zone of Richardson & McGregor (1986).

Geminospora extensa (EX) Zone (Pl. 7-9)

Age : Givetian

This zone has been traced over the entire territory of Eastern Europe (Tchibrikova & Naumova, 1974; Kedo & Obukhovskaya, 1981; Tchibrikova, 1982; Arkhangelskaya, 1985). It conforms to the Starooskol Superhorizon in the Central regions, the Polotsk Horizon in Belarus and their analogues elsewhere in the Russian Platform. The Starooskol Superhorizon equates with the Zone in the Unified Stratigraphic Scale.

The zonal assemblage is characterized by the appearance of the genus *Geminospora*, and the dominant species include *G. extensa, G. tuberculata, G. decora* and *G. vulgata*. *Geminospora micromanifesta, G. rugosa* and *G. notata* gradually become more numerous further up the zone. The index species *Geminospora extensa* is practically limited to this zone.

Conodonts of the *Polygnathus varcus* Zone (Aristov & Ovnatanova, 1985) and the Brachiopod *Stringocephalus burtini* have been found in this Zone in the Central regions.

The Zone is divided into three subzones.

Cymbosporites magnificus – Hymenozonotriletes tichonovitschi (MT) Subzone (Pl. 7)

This subzone corresponds to the Vorobiev Horizon which occurs in the Central and eastern regions of the Russian Platform and their analogues in other regions. Only the upper portion of the subzone is present over large territories (Ukraine, Belarus).

The subzonal miospore assemblage is characterized by the appearance of the index species. It should be mentioned that *Hymenozonotriletes tichonovitschi* has never been encountered above the subzone upper boundary. Species transitional from the Eifelian deposits are frequent e.g. *Ciratriradites monogrammos, Rhabdosporites langii, Calyptosporites velatus*, as well as spores of the genera *Camarozonotriletes, Diatomozonotriletes* and *Acanthotriletes*. *Geminospora meonacantha, G. compta* var. *expletivus* and *Archaeozonotriletes gravis* are also typical of the subzone.

Vallatisporites celeber – Cristatisporites (?) violabilis (CV) Subzone (Pl. 8)

This subzone conforms to the Ardatov Horizon in the Central and eastern regions of the Russian Platform, the Stolin Beds in Belarus and their analogues in other regions.

It is characterized by the maximum development of the index species and constant occurrence of *Chelinospora concinna, Lophozonotriletes scurrus, L. scurrus* var. *jugomaschevensis* and *Lanatisporites bislimbatus*.

Cristatisporites triangulatus – Corystisporites serratus (TS) Subzone (Pl. 9)

This subzone basically corresponds to the Mullin Horizon in the Central and eastern regions of the Russian Platform, to the Morotch Beds in Belarus and their analogues occurring elsewhere.

It is characterized by the appearance of *Cristatisporites triangulatus* and a maximum development of *Corystisporites serratus*. Species such as *Geminospora tuberculata, G. decora, G. vulgata, Lanatisporites bislimbatus, Membrabaculisporis comans, Cingulatisporites cassiformis* and others typical of the *Grandispora extensa* Zone become extinct within this subzone. Species transitional to the overlying deposits e.g. *Geminospora micromanifesta, G. notata* and *Perotrilites spinosus* are widespread

The two lower MT and CV Subzones can be palynologically correlated with the *Geminospora lemurata – Cymbosporites magnificus* Assemblage Zone and the TS Subzone with the lower part of the *Contagisporites optivus – Cristatisporites triangulatus* Assemblage Zone of Richardson & McGregor (1986)

Contagisporites optivus – Spelaeotriletes krestovnikovii (OK) Zone (Pl. 10-11)

Age : Early Frasnian.

This zone has been ascertained by a group of workers (Palynological meeting, 1984). It conforms to the Pashiya, Timan and Sargaevo Horizons in the Unified Stratigraphic Scale.

The zonal assemblage is characterized by abundant specimens of *Geminospora micromanifesta, G. rugosa* and *G. notata*, the stable presence of the first index species *Contagisporites optivus* and the appearance of *Ancyrospora incisa*. The zone is also characterized by the absence of the miospores typical of the underlying *Grandispora extensa* Zone.

This zone is divided into two subzones.

Ancyrospora incisa – Geminospora micromanifesta (IM) Subzone (Pl. 10)

This subzone corresponds to the Yastrebov and lower larger portion of the Tscigrov Horizons, both occurring in the Central regions of the Russian Platform (Raskatova, 1969; Raskatova, 1990), the Pashiya and lower portion of the Kynov Horizons in the eastern regions (Tchibrikova, 1962; Tchibrikova & Naumova, 1974; Raskatova, 1990) and the lower portion of the Lansk Horizon in Belarus (Kedo & Obukhovskaya, 1981). The Pashiya Horizon is confined to this subzone in the Unified Stratigraphic Scale.

The miospore assemblage is characterized by the appearance of *Ancyrospora incisa* and abundance of *Geminospora micromanifesta*. A typical feature is the dominance of miospores belonging to the genus *Geminospora*. *Cymbosporites magnificus, Perotrilites spinosus* and, in the majority of the regions, *Cristatisporites triangulatus* become

extinct in this subzone, while higher in the subzone *Spelaeotriletes krestovnikovii, Geminospora semilucensa* and *Acanthotriletes eximius* increase in number. The first appearance of occasional *Acanthotriletes bucerus* and *Archaeoperisaccus verrucosus* is recorded in the Timan-Pechora Province.

Acanthotriletes bucerus – Archaeozonotriletes variabilis insignis (BI) Subzone (Pl. 11)

This subzone conforms to the Timan and Sargaevo Horizons in the Timan-Pechora Province (MEDIANIK, 1981; RASKATOVA, 1990), the upper portion of the Kynov Horizon and the Sargaevo Horizon in the Volga-Ural Province (TCHIBRIKOVA & NAUMOVA, 1974; ARKHANGELSKAYA & OVNATANOVA, 1986), in the Volga region near Volgograd (NAZARENKO, 1983) and also in the upper portion of the Lansk Horizon and the Sargaevo Horizon in the Pripyat Depression (OBUKHOVSKAYA, 1986).

This subzonal assemblage is characterized by the abundance of *Archaeozonotriletes variabilis*, the appearance of *A. variabilis* var. *insignis*, the presence of *Acanthotriletes bucerus, A. dentatus, A. eximius, Kedoesporis livnensis* and the appearance of *Spelaeotriletes bellus. Archaeoperisaccus verrucosus, A. timanicus* and *Cristatisporites triangulatus* are numerous in the lower portion of this subzone in the Timan-Pechora Province.

The upper portion of the subzone, composed mainly of carbonaceous sediments, is characterized by a poor miospore composition. Apart from the subzonal species and abundance of the genus *Geminospora*, the following species have been found to prevail : *Converrucosisporites curvatus, Retusotriletes communis, Acanthotriletes uncatus, Kedoesporis angulosus* and *Lophozonotriletes concessus*.

The *Ancyrodella binodosa* Conodonts Zone has been identified in the lower portion of the subzone in the Volga-Ural Province while in the upper part, Conodonts of the *Ancyrodella rotundiloba* Zone (ARKHANGELSKAYA & OVNATANOVA, 1986) occur.

Both subzones can be palynologically correlated with the upper portion of the *Contagisporites optivus – Cristatisporites triangulatus* Assemblage Zone of RICHARDSON & MCGREGOR (1986).

Geminospora semilucensa – Perotrilites donensis (SD) Zone (Pl. 12)

Age : Early Frasnian

This zone is widespread in Eastern Europe and corresponds to a lower portion of the Semilouky Horizon in the Central regions, Belarus, Ukraine, Volga Region near Volgograd, the lowermost Domanikov Horizon in the Timan-Pechora Province and the eastern regions of the Russian Platform. The zone was established by a group of workers (PALYNOLOGICAL MEETING, 1984). The studies have been carried out by RASKATOVA (1969), NAZARENKO (1983), MEDIANIK (1981), OBUKHOVSKAYA (1986), ARKHANGELSKAYA in ARKHANGELSKAYA & OVNATANOVA, 1986). At present, the zone is known more precisely on a basis of zonal assemblage occurrence.

The miospore assemblage is characterized by dominating species of the genus *Geminospora*, among which *G. semilucensa* and *G. aurita* are invariably present. *Cristatisporites trivialis, Ancyrospora laciniosa, Hymenozonotriletes argutus, Archaeozonotriletes variabilis, A. timanicus* are also typical. The second zonal species *Perotrilites donensis* is not found everywhere, but in some sections it is abundant, as is *Camarozonotriletes obtusus*. The miospores with coarse tubercular ornamentation of the exine such as *Lophozonotriletes tylophorus* and *Verrucosisporites grumosus* have been observed to appear in the zone.

In the eastern sections of the Timan-Pechora Province, Conodonts of the middle-upper *Polygnathus asymmetricus* Zone have been discovered (ARKHANGELSKAYA & OVNATANOVA, 1986; OVNATANOVA & KUZMIN, 1991) in this SD Zone.

Archaeoperisaccus ovalis – Verrucosisporites grumosus (OG) Zone (Pl. 13-15)

Age : Middle Frasnian

This zone was identified by a group of workers (PALYNOLOGICAL MEETING, 1984). In the present study the composition of the zone has been determined more accurately. The upper portions of the Semilouky Horizon, the Rechitsa and Voronezh Horizons conform to this Zone in the Unified Stratigraphic Scale.

The features of the OG zonal miospore assemblage include the appearance and acme of bilateral spores of the genus *Archaeoperisaccus* which possess fine ornamented or shagreen surface of the exine, numerous miospores with filmy outer coatings and forms with coarse tubercular ornamentation together with representatives of the genus *Geminospora*.

The Zone is divided into three subzones.

Spelaeotriletes bellus (SB) Subzone (Pl. 13)

This subzone has been reliably identified in the Central regions of the Russian Platform and in the Timan-Pechora Province where it incorporates the upper portion of the Semilouky (Domanikov) Horizon (RASKATOVA, 1969; MEDIANIK, 1981).

The zonal miospore assemblage is characterized by the co-occurrence of *Archaeoperisaccus* species *(A. ovalis, A. menneri, A. concinnus* and *A. mirandus*) with representatives of the *krestovnikovii* morphon (*Spelaeotriletes krestovnikovii, S. bellus, S. domanicus* and *S. instabilis*). The latter species practically do not occur above the upper boundary of the zone. *Cristatisporites deliquescens, C. trivialis, Verruciretusispora semilucensa, V. pallida, Lophozonotriletes privus* are constantly found in miospore associations of the subzone.

In the Timan-Pechora Province, where the subzone section is the most complete, *Cyrtospora (?) expleta, Cymbosporites vetlasjanicus* and *Bascaudaspora dobridia* have been discovered in its upper part.

In this province, the subzone is associated with Conodonts of the upper *Polygnathus asymmetricus* and the *Ancyrognathus triangularis* Zones (OVNATANOVA & KUZMIN, 1991).

Cymbosporites vetlasjanicus (CVe) Subzone (Pl. 14)

This subzone is widespread in Eastern Europe. It conforms to the Petin Horizon and lower portion of the Voronezh Horizon in the Central regions and Volga region near Volgograd, the Rechitsa Horizon and lower portion of

the Voronezh Horizon in Belarus, the Vetlasjan Horizon and lower portion of the Siratchoi Horizon in the Timan-Pechora Province and to the Mendym Horizon in the eastern regions of the Russian Platform (Raskatova *et al.*, 1976; Medianik, 1981; Obukhovskaya, 1986; Arkhangelskaya & Ovnatanova, 1986).

The subzonal assemblage is featured by abundant miospores of the genera *Archaeoperisaccus* and *Geminospora*, all species of which were inherited from older strata. The index species *Cymbosporites vetlasjanicus* is abundant in the sections of the Timan-Pechora and Volga-Ural Provinces. *Bascaudaspora dobridia* is also present there. A higher content of miospores with coarse tubercular ornamentation is observed such as *Lophozonotriletes tylophorus, L. privus, L. torosus* and *Verrucosisporites grumosus*. The first appearance of occasional *Membrabaculisporis radiatus, Diducites radiatus, Auroraspora speciosa* is also observed. *Convolutispora crassitunicata* is confined to the lower portion of the section and specimens of *Grandispora famenensis* var. *gracilis* are found in its upper portion.

In the Timan-Pechora and Volga-Ural Provinces, the subzone is associated with Conodonts of the lower *Palmatolepis gigas* Zone (Arkhangelskaya & Ovnatanova, 1986; Kuzmin & Ovnatanova 1989; Obukhovskaya & Kuzmin, in press).

Membrabaculisporis radiatus (MR) Subzone (Pl. 15)

This subzone is widespread in Eastern Europe. The subzonal assemblage characterizes a large portion of the Voronezh Horizon in the Central regions of Russia and in Belarus and Volga region near Volgograd, the Siratchoi Horizon in the Timan-Pechora Province and the Orlov Formation in the western slope of the Ural (Tchibrikova, 1972; Raskatova, 1975; Medianik, 1981; Obukhovskaya, 1986).

The following features are typical of the subzone: constant presence of the index species *Membrabaculisporites radiatus, Geminospora aurita, Diducites radiatus* and appearance of *Diducites mucronatus, Bulbosisporites bulbosus, Kedoesporis rugilobus* and *K. imperfectus*. Higher in the subzone representatives of the genus *Archaeoperisaccus* become less numerous in the assemblages.

In the Timan-Pechora Province there are Conodonts of the *Palmatolepis gigas* Zone (Kuzmin & Ovnatanova, 1989; Obukhovskaya & Kuzmin, in press) associated with the subzone.

The miospore assemblages of the *A. ovalis – V. grumosus* Zone can be correlated with the *Archaeoperisaccus ovalis – Verrucosisporites bulliferus* Assemblage Zone of Richardson & McGregor (1986).

Cristatisporites deliquescens – Verrucosisporites evlanensis (DE) Zone (Pl. 16-17)

Age : Late Frasnian

It was first identified by a group of authors as the *H. speciosus – H. radiatus* and *H. imperfectus – H. subsutus* Subzones (Palynological meeting, 1984). The zone conforms to the Evlanov and Liven Horizons in Eastern Europe.

The zonal assemblage is characterized by the dominant development of *Cristatisporites deliquescens, Auroraspora speciosa, Diducites radiatus, Membrabaculisporis radiatus, Spelaeotriletes hopericus* and the appearance of *Verrucosisporites evlanensis*. A typical feature of the zone is the presence of species of the genera *Geminospora* and *Kedoesporis*.

Over a large part of the territory the zone is divided into two subzones.

Auroraspora speciosa (AS) Subzone (Pl. 16)

This subzone corresponds to the Evlanov Horizon in the Central regions of the Russian Platform, Belarus, Volga region near Volgograd and to the lower and middle portions of the Uhta Formation in the Timan-Pechora Province. The persistent presence of *Auroraspora speciosa*, the large number of miospores belonging to the genera *Stenozonotriletes* and *Verrucosisporites* and the appearance and widespread occurrence of *Cymbosporites acanthaceus, Chelinospora polymorpha* are regarded as characteristic features of the subzonal miospore assemblage (Raskatova, 1974; Medianik, 1981; Obukhovskaya & Nekriata, 1983). The miospores of the genus *Archaeoperisaccus* are not numerous and are even absent in some sections.

Conodonts of the *Palmatolepis gigas* Zone have been found in the AS Subzone of the Timan-Pechora Province (Obukhovskaya & Kuzmin, in press). The *Palmatolepis gigas* Zone has also been identified in the stratotypical sections of the Evlanov Horizon in the Russian Platform (Aristov, 1988).

Grandispora subsuta (GS) Subzone (Pl. 17)

This subzone conforms to the Liven Horizon. It has been reliably established in the Central regions of the Russian Platform, in the Pripyat and Dnieper-Donetsk Depressions and in the Volga region near Volgograd.

It is characterized by the appearance of the index species *Grandispora subsuta, Cymbosporites eximius, C. boafeticus, Spelaeotriletes microgranosus* and the permanent presence of *Chelinospora polymorpha* var. *lepidus*. The majority of the typical species of the Frasnian Stage cease to exist here. The GS Subzone spore assemblage is poorly present in the Timan-Pechora Province.

Conodonts of the uppermost *Palmatolepis gigas* Zone have been found in the deposits characterized by this poor miospore assemblage (Obukhovskaya & Kuzmin, in press).

Corbulispora vimineus – Geminospora vasjamica (VV) Zone (Pl. 18)

Age : Early Famennian

This zonal miospore assemblage has been identified in the tectonically most disturbed regions of the Russian Platform and in the western slope of the Ural (Nekriata, 1979; Medianik, 1981; Kononenko, 1984; Tchibrikova & Nazarenko, 1984; Mantsurova, 1987). At present, the composition and age of the zone are known more precisely. This zone corresponds to the Linev and Umetov Measures in the Volga region near Volgograd, the Domanovitchy Horizon and Kuzmitchev Beds in the Pripyat Depression, the Pakul and lowermost Leskov deposits in the Dnieper-Donetsk Depression, the Sub-Zadon Horizon in the Timan-Pechora Province and the Vazyam Measures in the western slope of the Ural (Nazarenko *et al.*, in press). In the Central Devonian Field this part of the section is absent.

The deposits corresponding to the *C. vimineus – G. vasjamica* (VV) Zone have not been established in the Unified Stratigraphic Scale as an independent stratigraphic unit. However, by the palynological data they may be regarded as a horizon having a rather widespread occurrence.

The zonal miospore assemblage is distinguished by the following features : appearance of the first index species *Corbulispora vimineus*, constant presence of *Geminospora vasjamica, G. notata* var. *microspinosus, Lophozonotriletes furssenkoi, Lophotriletes multiformis, Converrucosisporites curvatus, Pustulatisporites pullus* and absence of species typical of older deposits. In the Pripyat and Dnieper-Donetsk Depressions and in the Ural a higher content of the miospores with coarse tubercular ornamentation of the exine has been observed, while in the Timan-Pechora Province, *Cristatisporites imperpetuus*, and in the Volga region near Volgograd, *Cymbosporites boafeticus* are common with the latter species appearing in the underlying deposits where it played a subordinate role. *Pustulatisporites famenensis* and occasional *Cyrtospora cristifer* appear in the upper part of the zone.

Conodonts of the *Palmatolepis triangularis* Zone have been discovered in the VV Zone in the Timan-Pechora Province (OBUKHOVSKAYA & KUZMIN, in press).

Cyrtospora cristifer – Diaphanospora zadonica (CZ) Zone (Pl. 19-20)

Age : Early Famennian

This zone has been established by the same group of authors who determined the *Trachytriletes famenensis – Hymenozonotriletes zadonicus* Subzone of the *Archaeotriletes honestus – Hymenozonotriletes rugosus* Zone (PALYNOLOGICAL MEETING, 1984). The CZ Zone conforms to the Zadon Horizon and has been traced all over Eastern Europe (NAUMOVA, 1953; RASKATOVA, 1973; NAZARENKO, 1978; NEKRIATA, 1979; KONONENKO, 1984).

The zonal miospore assemblage is characterized by the constant presence of the first index species *Cyrtospora cristifer*, the appearance of the second one *Diaphanospora zadonica* and the extensive occurrence of *Diaphanospora rugosa, D. macrovarius, Auroraspora varia, A. limpida, Pustulatisporites famenensis* and *Converrucosisporites curvatus*, together with representatives of the genera *Stenozonotriletes, Retusotriletes* and *Hystricosporites.*

The changes in miospore composition make it possible to identify two subzones which have been studied in detail in the Pripyat (NEKRIATA, 1979) and Dnieper-Donetsk Depressions (KONONENKO, 1984).

Geminospora notata var. microspinosus (GM) Subzone (Pl. 19)

This subzone has been established in the lower portion of the section (NEKRIATA, 1979; AVKHIMOVITCH *et al.*, 1988). It is characterized by the prevailing development of *Geminospora notata*, the presence of sparse specimens of *Corbulispora vimineus, Converrucosisporites curvatus* var. *medius, Lophozonotriletes furssenkoi* inherited from more ancient sediments.

In many regions of Eastern Europe Brachiopods of the *Cyrtospirifer asiaticus* Zone have been discovered in the GM Subzone (LIASHENKO, 1959) while in the Central Devonian Field (ARISTOV, 1988) and Pripyat Depression (GOLUBTSOV *et al.*, 1978), Conodonts of the *Palmatolepis triangularis* and *Palmatolepis crepida* Zones occur.

Convolutispora zadonica (Za) Subzone (Pl. 20)

This subzone has been established in the upper part of the section (NEKRIATA, 1979; KONONENKO, 1984). It is characterized by the appearance of the index species *Convolutispora zadonica*, the higher content of the genera *Stenozonotriletes* and *Retusotriletes* species and the reduction in numbers of *Geminospora vasjamica* and *G. notata* var. *microspinosus. Diducites radiatus, D. vishenensis* are constantly present. The first appearance of occasional *Knoxisporites dedaleus* and *Lagenoisporites immensus* has also been observed.

Conodonts of the *Palmatolepis crepida* Zone have been determined in the Za Subzone in the Pripyat Depression (GOLUBTSOV *et al.*, 1978).

Lagenoisporites immensus (Im) Zone (Pl. 21)

Age : Early Famennian

This subzone is equivalent to that established by a group of authors (PALYNOLOGICAL MEETING, 1984) as the upper - *Archaeozonotriletes volgogradicus – Hymenozonotriletes immensus* Subzone of the *Archaeotriletes honestus – Hymenozonotriletes rugosus* Zone. It conforms to the Eletsk Horizon predominantly over the entire territory of Eastern Europe (NAUMOVA, 1953; RASKATOVA, 1973; NAZARENKO, 1978; NEKRIATA, 1979; KONONENKO, 1984).

The zonal miospore assemblage is characterized by the regular occurrence of the index species *Lagenoisporites immensus* and a number of other typical species, *Knoxisporites dedaleus* and *Ancyrospora orlovica* as well as by the appearance of *Lophozonotriletes lebedianensis, Diducites commutatus, D. compactus* and *Spelaeotriletes papulosus*. The last species considerably prevails in the Timan-Pechora Province. Miospores with a simple structure such as *Auroraspora luteola, A. pallida* and others are rather abundant in the assemblage. *Cornispora monocornata* appears in the upper half of the zone. The transitional species *Diaphanospora rugosa, Auroraspora varia* and small numbers of *Bulbosisporites volgogradicus* as well as various species of *Stenozonotriletes* are also present.

In many regions of Eastern Europe this Im Zone contains Brachiopods of the *Cyrtospirifer brodi – Ptychomaletoechia brodica* Zone (LIASHENKO, 1959), while in the Central Devonian Field (ARISTOV, 1988) and Pripyat Depression (KRUTCHEK, 1974) Conodonts of the *Palmatolepis rhomboidea* Zone have been found.

Cornispora varicornata (CVa) Zone (Pl. 22-24)

Age : Middle Famennian

This zone was originally established in Eastern Europe by TCHIBRIKOVA & NAUMOVA (1974). Since then it has been divided into three subzones by the present authors (AVKHIMOVITCH,

1975; PALYNOLOGICAL MEETING, 1984; KONONENKO, 1984). In the majority of the regions the Petrikov, Lebediansk and Optukhov Horizons and their analogues are related to this zone.

Grandispora famenensis minutus (GF) Subzone (Pl. 22)

This subzone has been identified in the Pripyat Depression (AVKHIMOVITCH, 1975, 1986). It also occurs in the Dnieper-Donetsk Depression (KONONENKO, 1983) and Timan-Pechora Province (Narian-Mar borehole). The middle Famennian Petrikov Horizon is related to the subzone. In the Unified Stratigraphic Scale the Petrikov Horizon is absent. It is possible that in the Central Devonian Field it corresponds to the upper member of limestones assigned to the Eletsk Horizon but not containing fossils of the Eletsk age. In other regions this part of the section has specific paleontological features and therefore should be identified as a separate stratigraphic unit which is confirmed by the palynological data.

In the GF Subzone *Cornispora varicornata* begins to develop and there are also various representatives of the genus *Grandispora* (*G. famenensis* var. *minutus, G. verrucata, G. aspersus* and others). Species of *Diducites* (*D. compactus, D. commutatus, D. poljessicus, D. mucronatus*) considerably increase in number. *Cristatisporites lupinovitchi, Spelaeotriletes papulosus* and various small size miospores such as *Auroraspora macra, A. luteola* are also rather numerous. *Lophozonotriletes lebedianensis* shows a maximum of development in this subzonal assemblage.

Conodonts of the upper part of the *Palmatolepis rhomboidea* Zone have been found in the typical GF Subzone in the Pripyat Depression (GOLUBTSOV *et al.*, 1978) whereas in the Timan-Pechora Province, Conodonts of the *Palmatolepis marginifera* Zone (DURKINA *et al.*, 1980) have been recorded. This GF Subzone correlates with Fa2a deposits of the Franco-Belgian Ardenne Massif characterized by the *gracilis – hirtus* (GH) miospores Zone which also coincides with the *Palmatolepis rhomboidea* Zone (BOUCKAERT *et al.*, 1968).

Cornispora bicornata (CB) Subzone (Pl. 23)

It has been established in the Volga region near Volgograd by NAZARENKO (1975). It is also found in the Central regions and in the Central Devonian Field (UMNOVA, 1971; RASKATOVA, 1973), the Pripyat Depression (AVKHIMOVITCH, 1974), the Dnieper-Donetsk Depression (KONONENKO, 1983) and the Timan-Pechora Province (SENNOVA, 1972). Generally, over the entire territory of Eastern Europe the subzone corresponds to the middle Famennian Lebediansk Horizon, the lower part of the Ust-Pechora Horizon in the Timan-Pechora Province and the Maksakov Formation in the northwest of the Dnieper-Donetsk Depression.

Miospores of the zonal species *Cornispora varicornata* reach their maximum development in this subzone. However, this species occurs unevenly across the region. For instance, it is abundant in the east, especially in the Timan-Pechora Province and Volga region near Volgograd. However, in the west (Pripyat and Dnieper-Donetsk Depressions) it rarely reaches its maximum development. *Lophozonotriletes lebedianensis* and *Knoxisporites dedaleus* still occur though in lesser numbers. *Cristatisporites lupinovitchi, Spelaeotriletes papulosus* and various species of the genus *Diducites* increase in number. Specimens of the genus *Lophozonotriletes* and *Stenozonotriletes* are also numerous.

In the majority of the regions the subzone contains the Brachiopods *Cyrtospirifer lebedianicus*.

Cristatisporites lupinovitchi (CL) Subzone (Pl. 24)

This subzone has been identified in the Pripyat Depression (AVKHIMOVITCH, 1975). It also occurs in the Dnieper-Donetsk Depression (KONONENKO, 1983), the Central regions (RASKATOVA, 1973) and the Timan-Pechora Province (DURKINA & AVKHIMOVITCH, in press). The subzone corresponds to the Optukhov Horizon in the Central regions of the Russian Platform, to the Oresa Horizon in the Pripyat Depression, to the middle portion of the Ust-Pechora Horizon in the Timan-Pechora Province and to the Adamov Formation in the northwest of the Dnieper-Donetsk Depression. The middle Famennian Optukhov Horizon corresponds to the subzone in the Unified Stratigraphic Scale.

The zonal species *Cristatisporites lupinovitchi* is abundant and terminates its development within the subzone. *Cornispora varicornata* is considerably reduced in number and *Grandispora famenensis* appears. *Ancyrospora orlovica* and *Bulbosisporites volgogradicus* cease to develop, as do the majority of the genus *Hystricosporites* species. *Discernisporites golubinicus* is more widespread and species of the genus *Diducites* are still abundant, especially in the western regions.

Based on the first appearance of *Grandispora famenensis* in both regions, CB and CL Subzones can be conditionally correlated with the uppermost Fa2a and the Fa2b intervals characterized by the *gracilis – minutus* (GM) miospores Zone [renamed *gracilis – famenensis* (GF) Oppel Zone in STREEL *et al.*, 1987] of the Franco-Belgian Ardenne Massif (BOUCKAERT *et al.*, 1968; AVKHIMOVITCH, 1986).

Diducites versabilis – Grandispora famenensis (VF) Zone (Pl. 25-26)

Age : Upper Famennian

This zone has been established first as *D. versabilis* Zone in the Pripyat Depression (KEDO & AVKHIMOVITCH, 1981). It occurs all over Eastern Europe. The upper Famennian Plavsk Horizon in the Central regions (UMNOVA, 1971), the Streshin Horizon in the Pripyat Depression (AVKHIMOVITCH & DEMIDENKO, 1985), the upper half of the Zimovsk Horizon and the lower half of the Sennov Horizon in the Volga region near Volgograd (NAZARENKO, 1978) are all related to this zone. The upper Famennian Plavsk Horizon conforms to the zone in the Unified Stratigraphic Scale. The base of the VF Zone in Eastern Europe is regarded as an important boundary where the spores that terminate the late stage of Devonian flora development appear.

The zone is divided into two subzones. In general it is comparable to the Fa2c interval defined by the *versabilis – cornuta* (VCo) Oppel Zone of the Franco-Belgian Ardenne Massif (STREEL, 1986).

Discernisporites golubinicus (DG) Subzone (Pl. 25)

This zone was first established in the Volga region near Volgograd as the *G. famenensis* Zone within the upper part of the Zimovsk Horizon (NAZARENKO, 1975). It also occurs in the Pripyat Depression in the lower part of the Streshin Horizon (AVKHIMOVITCH, 1978) and in the Timan-Pechora Province from the upper part of the Ust-Pechora Horizon (DURKINA & AVKHIMOVITCH, in press).

Typically Late Devonian miospores *Diducites versabilis* and *Retispora lepidophyta* var. *macroreticulata* appear in the subzone. *Grandispora famenensis* is most abundant at this level and reaches its maximum development. *Grandispora distinctus* appears and *Discernisporites golubinicus* is numerous. Also, various species of *Diducites* (*D. poljessicus, D. commutatus*) occur in the subzone as well as *Lophozonotriletes magnus* and *Converrucosisporites curvatus*.

Foraminifera of the *Quasiendothyra communis* Zone have been found in the DG Subzone in the Timan-Pechora Province (DURKINA & AVKHIMOVITCH, in press).

Spelaeotriletes papulosus (SP) Subzone (Pl. 26)

This subzone has been identified in the Volga Region near Volgograd (NAZARENKO, 1975). It also occurs in the Pripyat Depression (AVKHIMOVITCH & DEMIDENKO, 1985; AVKHIMOVITCH, 1986), in the Central regions (UMNOVA, 1971; RASKATOVA, 1973), in the Central Devonian Field (AVKHIMOVITCH, 1978) and in the Timan-Pechora Province (DURKINA & AVKHIMOVITCH, 1986).

This subzone is referable to the lower part of the Sennov Horizon in the Volga region near Volgograd, the upper part of the Streshin Horizon in the Pripyat Depression, the Kudejar Beds of the Plavsk Horizon in the Central regions and the lowermost Zelenets Horizon in the Timan-Pechora Province.

The index species of the Zone *Diducites versabilis* is still abundant and the subzonal index species *Spelaeotriletes papulosus* terminates its development in this subzone. *Grandispora facilis, G. lupata* and *Auroraspora evanida*, forms typical of the Late Devonian deposits, appear in the subzone as do *Convolutispora usitata* and *Dictyotriletes grandiformis*. *Lophozonotriletes proscurrus* is also a characteristic element. Among other miospores, *Grandispora distinctus, G. famenensis* and *Discernisporites golubinicus* are typical of the subzone. Miospores of the genus *Diducites* are less numerous than in the lower subzone.

In the Timan-Pechora Province Conodonts of the *Polygnathus stryriacus* Zone have been determined in this subzone (DURKINA *et al.*, 1980).

2. — BIOSTRATIGRAPHICAL RELATIONS BETWEEN THE EAST EUROPEAN PLATFORM AND THE ARDENNE-RHINE REGIONS

An attempt is made (Fig. 4) to correlate, using miospores, the new zonation of the East European Platform with the zonation built in the Ardenne-Rhine regions by STREEL *et al.* (1987). This last zonation having been correlated by STREEL & LOBOZIAK (in press) with the standard Conodont zonation, relatively reliable datation can be proposed.

A main result is to show the well diversified zones and subzones described on the East European Platform during the interval covering the Late Frasnian and Early Famennian times, compared to the poor definition of the contemporaneous zones (mainly IV and V tentatives zones) described so far in Western Europe.

3. — LIST OF TAXA CITED IN TEXT AND PLATE EXPLANATIONS

Abbreviations used :

ARKH. = ARKHANGELSKAYA
AVKH. = AVKHIMOVITCH
NEKR. = NEKRIATA
OBUKH. = OBUKHOVSKAYA
PASCHK. = PASCHKEVITCH
RASK. = RASKATOVA
TCHIB. = TCHIBRIKOVA

Acanthotriletes bucerus TCHIB. Pl. 11
Acanthotriletes eximius NAUMOVA Pl. 11
Acanthotriletes perpusillus NAUMOVA Pl. 6
Acanthotriletes uncatus NAUMOVA
Acanthotriletes variaculeatus KEDO Pl. 6

Acinosporites acanthomammillatus RICHARDSON

Ancyrospora fidus (NAUMOVA) OBUKH. Pl. 9, 12
Ancyrospora incisa (NAUMOVA) M. RASK. & OBUKH. Pl. 10
Ancyrospora laciniosa (NAUMOVA) MANTSUROVA Pl. 12
Ancyrospora melvillensis OWENS Pl. 11
Ancyrospora microincisa (KEDO) OBUKH. Pl. 5
Ancyrospora orlovica (NAZARENKO & NEKR.) AVKH. & NEKR. Pl. 21, 24
Ancyrospora voronensis (ARKH.) ARKH. Pl. 15

Aneurospora greggsii (MCGREGOR) STREEL Pl. 10
Aneurospora heterodonta (NAUMOVA) STREEL Pl. 9

Apiculatisporites dentatus (NAUMOVA) OBUKH. Pl. 11

Apiculiretusispora absurda (TCHIB.) ARKH. Pl. 1
Apiculiretusispora aculeolata (TCHIB.) ARKH. Pl. 1
Apiculiretusispora divulgata TCHIB. var. *plicata* TCHIB. Pl. 1
Apiculiretusispora gibberosa (KEDO) ARKH. Pl. 5
Apiculiretusispora microaculeata (TCHIB.) TCHIB.
Apiculiretusispora sterlibaschevensis (TCHIB.) ARKH. Pl. 2
Apiculiretusispora verrucosa (KEDO) ARKH. Pl. 3

Archaeoperisaccus concinnus NAUMOVA Pl. 13-15
Archaeoperisaccus echinatus RASK. Pl. 14, 15
Archaeoperisaccus menneri NAUMOVA Pl. 13, 14
Archaeoperisaccus mirandus NAUMOVA Pl. 14
Archaeoperisaccus mirus NAUMOVA Pl. 14, 15
Archaeoperisaccus ovalis NAUMOVA Pl. 13
Archaeoperisaccus verrucosus PASCHK. Pl. 11

Archaeozonotriletes densus (MCGREGOR) ARKH. Pl. 11
Archaeozonotriletes gravis ARKH.
Archaeozonotriletes ignoratus (NAUMOVA) TCHIB. Pl. 1, 2
Archaeozonotriletes latemarginatus (KEDO) OBUKH. Pl. 10
Archaeozonotriletes ocularis RASK. Pl. 8
Archaeozonotriletes polymorphus NAUMOVA var. *takatinicus* TCHIB. Pl. 2
Archaeozonotriletes timanicus NAUMOVA Pl. 8, 11, 12
Archaeozonotriletes variabilis NAUMOVA Pl. 12
Archaeozonotriletes variabilis NAUMOVA var. *insignis* SENNOVA Pl. 11

Auroraspora evanida (KEDO) AVKH.
Auroraspora limpida (NAUMOVA) AVKH. Pl.19
Auroraspora luteola (NAUMOVA) AVKH.
Auroraspora macra SULLIVAN Pl. 22
Auroraspora pallida (NAUMOVA) AVKH.
Auroraspora speciosa (NAUMOVA) OBUKH. Pl. 16, 17
Auroraspora speciosa (NAUMOVA) OBUKH. var. *ornatus* NAZARENKO Pl. 14
Auroraspora varia (NAUMOVA) AHMED Pl. 21, 26

Azonomonoletes ellipsoides KEDO Pl. 6

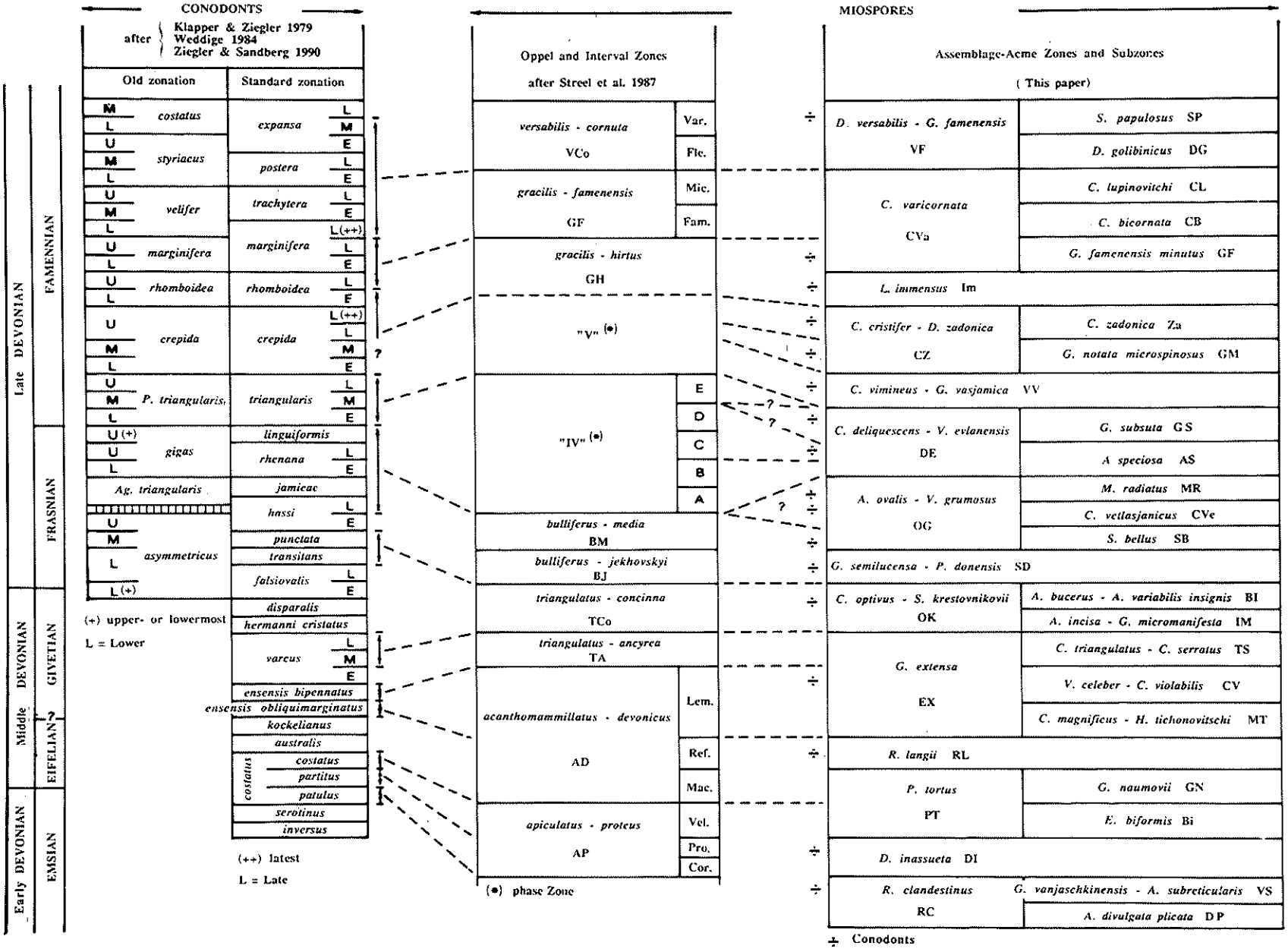

FIGURE 4

Middle and Late Devonian biostratigraphical (Conodonts and miospores) relations between the East European Platform and the Ardenne-Rhine regions, modified after STREEL & LOBOZIAK, in press

Azonomonoletes microtuberculatus Tchib. Pl. 1, 3
Azonomonoletes subreticularis Tchib. Pl. 1
Azonomonoletes tuberculatus Tchib. Pl. 3

Bascaudaspora dobridia Arkh. Pl. 14
Bulbosisporites bulbosus (Obukh.) Obukh. Pl. 15
Bulbosisporites volgogradicus (Nazarenko & Tchib.) Obukh. Pl. 21, 22

Calyptosporites proteus (Naumova) Allen Pl. 5
Calyptosporites tener (Tchib.) Obukh. var. *concinnus* Tchib. Pl. 2
Calyptosporites velatus (Eisenack) Richardson Pl. 4

Camarozonotriletes minutus (Naumova) Tchib. Pl. 6
Camarozonotriletes obtusus Naumova Pl. 12

Chelinospora concinna Allen Pl. 8, 11
Chelinospora lepidus (Obukh.) Obukh. Pl. 17
Chelinospora polymorpha (Naumova) Obukh.
Chelinospora polymorpha (Naumova) Obukh. var. *lepidus* Obukh.

Cingulatisporites cassiformis (Rask.) Arkh.

Cirratriradites monogrammos (Arkh.) Arkh. Pl. 6, 7
Cirratriradites punctomonogrammos (Arkh.) Arkh.

Contagisporites optivus (Tchib.) Owens Pl. 10

Converrucosisporites curvatus (Naumova) Turnau Pl. 11, 18-21
Converrucosisporites curvatus (Naumova) Turnau var. *medius* Kedo Pl. 18, 19

Convolutispora cancellothyris (Waltz) Avkh. & Nekr. Pl. 21, 23
Convolutispora crassitunicata (Obukh.) Obukh. Pl. 14
Convolutispora subtilis Owens Pl. 14
Convolutispora tegula Allen
Convolutispora usitata Playford Pl. 26
Convolutispora zadonica (Nekr.) Obukh. & Nekr. Pl. 20

Corbulispora semireticulata (Tchib.) Tchib. Pl. 18
Corbulispora vimineus (Nekr.) Obukh. & Nekr. Pl. 18, 19

Cornispora bicornata Nazarenko Pl. 22-24
Cornispora monocornata Nazarenko Pl. 22-24
Cornispora tricornata Nazarenko Pl. 23
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Cristatisporites deliquescens (Naumova) Arkh. Pl. 16, 17
Cristatisporites imperpetuus (Sennova) Obukh. Pl. 18
Cristatisporites lupinovitchi (Avkh.) Avkh. Pl. 22-24
Cristatisporites triangulatus (Allen) McGregor & Camfield Pl. 9, 10
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Cymbosporites acanthaceus (Kedo) Obukh. Pl. 16
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Diaphanospora inassueta (Tchib.) Arkh. Pl. 2
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PLATE 1

Illustrated specimens magnifications × 500 for all the plates
Retusotriletes clandestinus (RC) Zone

Fig. 1. — *Retusotriletes clandestinus* Tchib.
W. slope Southern Ural, Rauzjak, 8, 43,7-45, 2 m

2. — *Apiculiretusispora divulgata* Tchib. var. *plicata* Tchib.
W. slope Southern Ural, Rauzjak, 8, 38,2-40,6 m

3. — *Retusotriletes stylifer* Tchib.
W. Bashkir, Uruzbaevskaja, 59, 1427,5-1430,2 m

4. — *Cyclogranisporites plicatus* Allen
W. Bashkir, Uruzbaevskaja, 59, 1435-1440 m

5. — *Retusotriletes naumovae* Tchib.
W. slope Southern Ural, Rauzjak, 8, 33,5-34,4 m

6. — *Apiculiretusispora absurda* (Tchib.) Arkh.
W. Bashkir, Khlebodarovskaja, 7, 2448-2450 m

7. — *Apiculiretusispora aculeolata* (Tchib.) Arkh.
W. slope Southern Ural, Rauzjak, 8, 38,4-40,6 m

8. — *Retusotriletes microaculeatus* Tchib.
W. slope Southern Ural, Rauzjak, 8, 33,4-34,4 m

9. — *Dibolisporites capitellatus* (Tchib.) Arkh.
W. slope Southern Ural, Inzer river, Gabdukovo village

10. — *Archaeozonotriletes ignoratus* (Naumova) Tchib.
W. slope Southern Ural, Inzer river, Gabdukovo village

11. — *Emphanisporites annulatus* McGregor
Belarus, Braslavskaja, 14, 225-229 m

12. — *Retusotriletes ambagiosus* Tchib.
W. slope Southern Ural, Inzer river, Gabdukovo village

13. — *Grandispora endemica* (Tchib.) Tchib. var. *vanjaschkinensis* Tchib.
W. slope Southern Ural, Inzer river, Gabdukovo village

14. — *Grandispora longa* (Arkh.) Tchib. var. *antiquus* Tchib.
Belarus, Braslavskaja, 14, 225-229 m

15. — *Azonomonoletes microtuberculatus* Tchib.
W. slope Southern Ural, Inzer river, Gabdukovo village

16. — *Azonomonoletes subreticularis* Tchib.
W. slope Southern Ural, Inzer river, Gabdukovo village

17. — *Retusotriletes insperatus* Tchib.
W. slope Southern Ural, Inzer river, Gabdukovo village

18. — *Leiotriletes pagius* Allen
Belarus, Braslavskaja, 6, 327-331 m

19. — *Emphanisporites rotatus* McGregor
Belarus, Braslavskaja, 14, 225-229 m

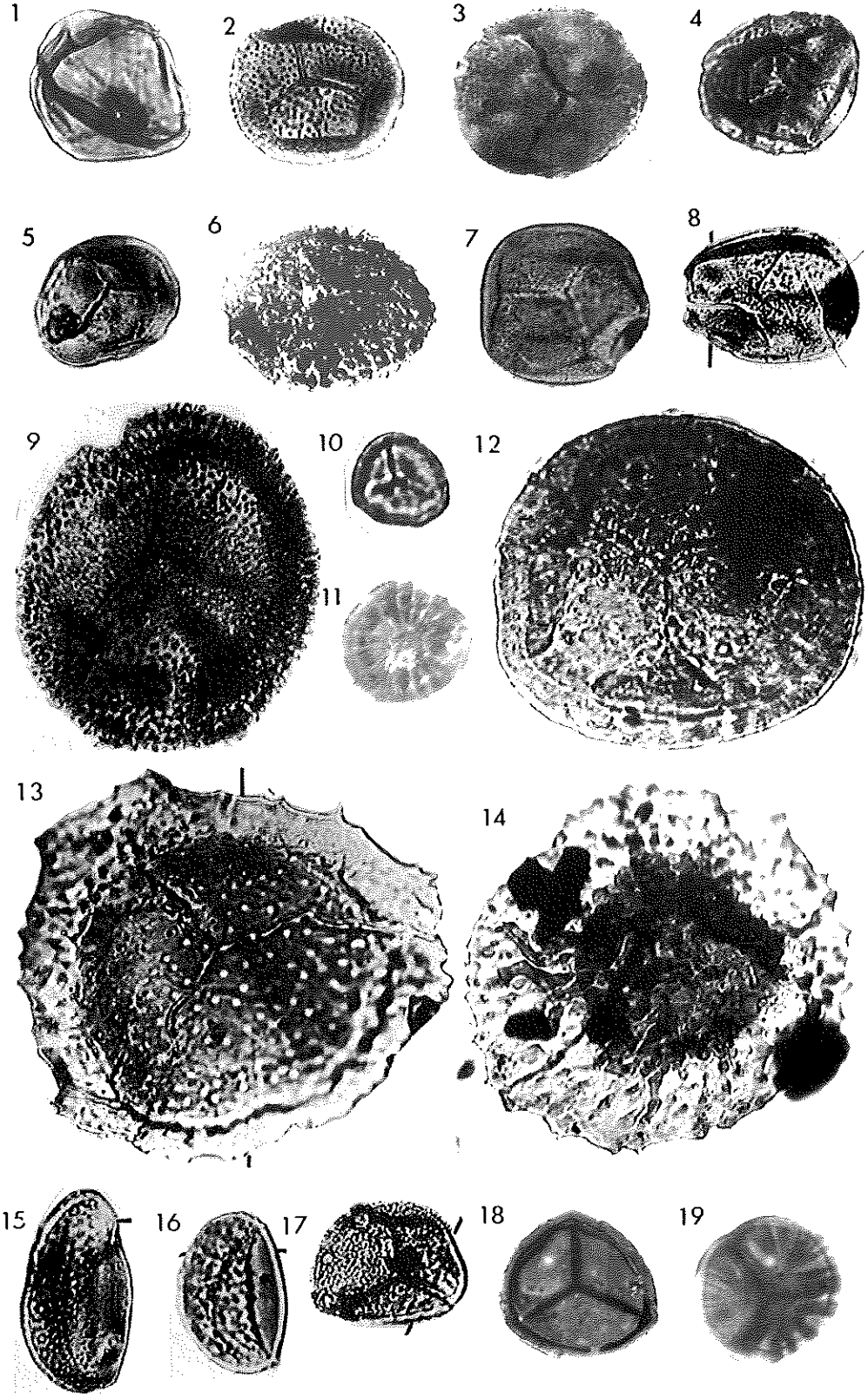
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PLATE 2

Diaphanospora inassueta (DI) Zone

Fig. 1. — *Diaphanospora inassueta* (Tchib.) Arkh.
W. Bashkir, Konstantinovskaja, 6, 1754-1760 m

2. — *Diaphanospora impolita* (Tchib.) Arkh.
W. slope Southern Ural, Inzer river, Gabdukovo village

3. — *Gneudnaspora divellomedium* (Tchib.) Balme
Belarus, Tscherikovskaja, 1, 418-423 m

4. — *Grandispora endemica* (Tchib.) Tchib.
W. slope Southern Ural, Inzer river, Gabdukovo village

5. — *Punctatisporites tortuosus* (Tchib.) Arkh.
W. Bashkir, Konstantinovskaja, 6, 1754-1760 m

6. — *Dibolisporites radiatus* Tiwari & Schaarschmidt
Belarus, Berdyzh, 1, 431-436 m

7. — *Apiculiretusispora sterlibaschevensis* (Tchib.) Arkh.
W. Bashkir, Sterlibashevskaja, 19, 2017-2028 m

8. — *Dibolisporites triangulatus* Tiwari & Schaarschmidt
Belarus, Berdyzh, 1, 431-436 m

9. — *Archaeozonotriletes ignoratus* (Naumova) Tchib.
W. Bashkir, Ishtuganovskaja, 2, 1028,7-1029,9 m

10. — *Archaeozonotriletes polymorphus* Naumova var. *takatinicus* Tchib.
W. Bashkir, Sumlinskaja, 17, 2092,7-2098,5 m

11. — *Lanatisporites hispidus* Arkh.
Belarus, Tscherikovskaja, 1, 418-423 m

12. — *Calyptosporites tener* (Tchib.) Obukh. var. *concinnus* Tchib.
Belarus, Braslavskaja, 6, 297-307 m

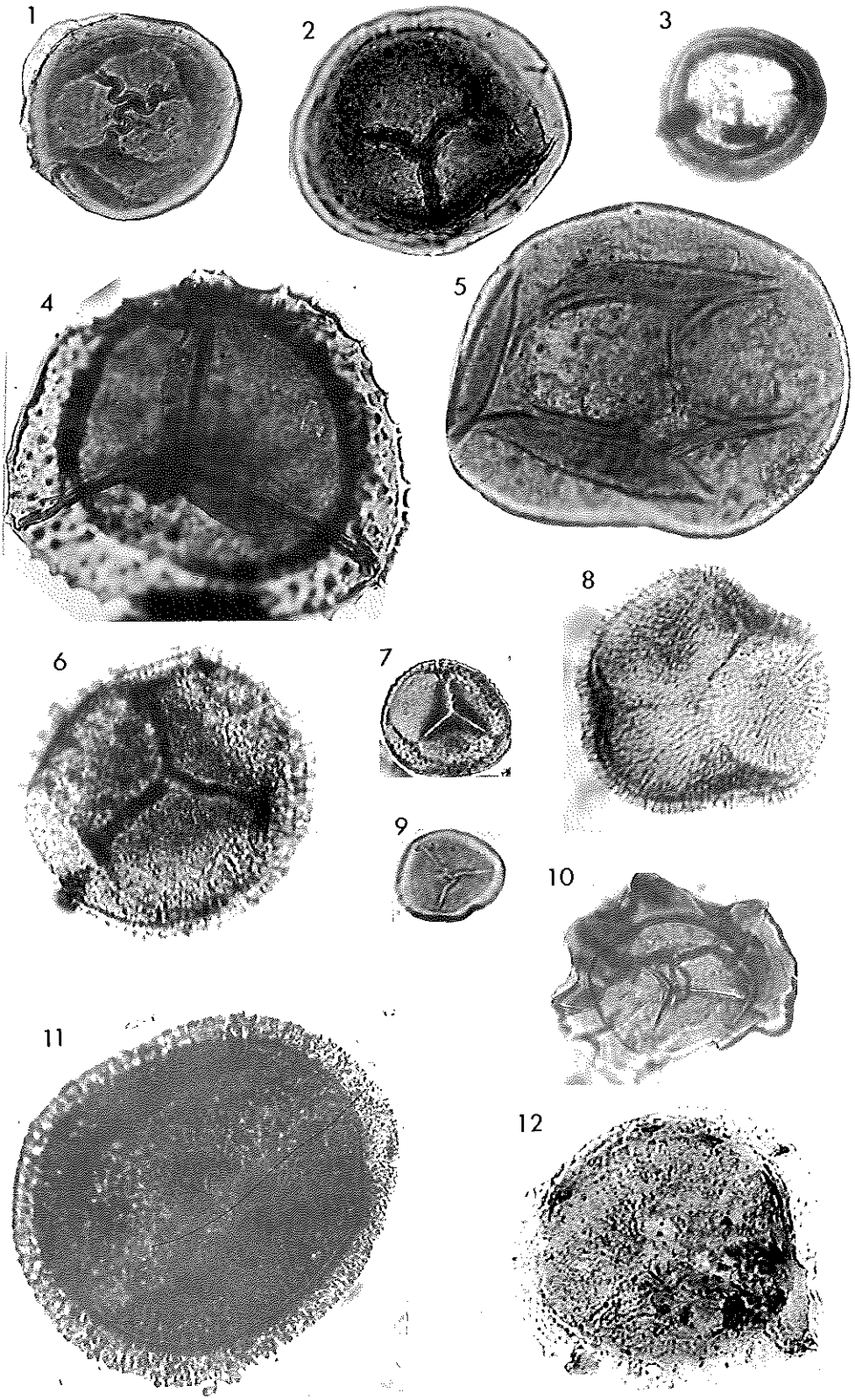
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PLATE 3

Diaphanospora inassueta (DI) Zone

Fig. 1. — *Dibolisporites capitellatus* (TCHIB.) ARKH.
Volga Basin near Volgograd, Tersinskaja,80, 2603-2611 m

2. — *Dibolisporites apsogus* (TCHIB.) TCHIB.
W. Bashkir, Leninskaja, 2, 1987-1990 m

3. — *Rhabdosporites mirus* ARKH.
Belarus, Tscherikovskaja, 1, 418-423 m

4. — *Hystricosporites mitratus* ALLEN
Latvia, Talsy, 55, 588 m

5. — *Azonomonoletes microtuberculatus* TCHIB.
W. Bashkir, Elatminskaja, 2, 2406-2413 m

6. — *Azonomonoletes tuberculatus* TCHIB.
W. Bashkir, Elatminskaja, 2, 2406-2413 m

7. — *Grandispora douglastownense* MCGREGOR
Belarus, Tscherikovskaja, 1, 418-423 m

8. — *Retusotriletes communis* NAUMOVA var. *modestus* TCHIB.
Volga Basin near Volgograd, Tersinskaja, 80, 2603-2611 m

9. — *Apiculiretusispora verrucosa* (KEDO) ARKH.
Belarus, Berdyzh, 1, 431-436 m

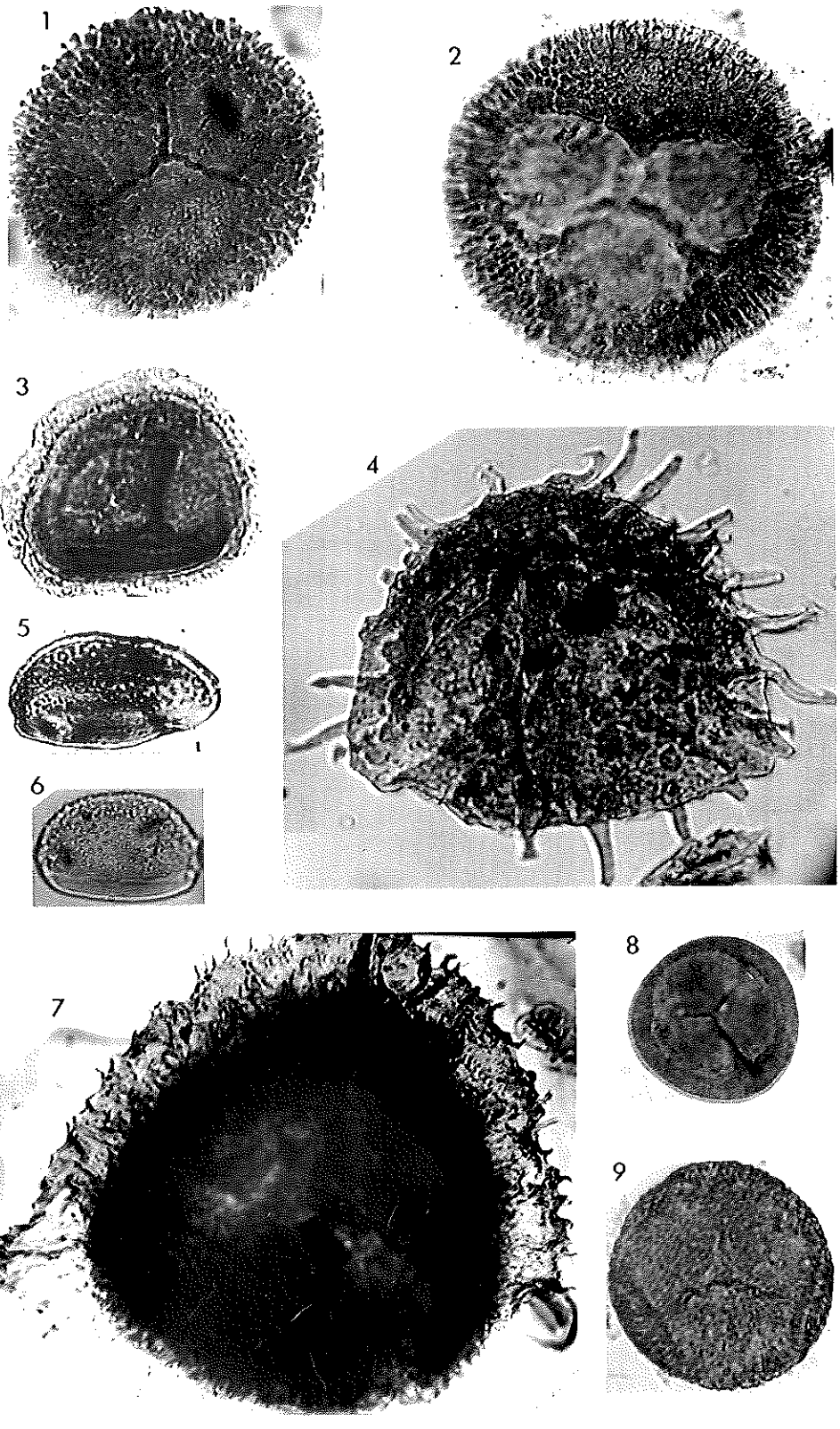
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PLATE 4

Periplecotriletes tortus (PT) Zone
E. biformis (Bi) Subzone

Fig. 1. — *Periplecotriletes tortus* EGOROVA
W. Bashkir, Ermekeevo, 11, 1976-1982 m

2. — *Dibolisporites antiquus* (KEDO) ARKH.
Central Regions, Brjanskaja, 6000, 510 m

3, 4. — *Elenisporis biformis* (ARKH.) ARKH.
3. Volga Basin near Volgograd, Khoperskaja, 974, 759,7-764,4 m
4. Belarus, Tscherikovskaja, 1, 386,8-392,2 m

5. — *Calyptosporites velatus* (EISENACK) RICHARDSON
Central Regions, Brjanskaja, 6000, 510 m

6. — *Sinuosisporites sinuosus* (UMNOVA) ARKH.
Volga Basin near Volgograd, Khoperskaja, 974, 759,7-764,4 m.

7. — *Kraeuselisporites acerosus* (ARKH.) McGREGOR & CAMFIELD
W. Bashkir, Ermekeevo, 11, 1976-1982 m

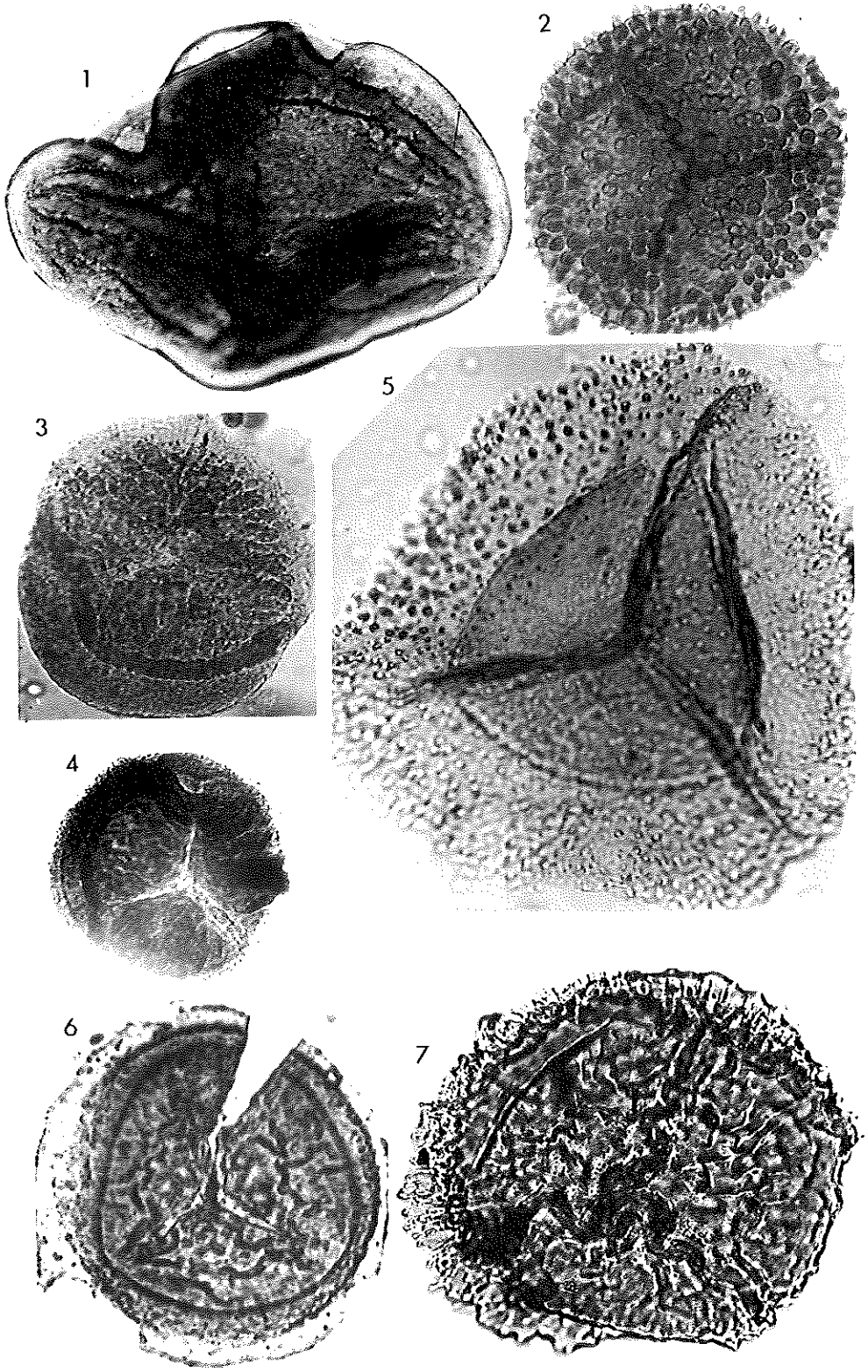
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PLATE 5

Periplecotriletes tortus (PT) Zone
G. naumovii (GN) Subzone

Fig. 1. — *Periplecotriletes tortus* EGOROVA
Belarus, Berdyzh, 1, 354-359 m

2. — *Grandispora naumovii* (KEDO) MCGREGOR
Belarus, Chotimskaja, 1, 470-472 m

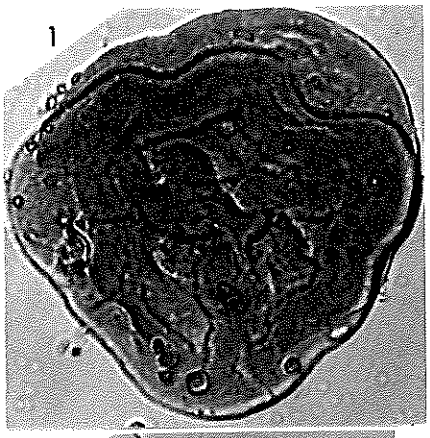
3. — *Hystricosporites setigerus* (KEDO) OBUKH.
Belarus, Chotimskaja, 1, 438-440 m

4. — *Ancyrospora microincisa* (KEDO) OBUKH.
Belarus, BH PNPZ, 215-230 m

5. — *Apiculiretusispora gibberosa* (KEDO) ARKH.
Volga Basin near Volgograd, Choperskaja, 974, 759,7-764,4 m

6. — *Rhabdosporites facetus* (ARKH.) ARKH.
Belarus, Berdyzh, 1, 354-359 m

7. — *Calyptosporites proteus* (NAUMOVA) ALLEN
Belarus, Gavriltchitskaja, 45, 385 m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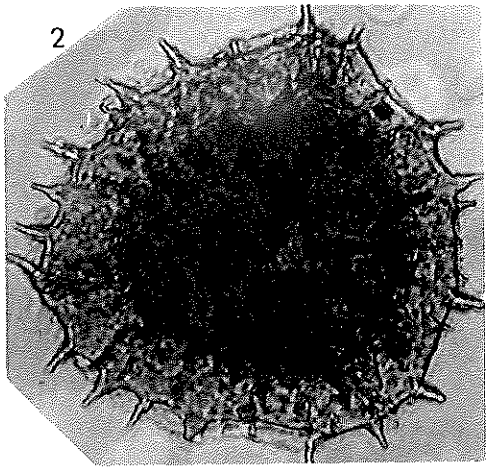
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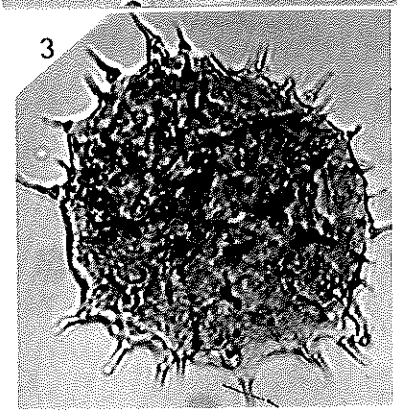
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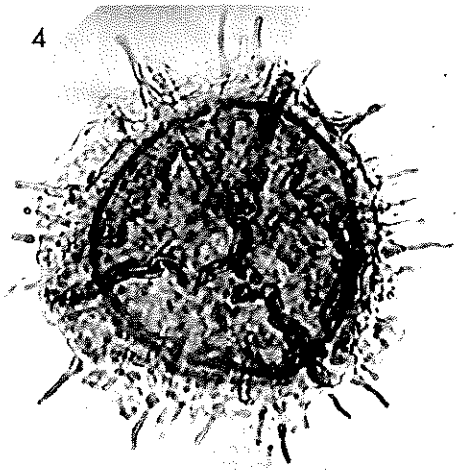
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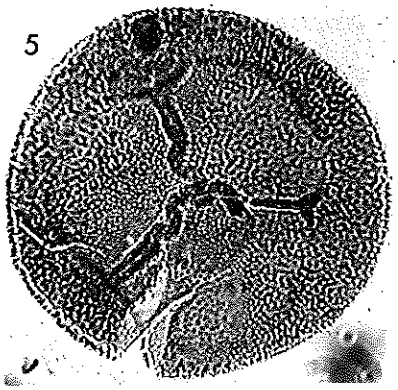
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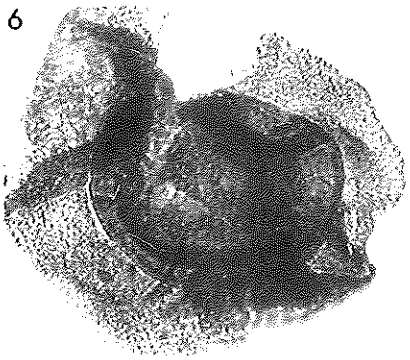
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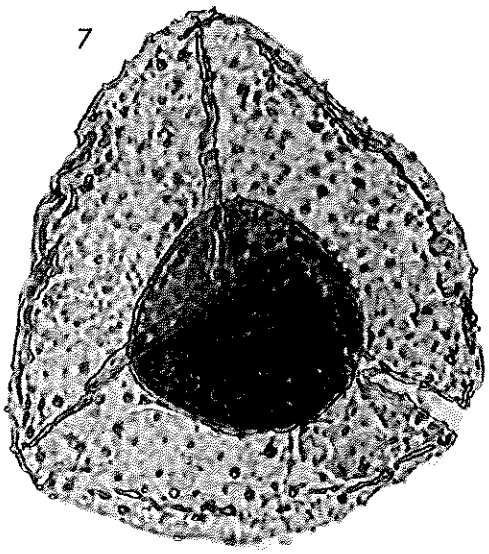
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PLATE 6

Rhabdosporites langii (RL) Zone

Fig. 1. — *Rhabdosporites langii* (Eisenack) Richardson
Central Devonian Field, L. Mamon, 596, 114,1 m

2. — *Retispora archaeolepidophyta* (Kedo) McGregor & Camfield
Belarus, Chotimskaja, 1, 414 m

3. — *Cirratriradites monogrammos* (Arkh.) Arkh.
Central Regions, Vjasma, 1, 734,9 m

4. — *Perotrilites meonacanthus* (Naumova) Arkh.
Belarus, Gavriltchitskaja, 45, 361-365 m

5. — *Lophotriletes paucus* Kedo
Belarus, Gavriltchitskaja, 45, 361-365 m

6. — *Camarozonotriletes minutus* (Naumova) Tchib.
Belarus, Gavriltchitskaja, 45, 361-365 m

7. — *Acanthotriletes variaculeatus* Kedo
Belarus, BH PNPZ, 190-194 m

8. — *Diatomozonotriletes devonicus* Naumova var. *azonatus* Tchib.
W. Bashkir, Ermekeevskaja, 12, 2278-2281 m

9. — *Azonomonoletes ellipsoides* Kedo
Central Regions, Adamovskaja, 1, 445 m

10. — *Acanthotriletes perpusillus* Naumova
W. Bashkir, BH Sulli, 7, 1926-1931 m

11. — *Samarisporites tozeri* Owens
Belarus, Gavriltchitskaja, 45, 361-365 m

12. — *Retusotriletes concinnus* Kedo
Central Devonian Field, L. Mamon, 596, 114,1 m

13. — *Stenozonotriletes formosus* Naumova
Belarus, Gavriltchitskaja, 45, 295-351 m

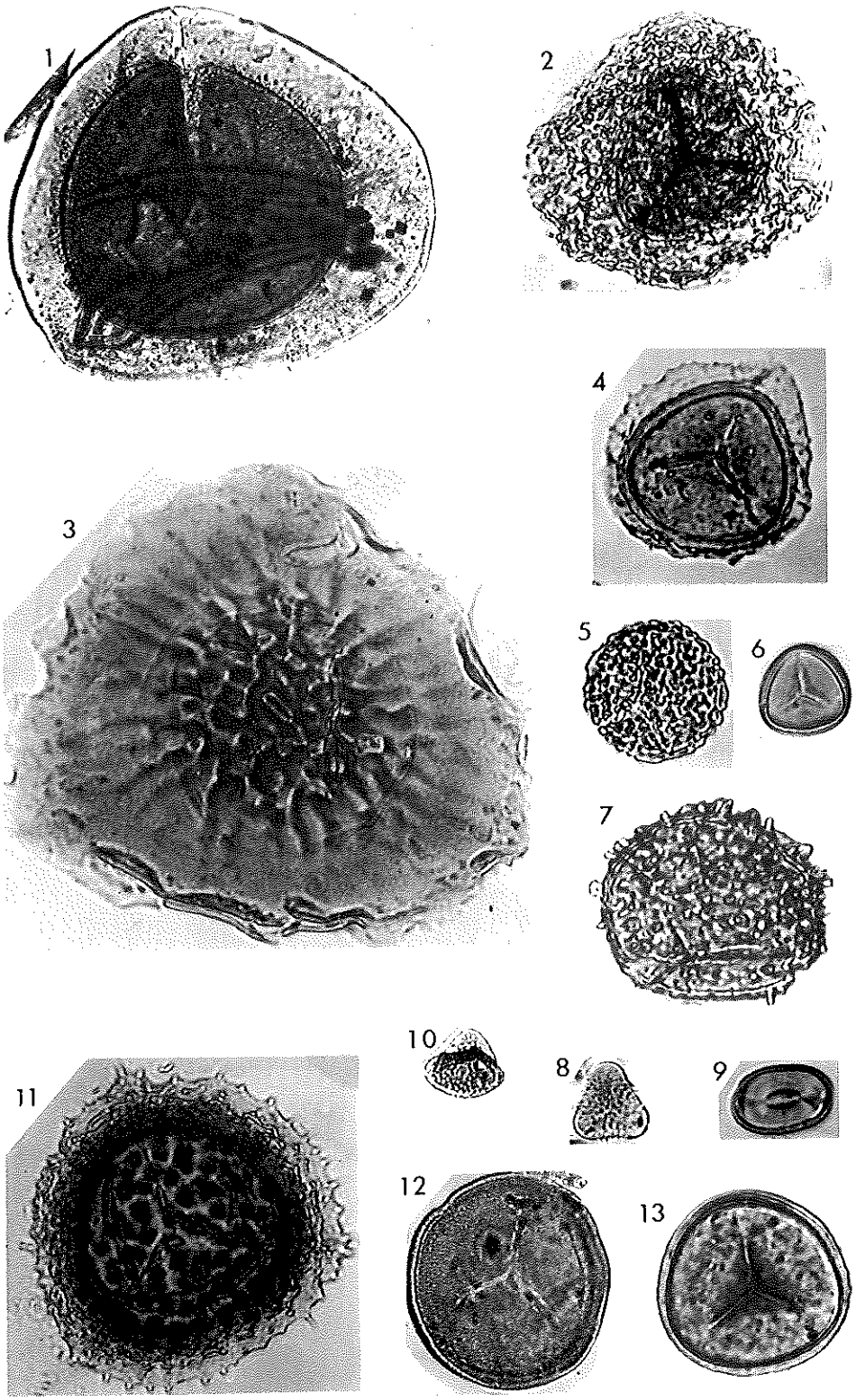
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PLATE 7

Geminospora extensa (EX) Zone
C. magnificus – H. tichonovitchi (MT) Subzone

Fig. 1. — *Geminospora extensa* (Naumova) Gao
Central Devonian Field, BH 8214, 139 m

2. — *Cymbosporites magnificus* (McGregor) McGregor & Camfield
W. Bashkir, Asnaevskaja, 1, 2208-2212 m

3. — *Geminospora tuberculata* (Kedo) Allen
Central Devovian Field, BH 8214, 139 m

4. — *Geminospora micromanifesta* (Naumova) Arkh. var. *minor* Naumova
Central Devonian Field, BH 8214, 139 m

5. — *Retusotriletes laevis* Tchib. var. *minor* Rask.
Central Devonian Field, BH 8204, 252 m

6. — *Membrabaculisporis comans* (Philimonova) Arkh.
W. Bashkir, Shaviady, 28, 1855,2-1857,3 m

7. — *Cirratriradites monogrammos* (Arkh.) Arkh.
Central Regions, Vjasma, 1, 674 m

8. — *Geminospora compta* (Naumova) Arkh. var. *expletivus* Tchib.
W. Bashkir, Kirgis-Mnjaki, 1, 2275-2281 m

9. — *Geminospora meonacantha* (Naumova) Tchib.
Central Regions, Vjasma, 1, 675 m

10. — *Lanatisporites bislimbatus* (Tchib.) Arkh.
Central Regions, Vjasma, 1, 675 m

11. — *Hymenozonotriletes tichonovitschi* Rask.
W. Bashkir, Znamenskaja, 120, 2075-2081 m

12. — *Geminospora egregius* (Naumova) Tchib.
W. Bashkir, Asnaevskaja, 1, 2212-2215 m

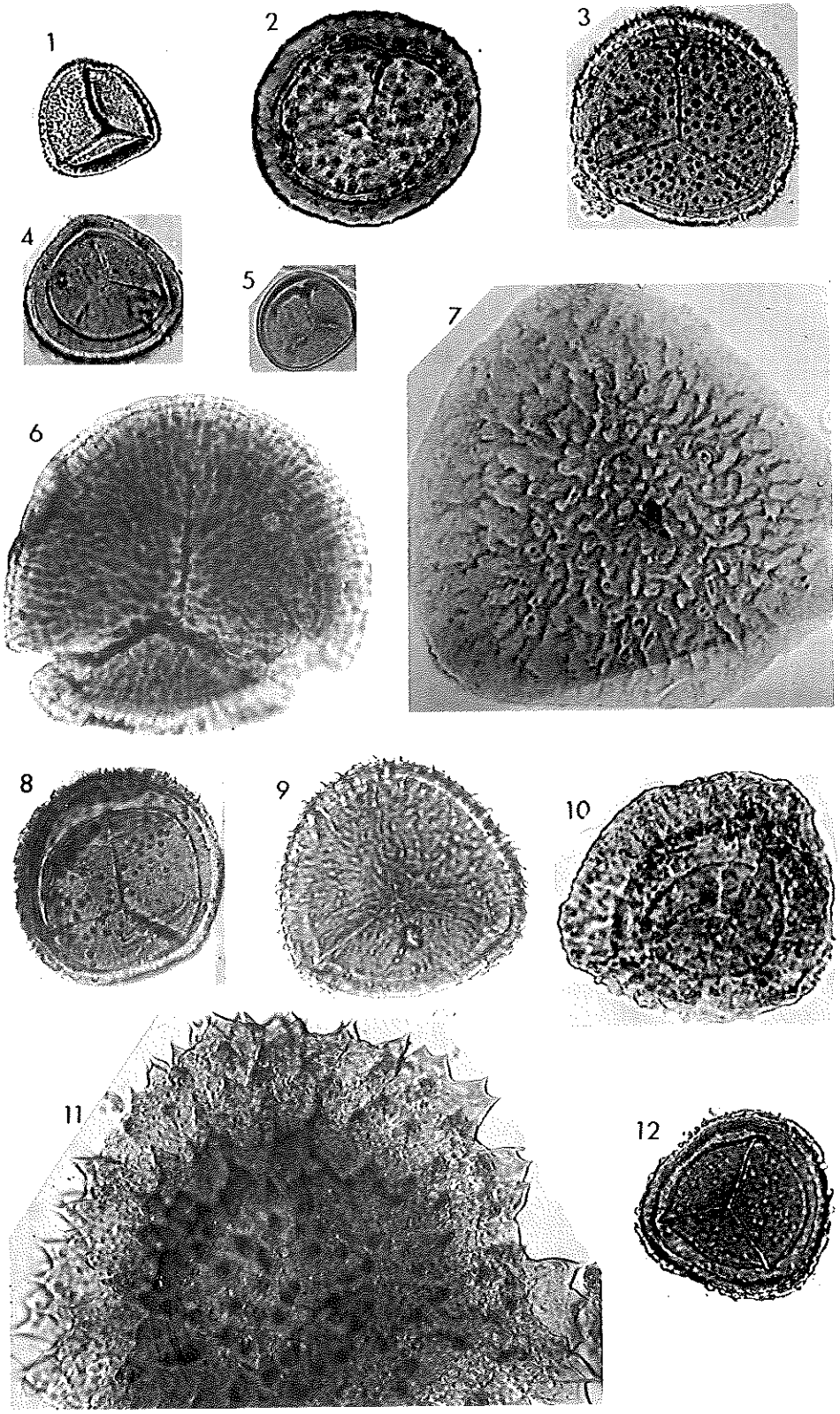
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PLATE 8

Geminospora extensa (EX) Zone
V. celeber – C.*(?) violabilis* (CV) Subzone

Fig. 1. — *Vallatisporites celeber* (Tchib.) Arkh.
W. Bashkir, Is – Basa, 22, 1829-1835 m

2. — *Cristatisporites (?) violabilis* (Tchib.) M. Rask. var. *major* Tchib.
W. Bashkir, Dubrovka, 1, 1760-1766 m

3. — *Cristatisporites (?) violabilis* (Tchib.) M. Rask.
W. Bashkir, Bokaly, 4, 1651-1657 m

4. — *Geminospora extensa* (Naumova) Gao
W. Bashkir, Arlanskaja, 3, 1925,7-1932,8 m

5. — *Geminospora tuberculata* (Kedo) Allen
Central Regions, Vjasma, 1, 654 m

6. — *Chelinospora concinna* Allen
Belarus, Pripyat Depression, BH 3259, 123-127 m

7. — *Lanatisporites bislimbatus* (Tchib.) Arkh.
Belarus, BH PNPZ, 106-112 m

8. — *Grandispora inculta* Allen
Central Regions, Vjasma, 646 m

9. — *Archaeozonotriletes ocularis* Rask.
Central Devonian Field, BH 8204, 210 m

10. — *Archaeozonotriletes timanicus* Naumova
Central Devonian Field, Pavlosk quarry

11. — *Geminospora decora* (Naumova) Arkh.
Belarus, Pripyat Depression, BH 3259, 123-127 m

12. — *Geminospora vulgata* (Naumova) Arkh.
Belarus, Pripyat Depression, BH 3259, 123-127 m

13. — *Geminospora micromanifesta* (Naumova) Arkh.
Central Regions, Vjasma, 674 m

14. — *Lophozonotriletes scurrus* Naumova var. *jugomaschevensis* Tchib.
W. Bashkir, Leninskaja, 8, 1841,4-1845,4 m

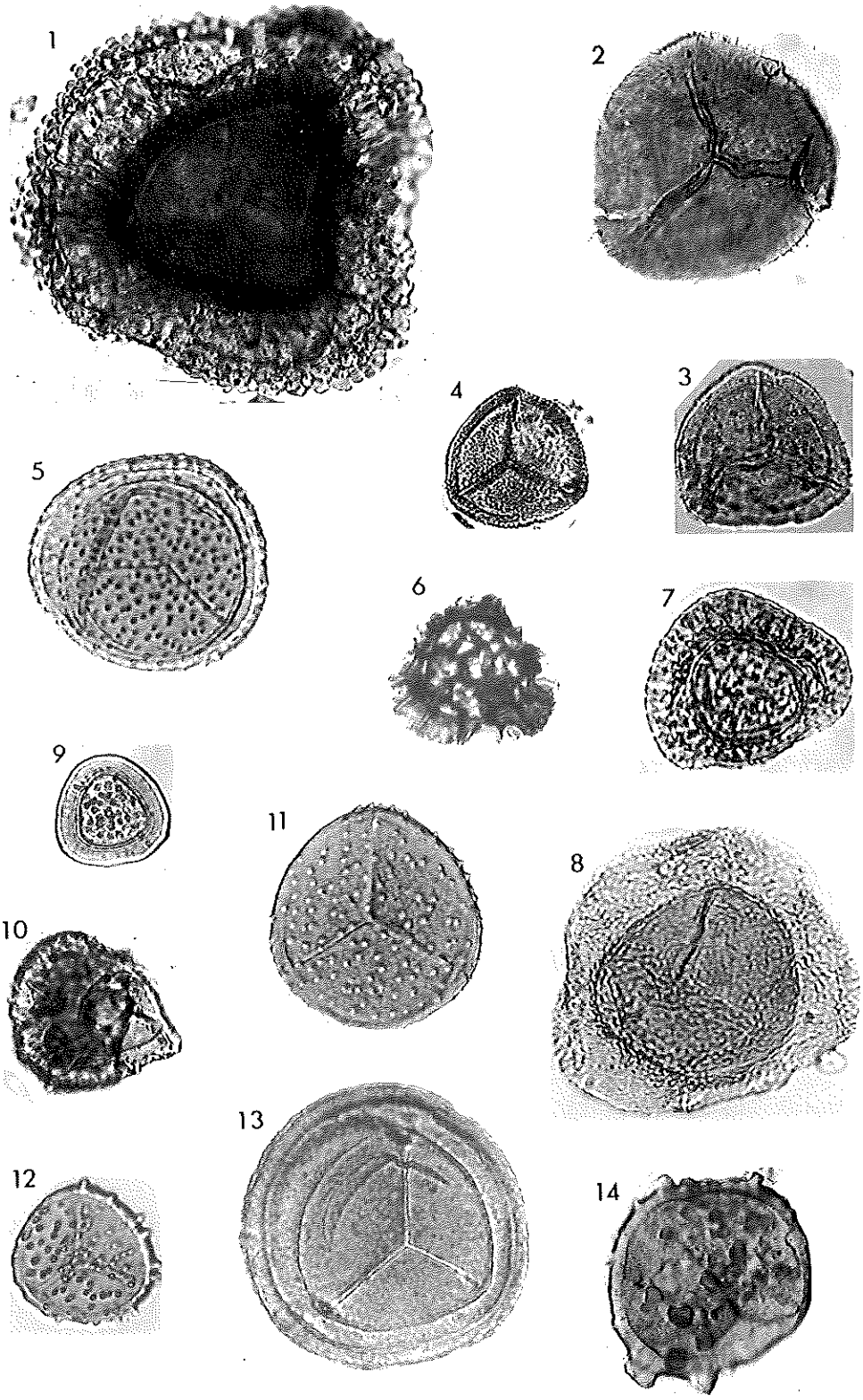
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PLATE 9

Geminospora extensa **(EX) Zone**

C. triangulatus – C. serratus (TS) Subzone

Fig. 1-2. — *Cristatisporites triangulatus* (ALLEN) MCGREGOR & CAMFIELD
1. Central Devonian Field, BH 8151, 113 m
2. Belarus, Mstislavskaja, 1, 263-265 m

3. — *Corystisporites serratus* (KEDO) MCGREGOR & CAMFIELD
Belarus, BH PNPZ, 106 m

4. — *Geminospora extensa* (NAUMOVA) GAO
W. Bashkir, Alkinskaja, 4, 2247-2249 m

5. — *Cymbosporites magnificus* (MCGREGOR) MCGREGOR & CAMFIELD
W. Bashkir, Ik-Basa, 22, 1807-1808 m

6. — *Corystisporites spinutissimus* (KEDO) OBUKH.
Central Regions, Vjasma, 646 m

7. — *Perotrilites spinosus* (NAUMOVA) ARKH.
W. Bashkir, Igrovka, 20, 2049,8-2050,6 m

8. — *Geminospora micromanifesta* (NAUMOVA) ARKH.
Central Devonian Field, BH, 88 m

9. — *Aneurospora heterodonta* (NAUMOVA) STREEL
W. Bashkir, Ik – Basa, 22, 1803-1807 m

10. — *Geminospora vulgata* (NAUMOVA) ARKH.
W. Bashkir, Ik – Basa, 22, 1803-1807 m

11. — *Geminospora rugosa* (NAUMOVA) OBUKH.
Central Devonian Field, BH 6774, 150 m

12. — *Geminospora tuberculata* (KEDO) ALLEN
Belarus, BH PNPZ, 106 m

13. — *Rugospora ? impolita* (NAUMOVA) TCHIB.
W. Bashkir, Dubrovka, 1, 1721,9-1728,8 m

14. — *Geminospora decora* (NAUMOVA) ARKH.
Central Regions, Vjasma, 646 m

15. — *Geminospora notata* (NAUMOVA) OBUKH.
Central Regions, Vjasma, 646 m

16. — *Ancyrospora fidus* (NAUMOVA) OBUKH.
W. Bashkir, Tumenjak-Charan, 1500, 1752 m

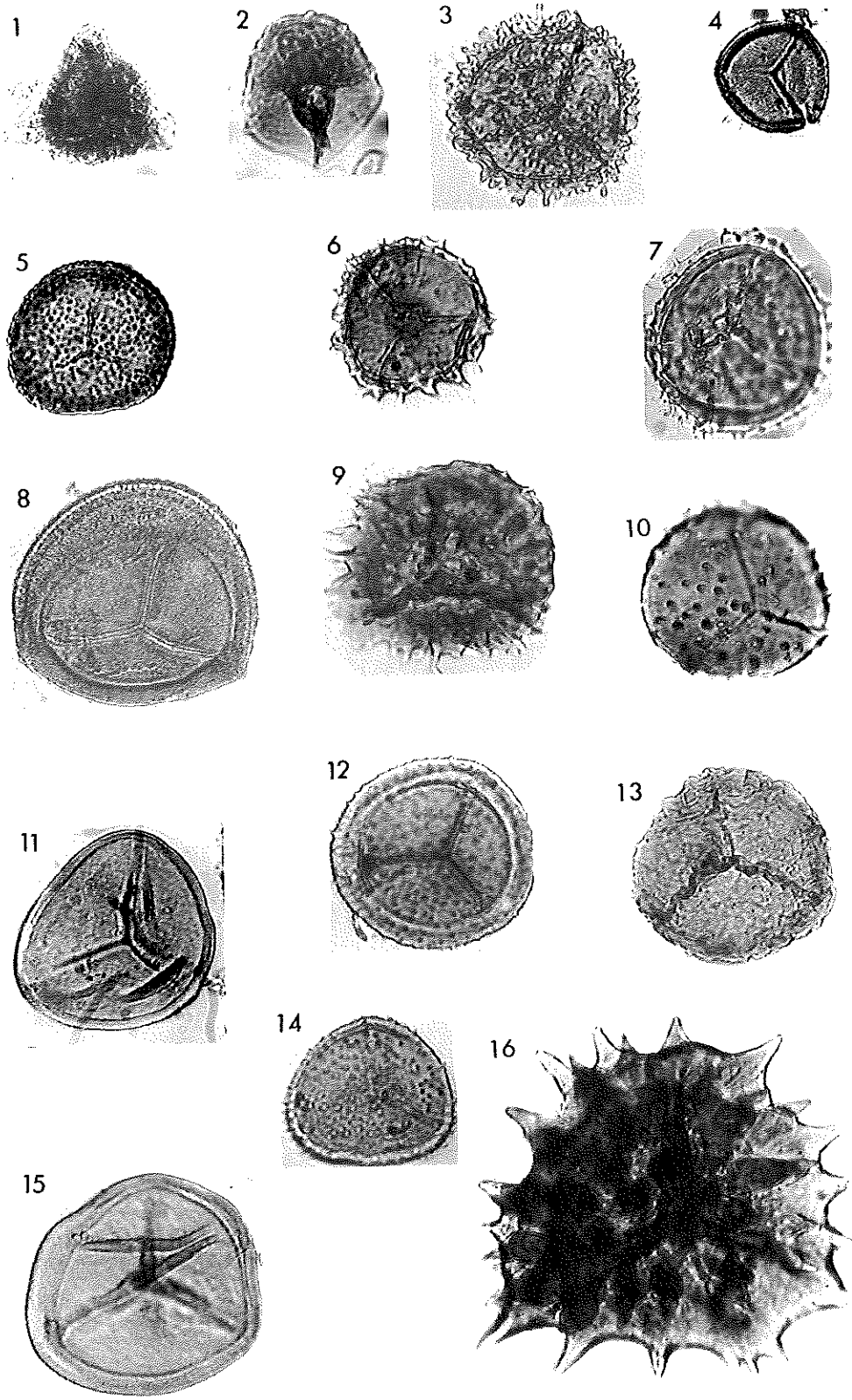
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PLATE 10

Contagisporites optivus – Spelaeotriletes krestovnikovii (OK) Zone
A. incisa – G. micromanifesta (IM) Subzone

Fig. 1. — *Ancyrospora incisa* (NAUMOVA) M. RASK. & OBUKH.
Belarus, Pripyat Depression, BH 3260, 67 m

2. — *Geminospora micromanifesta* (NAUMOVA) ARKH.
Central Devonian Field, BH 8151, 62 m

3. — *Aneurospora greggsii* (McGREGOR) STREEL
Central Devonian Field, BH 8151, 64 m

4, 5. — *Cristatisporites triangulatus* (ALLEN) McGREGOR & CAMFIELD
4. Central Regions, Vjasma, 602,5 m
5. Pripyat Depression, BH 3259, 123 m

6. — *Reticulatisporites retiformis* (NAUMOVA) OBUKH.
Belarus, Mstislavskaja, 1, 225-230 m

7. — *Geminospora micromanifesta* (NAUMOVA) ARKH. var. *limbatus* TCHIB.
Belarus, Pripyat Depression, BH 3259, 123 m

8. — *Geminospora plicata* OWENS
Belarus, Mstislavskaja, 1, 225-230 m

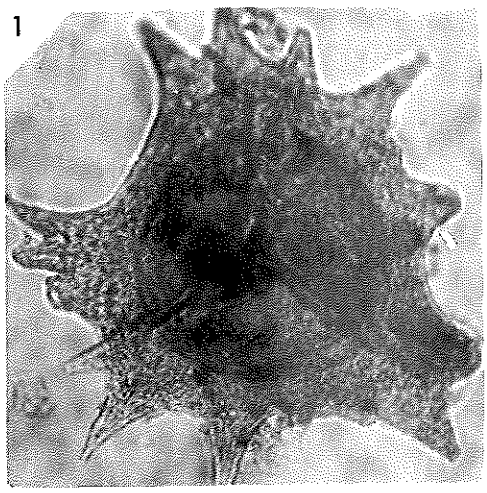
9. — *Reticulatisporites perlotus* (NAUMOVA) OBUKH.
W. Bashkir, Tchekmagushskaj, 67, 1922-1925 m

10. — *Geminospora notata* (NAUMOVA) OBUKH.
Belarus, Mstislavskaja, 1, 225-230 m

11. — *Contagisporites optivus* (TCHIB.) OWENS
Central Devonian Field, Pavlovsk quarry

12. — *Retusotriletes radiosus* RASK.
Belarus, Pripyat Depression, BH 3285, 71 m

13. — *Archaeozonotriletes latemarginatus* (KEDO) OBUKH.
Central Regions, Vjasma, 557 m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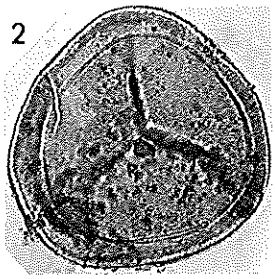
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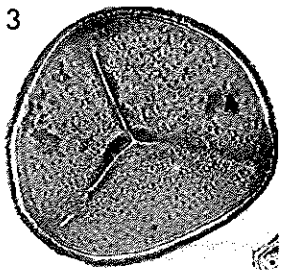
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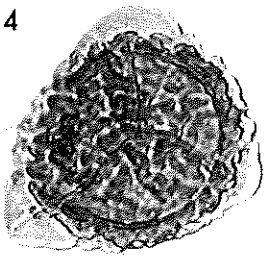
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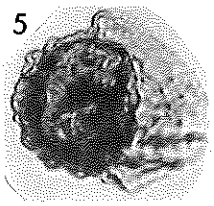
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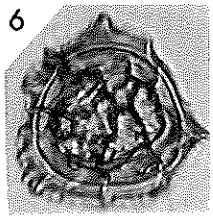
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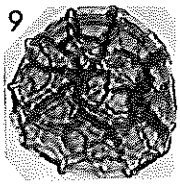
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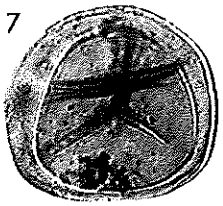
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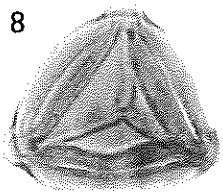
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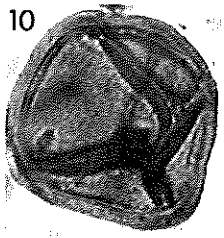
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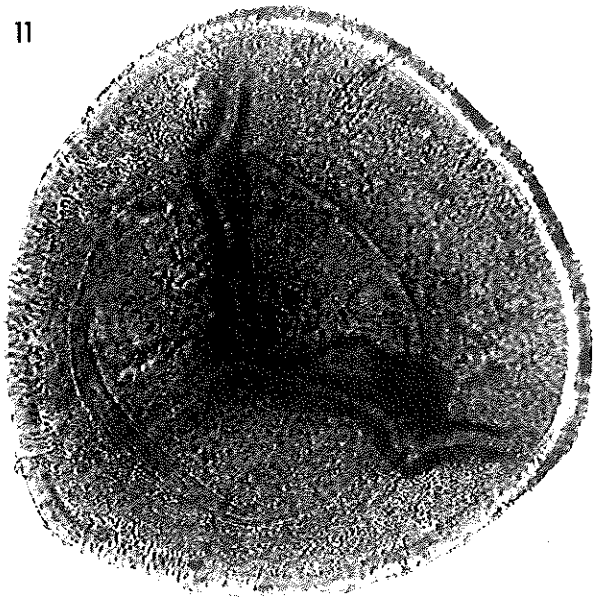
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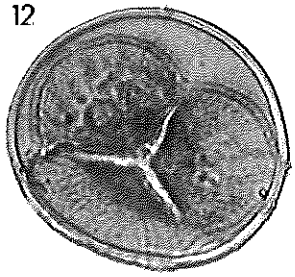
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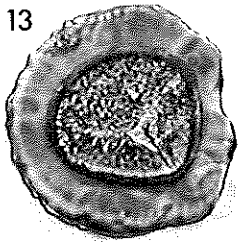
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PLATE 11

Contagisporites optivus – Spelaeotriletes krestovnikovii (OK) Zone
A. bucerus – A. variabilis insignis (BI) Subzone

Fig. 1. — *Spelaeotriletes krestovnikovii* (NAUMOVA) OBUKH.
Central Devonian Field, BH 8151, 44 m

2, 3. — *Archaeozonotriletes variabilis* NAUMOVA var. *insignis* SENNOVA
2. Belarus, Mstislavskaja, 1, 146,5-148,5 m
3. Central Devonian Field, BH 8151, 44 m

4. — *Acanthotriletes eximius* NAUMOVA
Central Devonian Field, BH 8231, 161,2 m

5. — *Acanthotriletes bucerus* TCHIB.
W. Bashkir, Bogorodskaja, 2, 2081-2084 m

6. — *Archaeozonotriletes densus* (MCGREGOR) ARKH.
Belarus, Pripyat Depression, N. Bobrovitschska, 1, 3729 m

7. — *Chelinospora concinna* ALLEN
W. Bashkir, Right Bank Belaja river

8, 9. — *Converrucosisporites curvatus* (NAUMOVA) TURNAU
8. Central Devonian Field, BH 8207, 157 m
9. Belarus, Pripyat Depression, Turovskaja, 121, 266 m

10. — *Archaeozonotriletes timanicus* NAUMOVA
Central Devonian Field, BH 8207, 157 m

11. — *Geminospora notata* (NAUMOVA) OBUKH.
Belarus, Mstislavskaja, 1, 146,5-148,5 m

12. — *Verrucosisporites (?) concessus* (NAUMOVA) OBUKH.
Belarus, Mstislavskaja, 1, 146,5-148,5 m

13. — *Archaeoperisaccus verrucosus* PASCHK.
Central Devonian Field, BH 8225, 178,5 m

14. — *Apiculatisporites dentatus* (NAUMOVA) OBUKH.
Belarus, Mstislavskaja, 1, 158-164 m

15. — *Ancyrospora melvillensis* OWENS
Timan-Pechora Province, Pyzhama river, outcrop 45/09, layer 27

16. — *Densosporites sorokinii* OBUKH.
Timan-Pechora Province, Pyzhama river, outcrop 45/09, layer 27

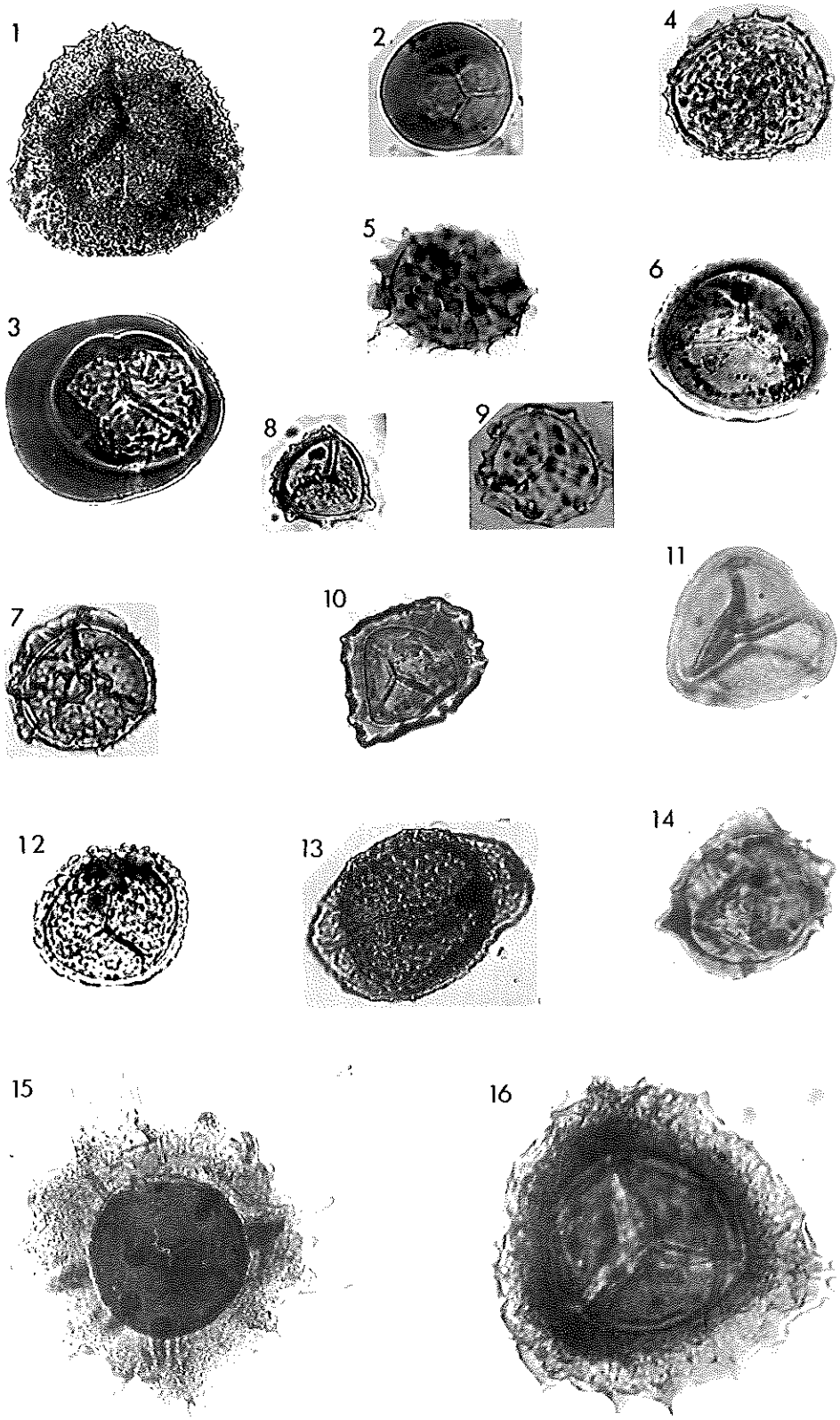
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PLATE 12

Geminospora semilucensa – Perotrilites donensis (SD) Zone

Fig. 1. — *Geminospora semilucensa* (NAUMOVA) OBUKH. & M. RASK.
Central Devonian Field, Kosii ovrag, outcrop, layer 1

2. — *Perotrilites donensis* (RASK.) M. RASK.
Central Devonian Field, Kosii ovrag, outcrop, layer 5

3. — *Geminospora aurita* ARKH.
Central Devonian Field, Kosii ovrag, outcrop, layer 5

4. — *Archaeozonotriletes timanicus* NAUMOVA
Volga Basin near Volgograd, Choperskaja, 966, 835-841 m

5. — *Geminospora rugosa* (NAUMOVA) OBUKH.
Belarus, Chotimskaja, 1, 140-145 m

6. — *Verruciretusispora domanica* (NAUMOVA) OBUKH.
Timan-Pechora Province, Domanik river outcrop

7. — *Cristatisporites trivialis* (NAUMOVA) OBUKH.
Volga Basin near Volgograd, Bolshovskaja, 5008, 1435-1439 m

8. — *Camarozonotriletes obtusus* NAUMOVA
Central Devonian Field, Kosii ovrag, outcrop, layer 1

9. — *Ancyrospora laciniosa* (NAUMOVA) MANTSUROVA
Volga Basin near Volgograd, Tersinskaja, 161, 1396-1400 m

10. — *Ancyrospora fidus* (NAUMOVA) OBUKH.
Volga Basin near Volgograd, Orlovskaja, 23, 1440-1442 m

11. — *Archaeozonotriletes variabilis* NAUMOVA
Volga Basin near Volgograd, Choperskaja, 966, 827-829 m

12. — *Spelaeotriletes krestovnikovii* (NAUMOVA) OBUKH.
Central Devonian Field, Rudkino outcrop, layer 1

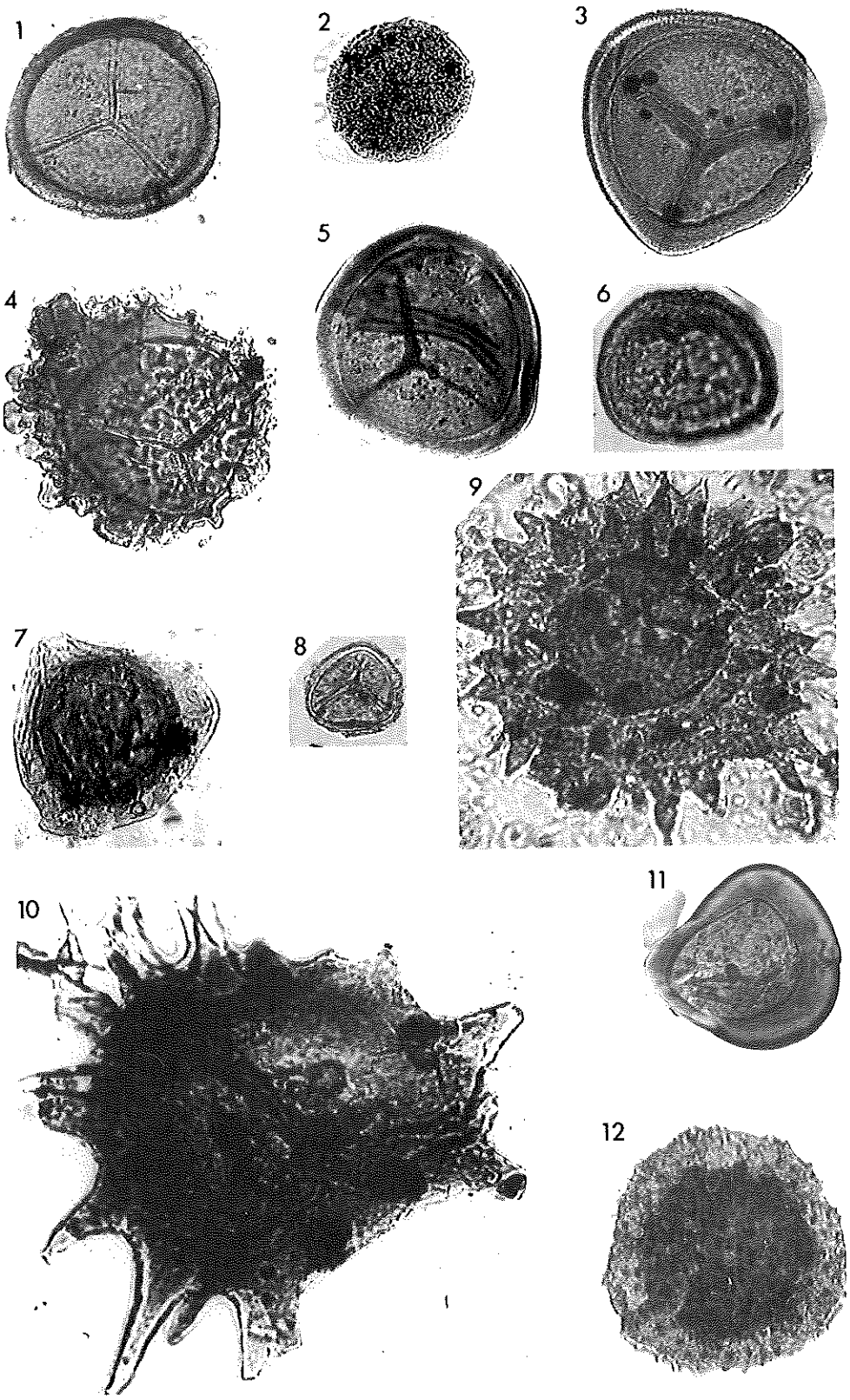
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PLATE 13

Archaeoperisaccus ovalis – *Verrucosisporites grumosus* (OG) Zone
S. bellus (SB) Subzone

Fig. 1. — *Archaeoperisaccus ovalis* Naumova
Central Devonian Field, Kosii ovrag, outcrop, layer 9

2. — *Archaeoperisaccus concinnus* Naumova
Central Devonian Field, Kosii ovrag, outcrop, layer 9

3. — *Spelaeotriletes bellus* (Naumova) Obukh.
Timan-Pechora Province, outcrop Tschut river 45/90

4. — *Geminospora aurita* Arkh.
Timan-Pechora Province, outcrop Tschut river 45/90

5. — *Archaeoperisaccus menneri* Naumova
Timan-Pechora Province, Pizhma river, outcrop 45/17

6. — *Spelaeotriletes krestovnikovii* (Naumova) Obukh.
Timan-Pechora Province, Pizhma river, outcrop 45/17

7. — *Spelaeotriletes instabilis* (Rask.) Obukh. & M. Rask.
Timan-Pechora Province, Pizhma river, outcrop 45/17

8. — *Hymenozonotriletes argutus* Naumova
Timan-Pechora Province, Pizhma river, outcrop 45/17

9. — *Geminospora semilucensa* (Naumova) Obukh. & M. Rask.
Central Devonian Field, Kosii ovrag, outcrop layer 9

10. — *Verruciretusispora pallida* Owens
Timan-Pechora Province, Pizhma river, outcrop 45/17

11. — *Verruciretusispora lucensa* (Naumova) Obukh.
Central Devonian Field, Kosii ovrag, outcrop layer 9

12. — *Spelaeotriletes domanicus* (Naumova) Obukh.
Timan-Pechora Province, outcrop Tschut river, 45/90

13. — *Hymenozonotriletes ? inaequalis* Philimonova & coll.
Volga Basin near Volgograd, Choperskaja, 966, 835-841 m

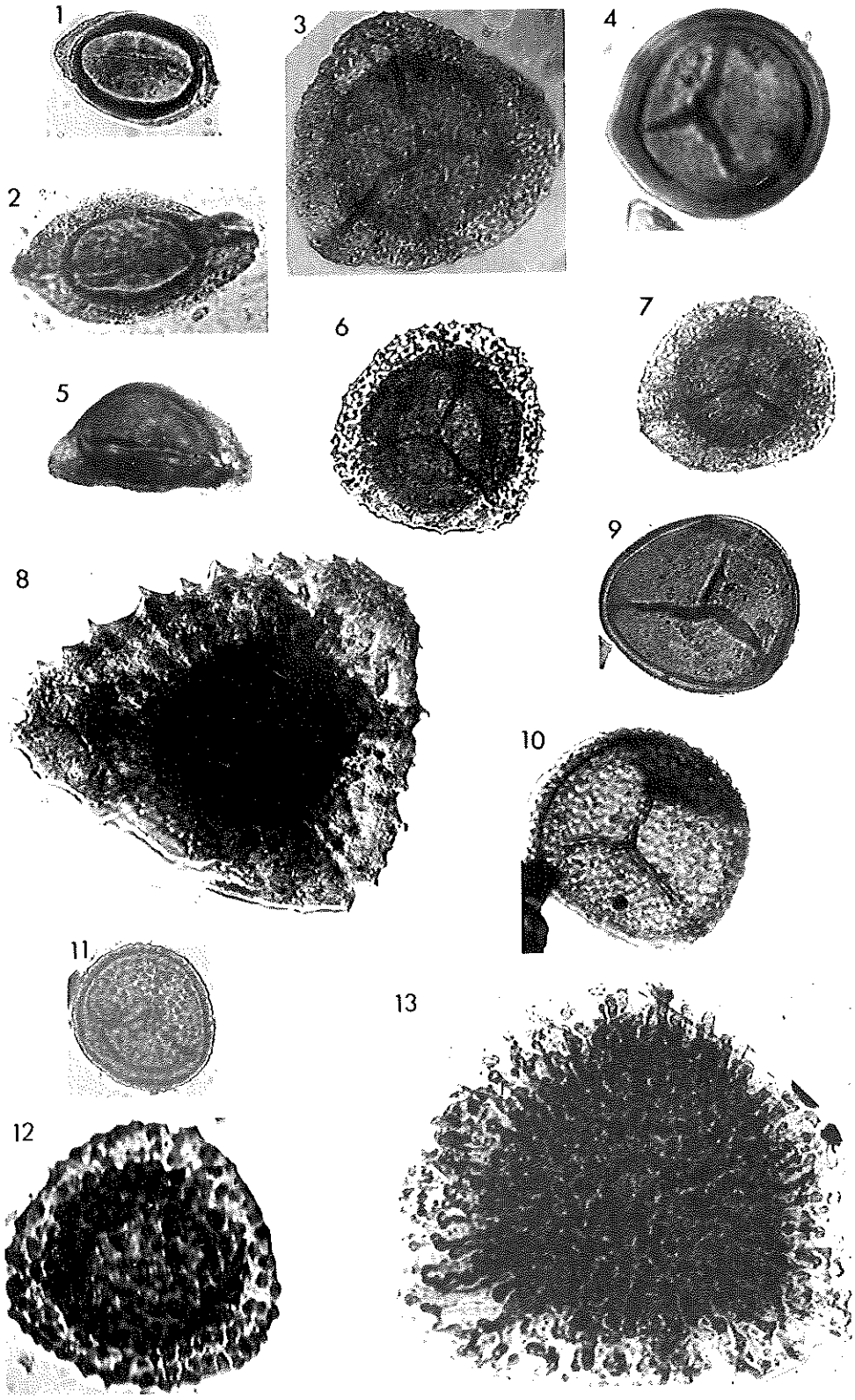
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PLATE 14

Archaeoperisaccus ovalis – Verrucosisporites grumosus (OG) Zone
M. radiatus (MR) Subzone

Fig. 1. — *Archaeoperisaccus concinnus* NAUMOVA
Central Devonian Field, Petino outcrop

2. — *Archaeoperisaccus mirus* NAUMOVA
Timan-Pechora Province, Uchta river outcrop

3. — *Archaeoperisaccus menneri* NAUMOVA
Belarus, Pripyat Depression, Elskaja, 22, 3530 m

4. — *Archaeoperisaccus mirandus* NAUMOVA
Timan-Pechora Province, Uchta river outcrop

5. — *Archaeoperisaccus echinatus* RASK.
Central Devonian Field, Petino outcrop

6, 9. — *Cymbosporites vetlasjanicus* MEDIANIK & OBUKH.
6. Timan-Pechora Province, Uchta river outcrop
9. W. Bashkir, Salmyschskaja, 619, 3219-3223 m

7. — *Cristatisporites trivialis* (NAUMOVA) OBUKH.
Belarus, Pripyat Depression, Vyschemirovskaja, 3, 3122-3126 m

8. — *Bascaudaspora dobridia* ARKH.
Timan-Pechora Province, Uchta river outcrop

10. — *Geminospora rugosa* (NAUMOVA) OBUKH.
Central Devonian Field, Petino outcrop

11. — *Cyrtospora expleta* ARKH.
Timan-Pechora Province, Uchta river outcrop

12. — *Grandispora famenensis* (NAUMOVA) STREEL var. *gracilis* KEDO
Belarus, Pripyat Depression, Elskaja, 22, 3515-3530 m

13, 15. — *Convolutispora crassitunicata* (OBUKH.) OBUKH.
13. Central Devonian Field, Petino outcrop
15. Belarus, Pripyat Depression, Vyschemirovskaja, 3, 3122-3126 m

14. — *Geminospora notata* (NAUMOVA) OBUKH.
Central Devonian Field, Semiluki outcrop

16. — *Verruciretusispora pallida* OWENS
Timan-Pechora Province, Uchta river outcrop

17. — *Lophozonotriletes torosus* NAUMOVA
Central Devonian Field, Petino outcrop

18. — *Convolutispora subtilis* OWENS
Belarus, Pripyat Depression, Elskaja, 22, 3532 m

19. — *Auroraspora speciosa* (NAUMOVA) OBUKH. var. *ornatus* NAZARENKO
Dnieper-Donetsk Depression, Sorokoschichi Repki, 654, 1542-1545 m

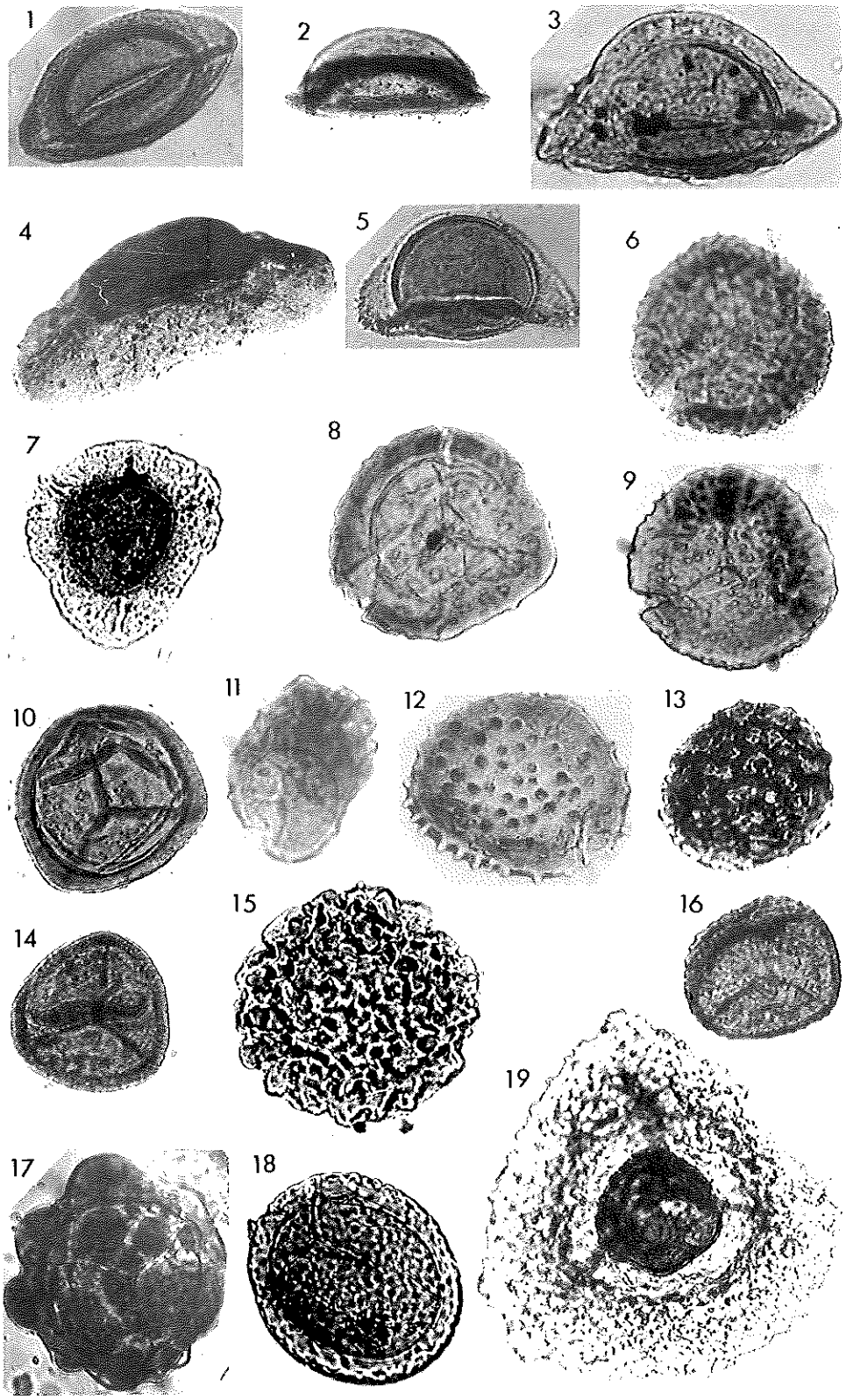
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PLATE 15

Archaeoperisaccus ovalis – Verrucosisporites grumosus (OG) Zone
M. radiatus (MR) Subzone

Fig. 1. — *Membrabaculisporis radiatus* (NAUMOVA) ARKH.
Timan-Pechora Province, Izhma river outcrop, Verchovskaja village

2. — *Diducites radiatus* (KEDO) OBUKH.
Belarus, Pripyat Depression, Strelitchevskaja, 4, 1642 m

3. — *Archaeoperisaccus echinatus* RASK.
Timan-Pechora Province, Belhopskaja, 15, 203-207 m

4, 7. — *Kedoesporis imperfectus* (NAUMOVA) OBUKH.
Belarus, Pripyat Depression, Mstislavskaja, 1, 76-78 m

5. — *Archaeoperisaccus mirus* NAUMOVA
Timan-Pechora Province, Izhma river outcrop, Verchovskaja village

6, 8. — *Archaeoperisaccus concinnus* NAUMOVA
6. Pripyat Depression, Strelitchevskaja, 4, 1642 m
8. Timan-Pechora Province, Izhma river outcrop, Verchovskaja village

9. — *Kedoesporis evlanensis* (NAUMOVA) OBUKH.
Belarus, Pripyat Depression, Strelitchevskaja, 4, 1642 m

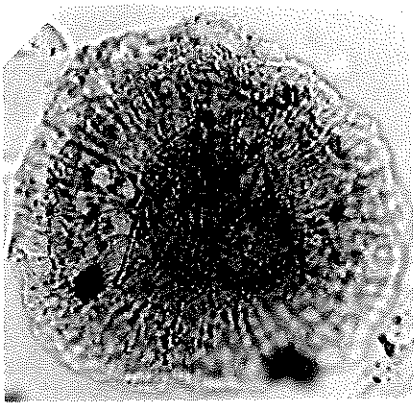
10. — *Lophozonotriletes tylophorus* NAUMOVA
Belarus, Pripyat Depression, Elskaja, 22, 3505 m

11. — *Verrucosisporites grumosus* (NAUMOVA) OBUKH.
Timan-Pechora Province, Izhma river outcrop, Verchovskaja village

12. — *Bulbosisporites bulbosus* (OBUKH.) OBUKH.
Belarus, Pripyat Depression, W. Bobrovitchi, 1, 3657 m

13. — *Geminospora rugosa* (NAUMOVA) OBUKH.
Belarus, Pripyat Depression, Elskaja, 22, 3515 m

14. — *Ancyrospora voronensis* (ARKH.) ARKH.
Timan-Pechora Province, Vezhavosh river outcrop



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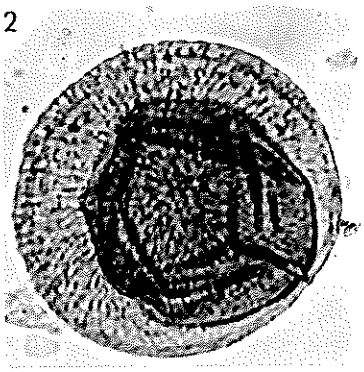

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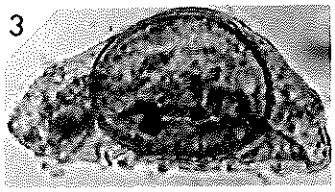

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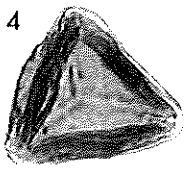

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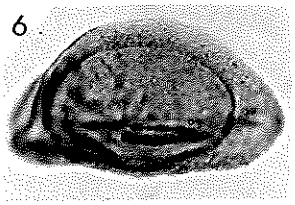

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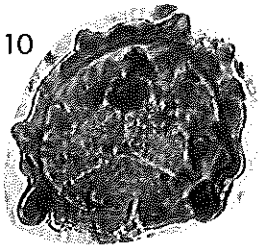

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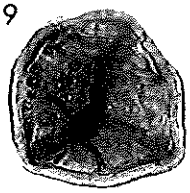

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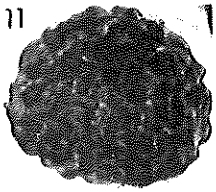

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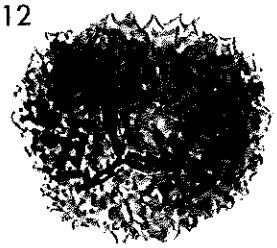

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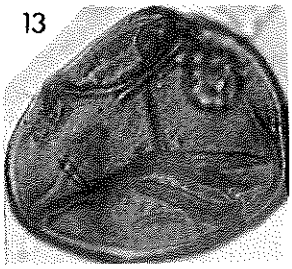

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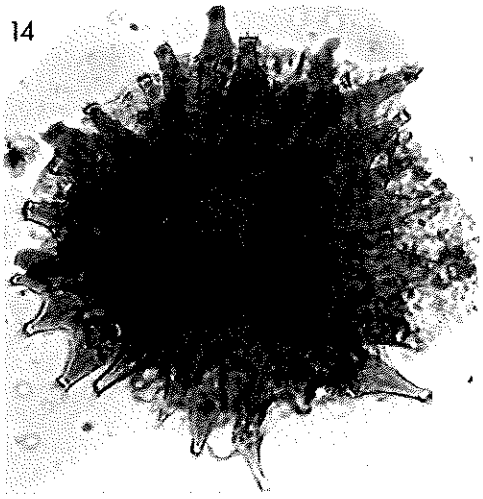

PLATE 16

Cristatisporites deliquescens – Verrucosisporites evlanensis (DE) Zone
A. speciosa (AS) Subzone

Fig. 1. — *Verrucosisporites evlanensis* (NAUMOVA) OBUKH.
Central Devonian Field, Kon-Kolodez village outcrop

2, 5. — *Cristatisporites deliquescens* (NAUMOVA) ARKH.
2. Central Devonian Field, Zadonsk town outcrop
5. Volga Basin near Volgograd, Choperskaja, 948, 849,9-851,9m

3, 4. — *Cymbosporites acanthaceus* (KEDO) OBUKH.
3. Belarus, Pripyat Depression, Grebenevskaja, 1, 4774,2-4779,3 m
4. Timan-Pechora Province, Belhopskaja, 4, 117-124 m

6. — *Stenozonotriletes conformis* NAUMOVA
Belarus, Pripyat Depression, Grebenevskaja, 1, 4889,1-4897,4 m

7. — *Membrabaculisporis radiatus* (NAUMOVA) ARKH.
Volga Basin near Volgograd, Choperskaja, 948, 849,9-851,9 m

8. — *Verruciretusispora* sp. A
Belarus, Pripyat Depression, Radomlja, 16, 1967-1702 m

9. — *Kedoesporis evlanensis* (NAUMOVA) OBUKH.
Central Devonian Field, Kon-Kolodez village outcrop

10. — *Diaphanospora rugosa* (NAUMOVA) Byvscheva
Belarus, Pripyat Depression, Radomlja, 16, 1697-1702 m

11. — *Kedoesporis imperfectus* (NAUMOVA) OBUKH.
Belarus, Pripyat Depression, Grebenevskaja, 1, 4889,1-4897,4 m

12. — *Auroraspora speciosa* (NAUMOVA) OBUKH.
Timan-Pechora Province, Belhopskaja, 4, 117-124 m

13. — *Diducites radiatus* (KEDO) OBUKH.
Belarus, Pripyat Depression, Turovskaja, 121, 266 m

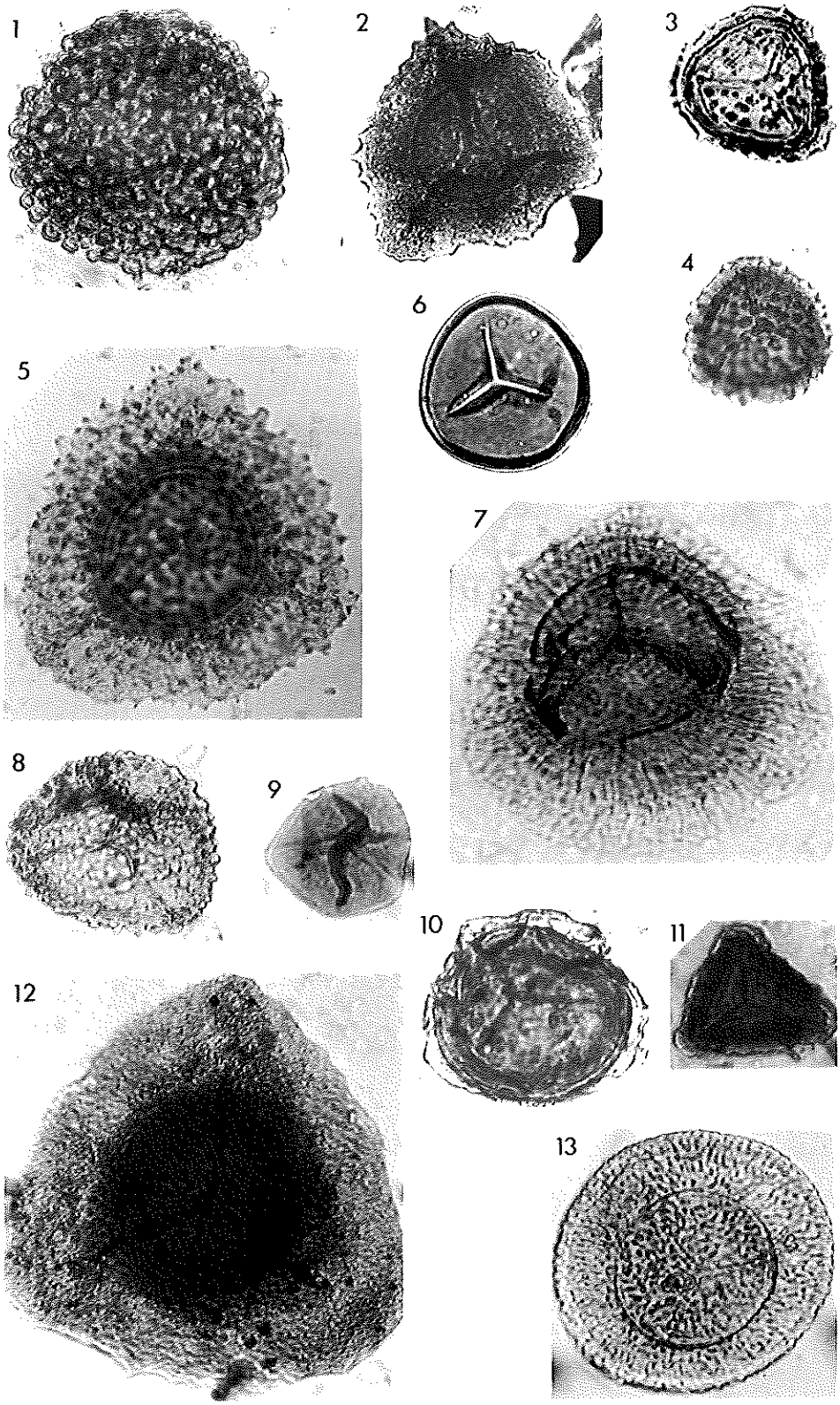
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PLATE 17

Cristatisporites deliquescens – Verrucosisporites evlanensis (DE) Zone
G. subsuta (GS) Subzone

Fig. 1, 2. — *Grandispora subsuta* (NAZARENKO) OBUKH.
1. Volga Basin near Volgograd, Mirnaja, 1, 3880-3887 m
2. Belarus, Pripyat Depression, Petrikovskaja, 469, 962-968 m

3. — *Spelaeotriletes hopericus* (NAZARENKO) OBUKH.
Volga Basin near Volgograd, Choperskaja, 945, 580-584 m

4. — *Verrucosisporites grumosus* (NAUMOVA) OBUKH.
Timan-Pechora Province, Belhopskaja, 4, 64-70 m

5. — *Chelinospora lepidus* (OBUKH.) OBUKH.
Belarus, Pripyat Depression, Kasimirovskaja, 1, 2622, 8-2654, m

6. — *Diducites mucronatus* (KEDO) VAN VEEN
Belarus, Pripyat Depression, Lelchitskaja, 1, 1810 m

7. — *Kedoesporis evlanensis* (NAUMOVA) OBUKH.
Central Devonian Field, Kon-Kolodez village outcrop

8. — *Cymbosporites eximius* (OBUKH.) OBUKH.
Belarus, Pripyat Depression, Lelchitskaja, 1, 1810 m

9. — *Spelaeotriletes microgranosus* (KEDO) OBUKH.
Belarus, Pripyat Depression, Kasimirovskaja, 1, 2662,8-2645 m

10. — *Stenozonotriletes extensus* NAUMOVA
Central Devonian Field, Kon-Kolodez village outcrop

11. — *Auroraspora speciosa* (NAUMOVA) OBUKH.
Timan-Pechora Province, Belhopskaja, 4, 67-70 m

12. — *Cymbosporites boafeticus* (TCHIB.) OBUKH.
Latvija, Dobele, 18, 122 m

13. — *Cristatisporites deliquescens* (NAUMOVA) ARKH.
Belarus, Pripyat Depression, W. Kamenskaja, 1, 3335 m

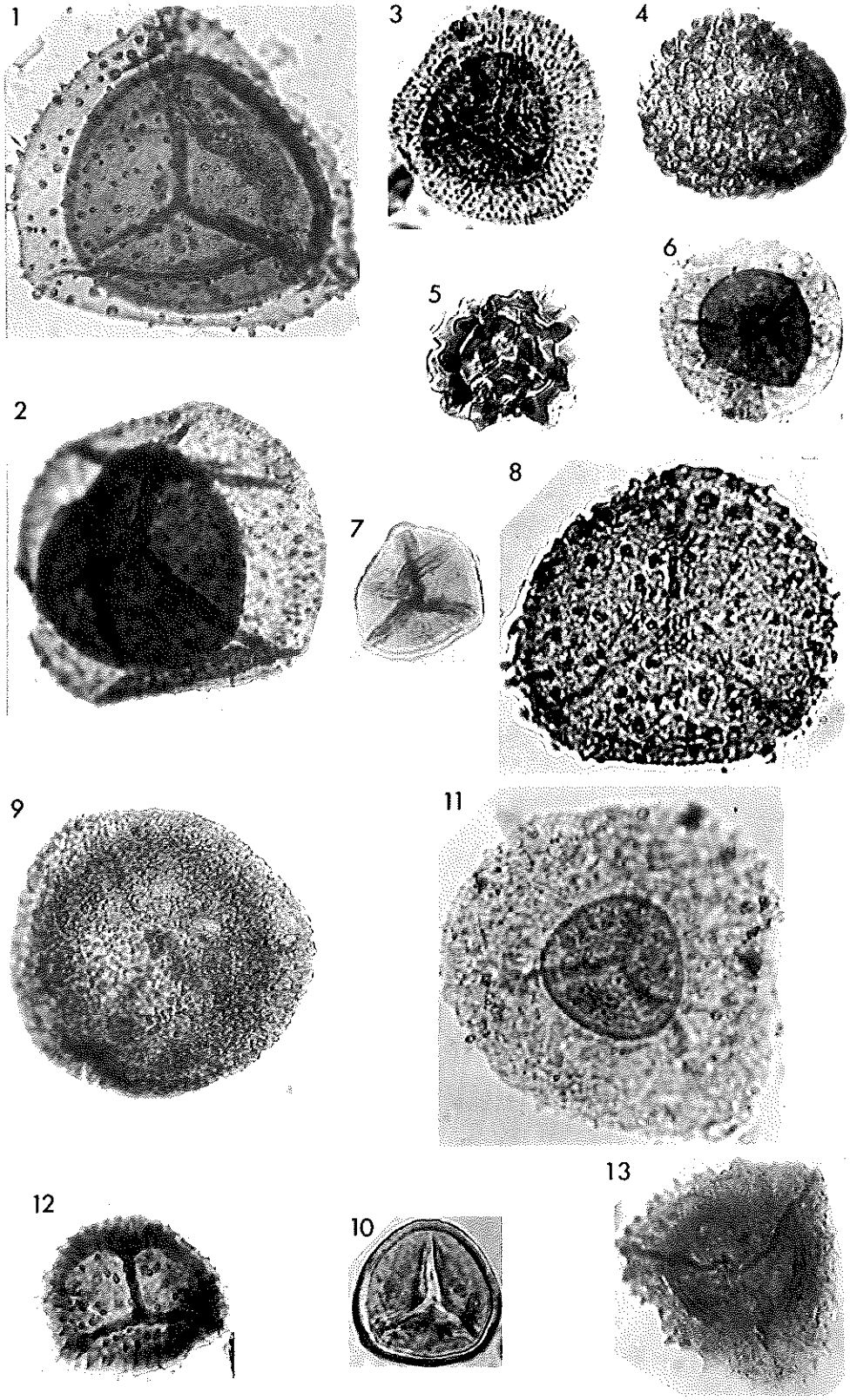
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PLATE 18

Corbulispora vimineus – Geminospora vasjamica (VV) Zone

Fig. 1-3. — *Corbulispora vimineus* (Nekr.) Obukh. & Nekr.
1. Pripyat Depression, Vyshemirovskaja, 11, 2065-2075 m
2. Volga Basin near Volgograd, Romanovskaja, 23, 3480-3487 m
3. Timan-Pechora Province, Belgopskaja, 4, 33-36 m

4, 5. — *Geminospora vasjamica* (Tchib.) Obukh. & Nekr.
4. Timan-Pechora Province, BH VIS, 909, 1689-1694 m
5. W. slope Southern Ural, Vasjamskaja, 8, 122-123 m

6. — *Corbulispora semireticulata* (Tchib.) Tchib.
W. slope Southern Ural, Kuruil river, Pokrovskoye village

7. — *Lophozonotriletes furssenkoi* Nekr.
Pripyat Depression, Petrikov, 469, 929-935 m

8. — *Lophotriletes multiformis* Tchib.
W. Bashkir, Alkinskaja, 2, 2192-2196 m

9, 10. — *Geminospora notata* (Naumova) Obukh. var. *microspinosus* Tchib.
9. Volga Basin near Volgograd, Krasnojarskaja, 44, 2304-2308 m
10. Timan-Pechora Province, Belgopskaja, 4, 33-36 m

11. — *Converrucosisporites curvatus* (Naumova) Turnau var. *medius* Kedo
Volga Basin near Volgograd, Osinovskaja, 2, 2648-2653 m

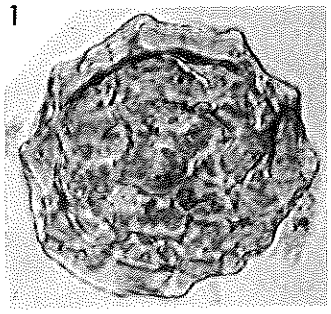
12. — *Converrucosisporites curvatus* (Naumova) Turnau
Timan-Pechora Province, Tebukskaja, 881, 1645-1651 m

13. — *Cymbosporites boafeticus* (Tchib.) Obukh.
Volga Basin near Volgograd, Korobkovskaja, 69, 2633-2638 m

14. — *Pustulatisporites pullus* (Naumova) Obukh.
Volga Basin near Volgograd, Osinovskaja, 2, 2648-2653 m

15. — *Verrucosisporites evlanensis* (Naumova) Obukh.
Pripyat Depression, W. Bobrovitchi, 4, 2621-2634 m

16, 17. — *Cristatisporites imperpetuus* (Sennova) Obukh.
16. Timan-Pechora Province, Volsko-Vymskaja, Uhta river, 750/2
17. Izhma river, near Sosnogorsk, 50/30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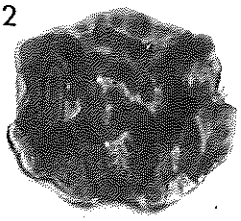
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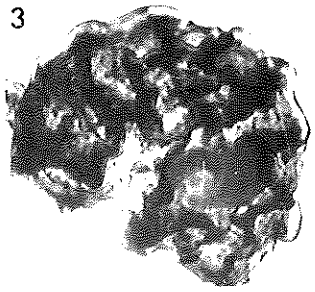
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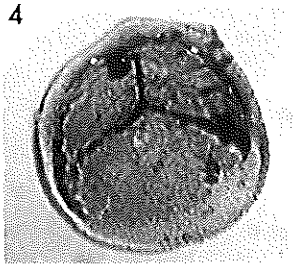
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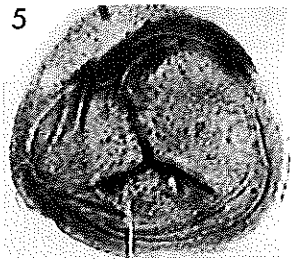
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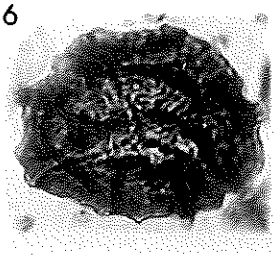
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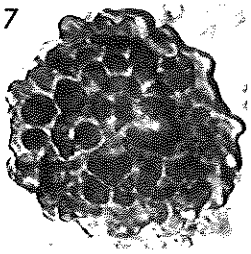
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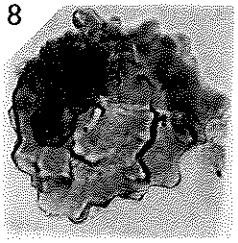
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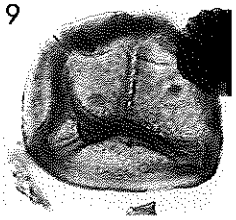
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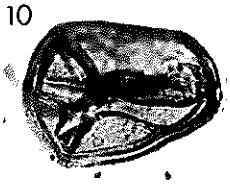
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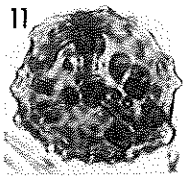
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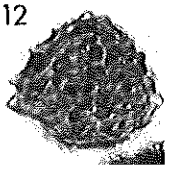
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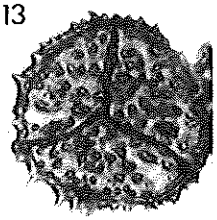
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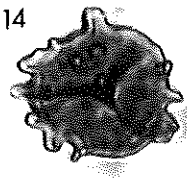
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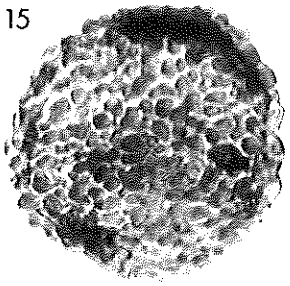
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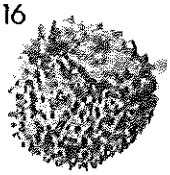
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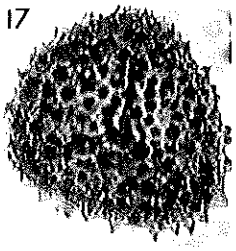
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PLATE 19

Cyrtospora cristifer – Diaphanospora zadonica (CZ) Zone
G. notata microspinosus (GM) Subzone

Fig. 1, 2. —*Cyrtospora cristifer* (LUBER) VAN DER ZWAN
1. Pripyat Depression, W. Bobrovitchi, 4, 2604-2610 m
2. Volga Basin near Volgograd, Kotovskaya, 19

3, 4. — *Geminospora notata* (NAUMOVA) OBUKH. var. *microspinosus* TCHIB.
Pripyat Depression, W. Sophievskaja, 1, 2512 m

5. — *Geminospora vasjamica* (TCHIB.) OBUKH. & NEKR.
Pripyat Depression, W. Bobrovitchi, 4, 2545-2580 m

6, 7. — *Converrucosisporites curvatus* (NAUMOVA) TURNAU
Volga Basin near Volgograd, Kotovskaja, 19, 2582-2588 m

8. — *Converrucosisporites curvatus* (NAUMOVA) TURNAU var. *medius* KEDO
Pripyat Depression, W. Bobrovitchi, 4, 2577 m

9. — *Pustulatisporites famenensis* (NAUMOVA) OBUKH.
Pripyat Depression, W. Bobrovitchi, 4, 2545-2580 m

10. — *Diaphanospora macrovarius* (NAZARENKO) NEKR. & AVKH.
Volga Basin near Volgograd, Kotovskaja, 19, 2582-2588 m

11. — *Auroraspora limpida* (NAUMOVA) AVKH.
Pripyat Depression, Chobno, 1, 2873 m

12. — *Cymbosporites boafeticus* (TCHIB.) OBUKH.
Volga Basin near Volgograd, Kotovskaja, 19, 2582-2588 m

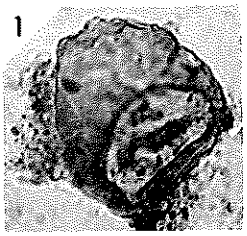
13. — *Dictyotriletes famenensis* NAUMOVA
Pripyat Depression, W. Sophievskaja, 1, 2512 m

14. — *Retusotriletes communis* NAUMOVA
Pripyat Depression, Chobno, 1, 2866 m

15. — *Punctatisporites famenensis* (NAUMOVA) OBUKH.
Timan-Pechora Province, Belgopskaja, 4, 26-27 m

16. — *Corbulispora vimineus* (NEKR.) OBUKH. & NEKR.
Pripyat Depression, W. Bobrovitchi, 4, 2547-2550 m

17. — *Hystricosporites pleiomorphus* (KEDO) OBUKH.
Pripyat Depression, Chobno, 1, 2888 m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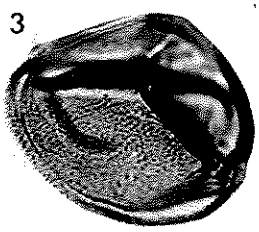
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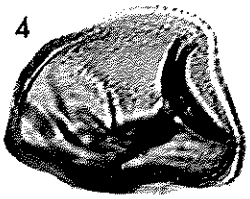
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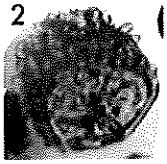
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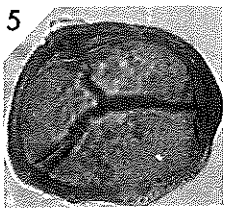
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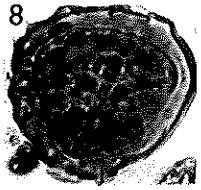
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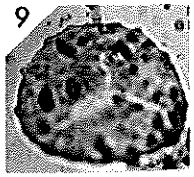
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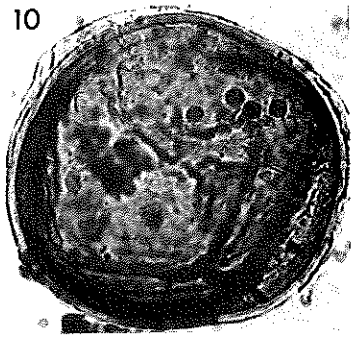
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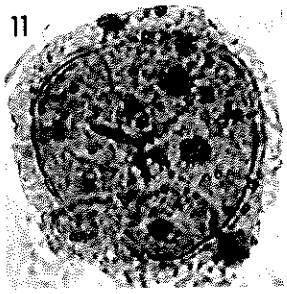
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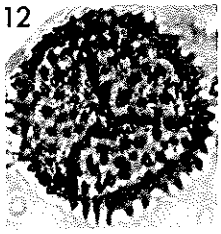
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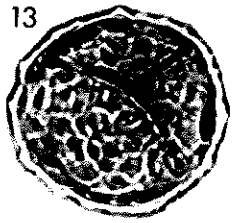
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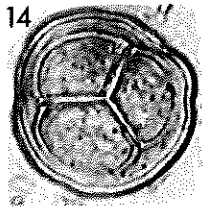
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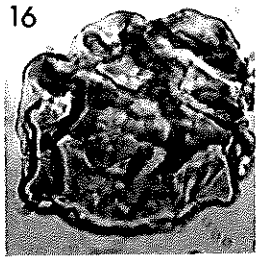
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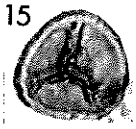
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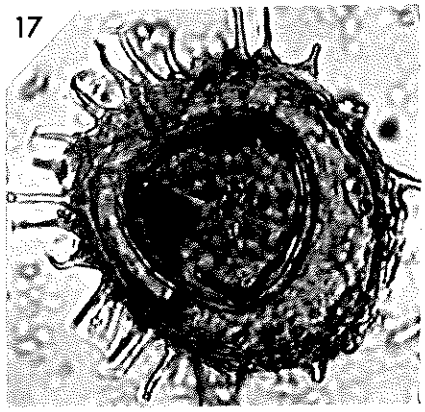
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PLATE 20

Cyrtospora cristifer – *Diaphanospora zadonica* (CZ) Zone
C. zadonica (Za) Subzone

Fig. 1. — *Cyrtospora cristifer* (Luber) Van Der Zwan
Pripyat Depression, W. Bobrovitchi, 4, 2604-2610 m

2. — *Convolutispora zadonica* (Nekr.) Obukh. & Nekr.
Pripyat Depression, Malodushinskaja, 1, 1450-1456 m

3. — *Diaphanospora zadonica* (Naumova) Avkh.
Volga Basin near Volgograd, Jarskaja, 1, 2470-2476 m

4. — *Geminospora notata* (Naumova) Obukh. var. *microspinosus* Tchib.
Pripyat Depression, W. Bobrovitchi, 4, 2545-2580 m

5. — *Kedoesporis angulosus* (Naumova) Obukh.
Central Devonian Field, Dobrynka, 690

6. — *Converrucosisporites curvatus* (Naumova) Turnau
Central Devonian Field, Dobrynka, 690

7. — *Retusotriletes pychovi* Naumova
Volga Basin near Volgograd, Jarskaja, 1, 2470-2476 m

8. — *Diaphanospora macrovarius* (Nazarenko) Nekr.
Pripyat Depression, Turov, 120, 345 m

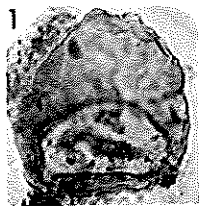
9. — *Diducites radiatus* (Kedo) Obukh.
Pripyat Depression, Petrikov, 5, 1401-1418 m

10. — *Diducites vishenensis* Obukh. & Avkh.
Pripyat Depression, Velikopolskaja, 1

11. — *Stenozonotriletes definitus* Naumova
Volga Basin near Volgograd, Jarskaja, 1, 2470-2476 m

12. — *Stenozonotriletes conformis* Naumova
Pripyat Depression, Turov, 120, 345 m

13. — *Hystricosporites hamulus* (Naumova) Nekr.
Pripyat Depression, Chobno, 1, 2784 m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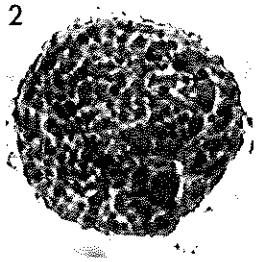
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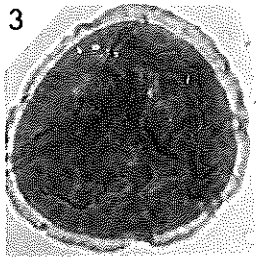
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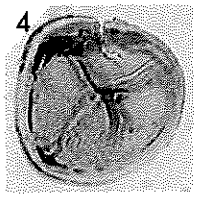
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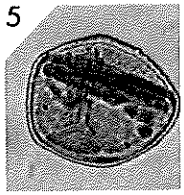
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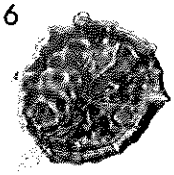
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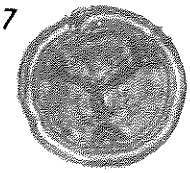
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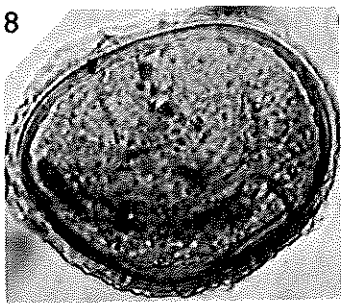
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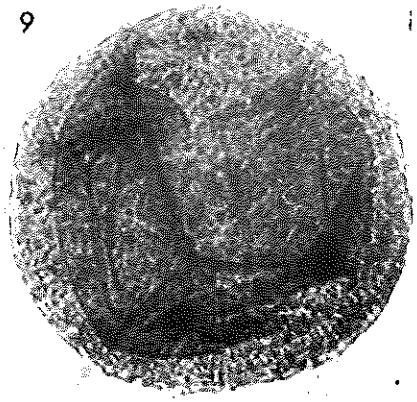
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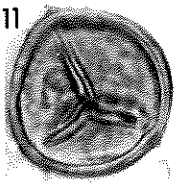
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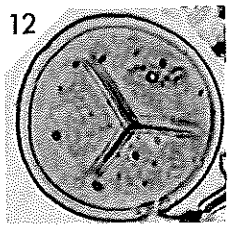
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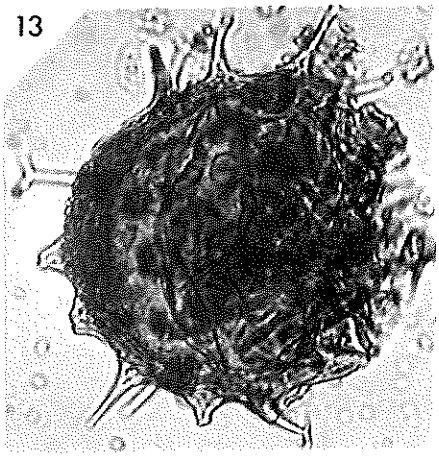
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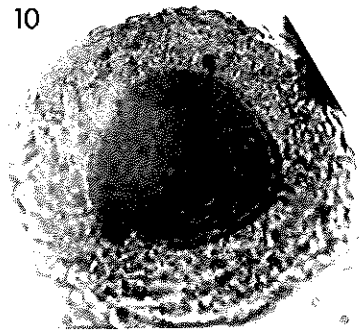
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PLATE 21

Lagenoisporites immensus (Im) Zone

Fig. 1. — *Lagenoisporites immensus* (NAZARENKO & NEKR.) AVKH. & TURNAU
Pripyat Depression, Chobno, 1, 2793 m

2. — *Lophozonotriletes lebedianensis* NAUMOVA
Pripyat Depression, Chobno, 1, 2728 m

3. — *Diducites commutatus* (NAUMOVA) AVKH.
Pripyat Depression, Chobno, 1, 2716 m

4. — *Spelaeotriletes papulosus* (SENNOVA) AVKH.
Volga Basin near Volgograd, Orlovskaja, 22, 1216-1222 m

5. — *Convolutispora cancellothyris* (WALTZ) AVKH. & NEKR.
Pripyat Depression, Chobno, 1, 2740 m

6. — *Stenozonotriletes laevigatus* NAUMOVA
Volga Basin near Volgograd, Orlovskaja, 22, 1216-1222 m

7. — *Converrucosisporites curvatus* (NAUMOVA) TURNAU
Pripyat Depression, Turov, 121, 2178 m

8. — *Diducites compactus* (NEKR.) NEKR.
Pripyat Depression, Turov, 121, 127,5 m

9. — *Auroraspora varia* (NAUMOVA) AHMED
Pripyat Depression, Turov, 121, 168,2 m

10. — *Knoxisporites dedaleus* (NAUMOVA) MOREAU-BENOIT
Pripyat Depression, Chobno, 1, 2709 m

11. — *Ancyrospora orlovica* (NAZARENKO & NEKR.) AVKH. & NEKR.
Pripyat Depression, Shestovitchy, 18, 362 m

12. — *Cyrtospora cristifer* (LUBER) VAN DER ZWAN
Pripyat Depression, Shestovitchy, 18, 362 m

13. — *Bulbosisporites volgogradicus* (NAZARENKO & TCHIB.) OBUKH.
Pripyat Depression, Turov, 121, 333 m

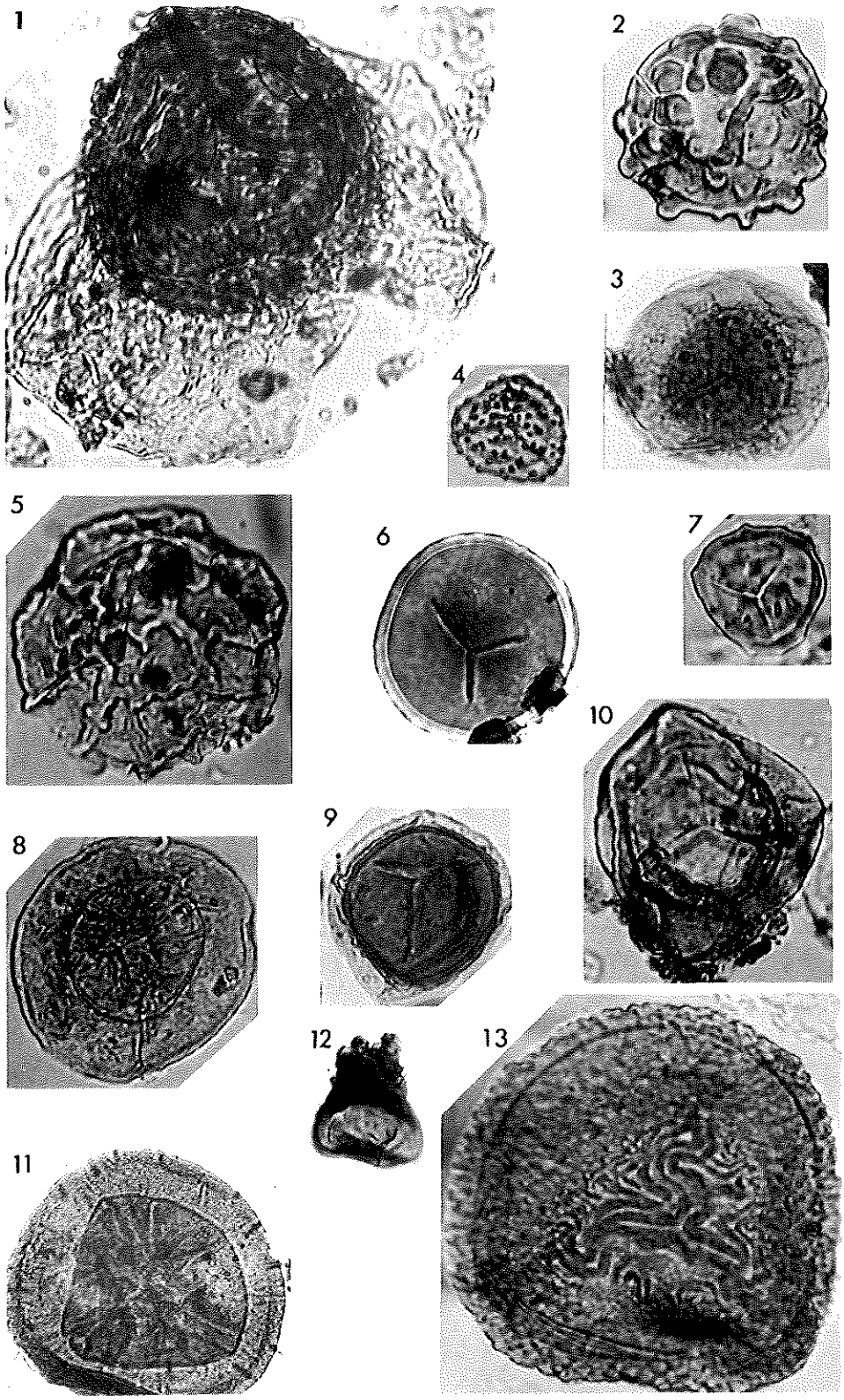
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PLATE 22

Cornispora varicornata (CVa) Zone
G. famenensis minutus (GF) Subzone

Fig. 1. — *Cornispora monocornata* NAZARENKO
Volga Basin near Volgograd, Grishin, 1, 1196-1220 m

2. — *Cornispora bicornata* NAZARENKO
Pripyat Depression, Shestovitchy, 18, 362 m

3, 4. — *Grandispora famenensis* (NAUMOVA) STREEL var. *minutus* NEKR.
3 Pripyat Depression, Shestovitchy, 18, 362 m
4 Pripyat Depression, Turov, 121, 110,3 m

5. — *Cristatisporites lupinovitchi* (AVKH.) AVKH.
Pripyat Depression, Turov, 121, 110,3 m

6. — *Grandispora aspersus* (AVKH.) AVKH.
Pripyat Depression, Petricov, 269, 771-773 m

7, 8. — *Spelaeotriletes papulosus* (SENNOVA) AVKH.
Timan-Pechora Province, Velikovisochnaja, 55, 1201 m

9. — *Lophozonotriletes lebedianensis* NAUMOVA
Pripyat Depression, Chobno, 1, 2709-2711 m

10. — *Diducites compactus* (NEKR.) NEKR.
Pripyat Depression, Turov, 115, 105 m

11. — *Diducites mucronatus* (KEDO) VAN VEEN
Pripyat Depression, Turov, 121, 110,3 m

12. — *Lagenoisporites immensus* (NAZARENKO & NEKR.) AVKH. & TURNAU
Pripyat Depression, Strelitchev, 1, 940-944 m

13. — *Knoxisporites dedaleus* (NAUMOVA) MOREAU-BENOIT
Pripyat Depression, Zhitkovitchy, 2, 390 m

14. — *Auroraspora macra* SULLIVAN
Pripyat Depression, Shestovitchy, 18, 355-362 m

15. — *Bulbosisporites volgogradicus* (NAZARENKO & TCHIB.) OBUKH.
Pripyat Depression, Tulgovitchy, 2, 1175-1180 m

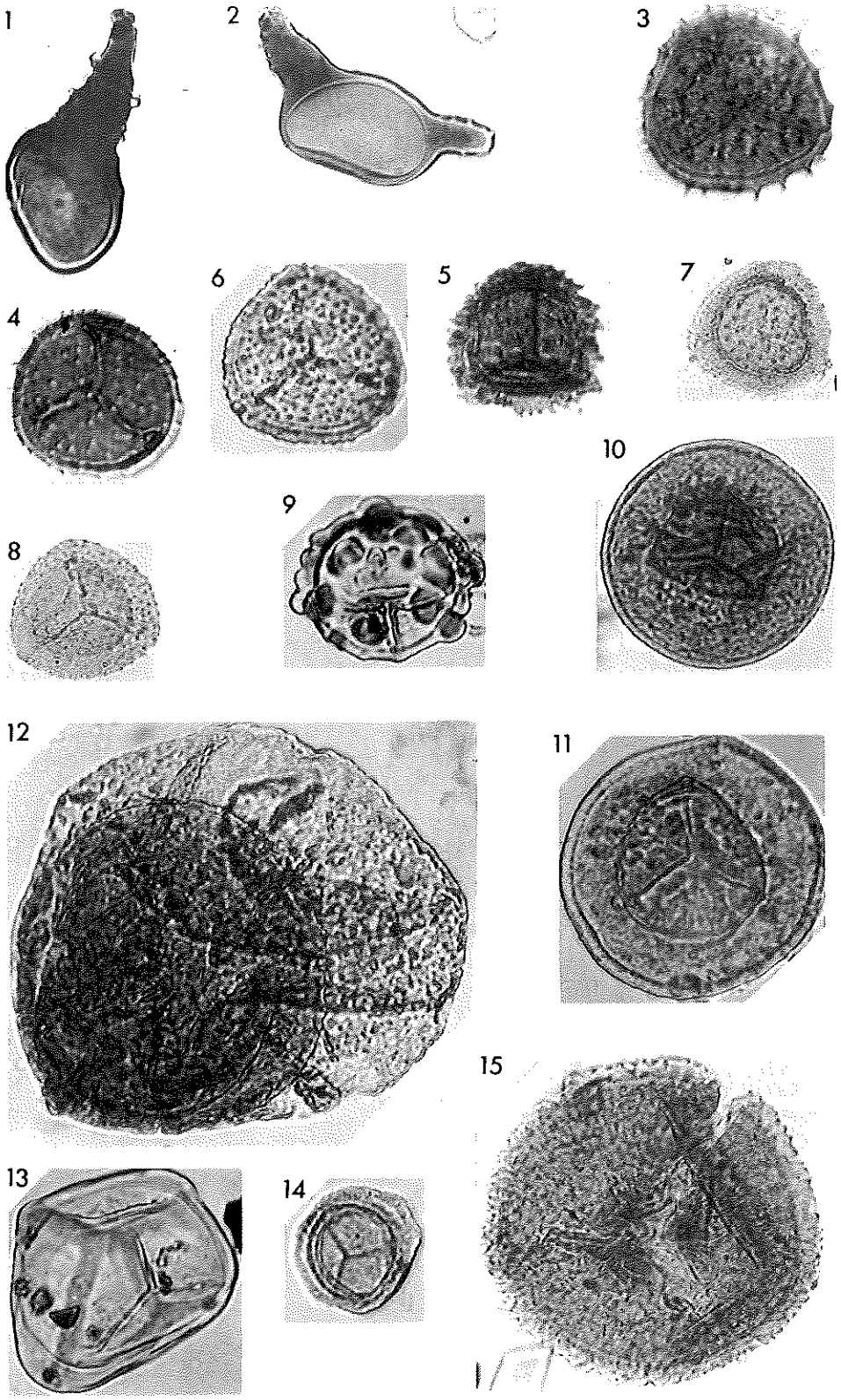
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PLATE 23

Cornispora varicornata (CVa) Zone
C. bicornata (CB) Subzone

Fig. 1. — *Cornispora monocornata* NAZARENKO
Pripyat Depression, Shestovitchy, 4, 2461,35-2467,45 m

2. — *Cornispora bicornata* NAZARENKO
Volga Basin near Volgograd, Grishkin-Sviridov, 1, 1196-1203 m

3, 4. — *Cornispora tricornata* NAZARENKO
Volga Basin near Volgograd, Grishkin-Sviridov, 1, 1196-1203 m

5. — *Grandispora famenensis* (NAUMOVA) STREEL var. *minutus* NEKR.
Pripyat Depression, Starobin, 239, 537-540 m

6. — *Lophozonotriletes lebedianensis* NAUMOVA
Pripyat Depression, Strelitchev, 1, 940-944 m

7. — *Cristatisporites lupinovitchi* (AVKH.) AVKH.
Pripyat Depression, Turov, 121, 60,2 m

8. — *Diducites compactus* (NEKR.) NEKR.
Pripyat Depression, Turov, 121, 60,2 m

9. — *Diducites poljessicus* (KEDO) VAN VEEN
Pripyat Depression, Turov, 115, 105 m

10. — *Knoxisporites dedaleus* (NAUMOVA) MOREAU-BENOIT
Pripyat Depression, Zhitkovitchy, 2, 390 m

11. — *Retusotriletes communis* NAUMOVA
Pripyat Depression, Chobno, 1, 2771-2775 m

12. — *Diaphanospora rugosa* (NAUMOVA) BYVSCHEVA
Pripyat Depression, Turov, 121, 60,2 m

13. — *Convolutispora cancellothyris* (WALTZ) AVKH. & NEKR.
Pripyat Depression, Turov, 121, 127,5 m

14. — *Kedoesporis rugilobus* (NAUMOVA) OBUKH. & AVKH.
Pripyat Depression, Turov, 120, 345 m

15. — *Stenozonotriletes conformis* NAUMOVA
Pripyat Depression, Sharpilovskaja, 1, 920 m

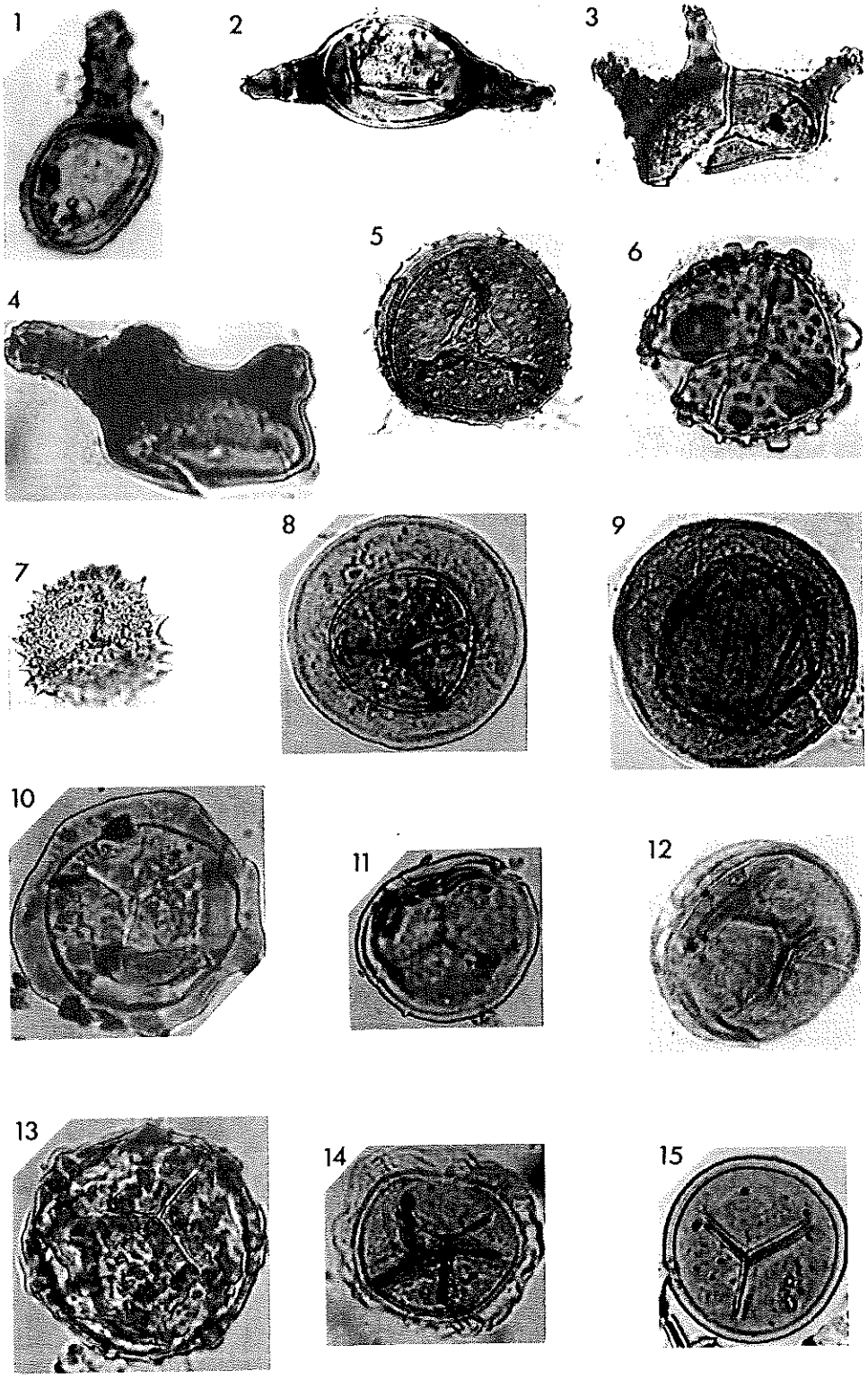
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PLATE 24

Cornispora varicornata (CVa) Zone
C. lupinovitchi (CL) Subzone

Fig. 1, 2. — *Cristatisporites lupinovitchi* (AVKH.) AVKH.
Pripyat Depression, Turov, 121, 60,2 m

3. — *Spelaeotriletes papulosus* (SENNOVA) AVKH.
Timan-Pechora Province, Velikovisochnaja, 55, 1201 m

4. — *Diducites poljessicus* (KEDO) VAN VEEN
Pripyat Depression, Turov, 115, 267 m

5. — *Hymenospora intertextus* (NEKR. & SERGEEVA) AVKH. & LOBOZIAK
Pripyat Depression, Vyshemir, 1, 2204 m

6. — *Grandispora famenensis* (NAUMOVA) STREEL
Pripyat Depression, Turov, 115, 267 m

7. — *Grandispora prodigialis* (KEDO) AVKH.
Pripyat Depression, Starobin, 239, 771-773 m

8. — *Cornispora monocornata* NAZARENKO
Pripyat Depression, Sharpiloskaja, 1, 1113 m

9. — *Cornispora bicornata* NAZARENKO
Pripyat Depression, Turov, 121, 60,2 m

10. — *Zonomonoletes vulgaris* KEDO
Pripyat Depression, Turov, 121, 74,5 m

11. — *Ancyrospora orlovica* (NAZARENKO & NEKR.) AVKH. & NEKR.
Pripyat Depression, Tulgovitchy, 2, 1175,8-1180,2 m

12. — *Stenozonotriletes supragrandis* KEDO
Pripyat Depression, Sharpilovskaja, 1, 847 m

13. — *Hystricosporites* sp.
Pripyat Depression, Petricov, 269, 637-641 m

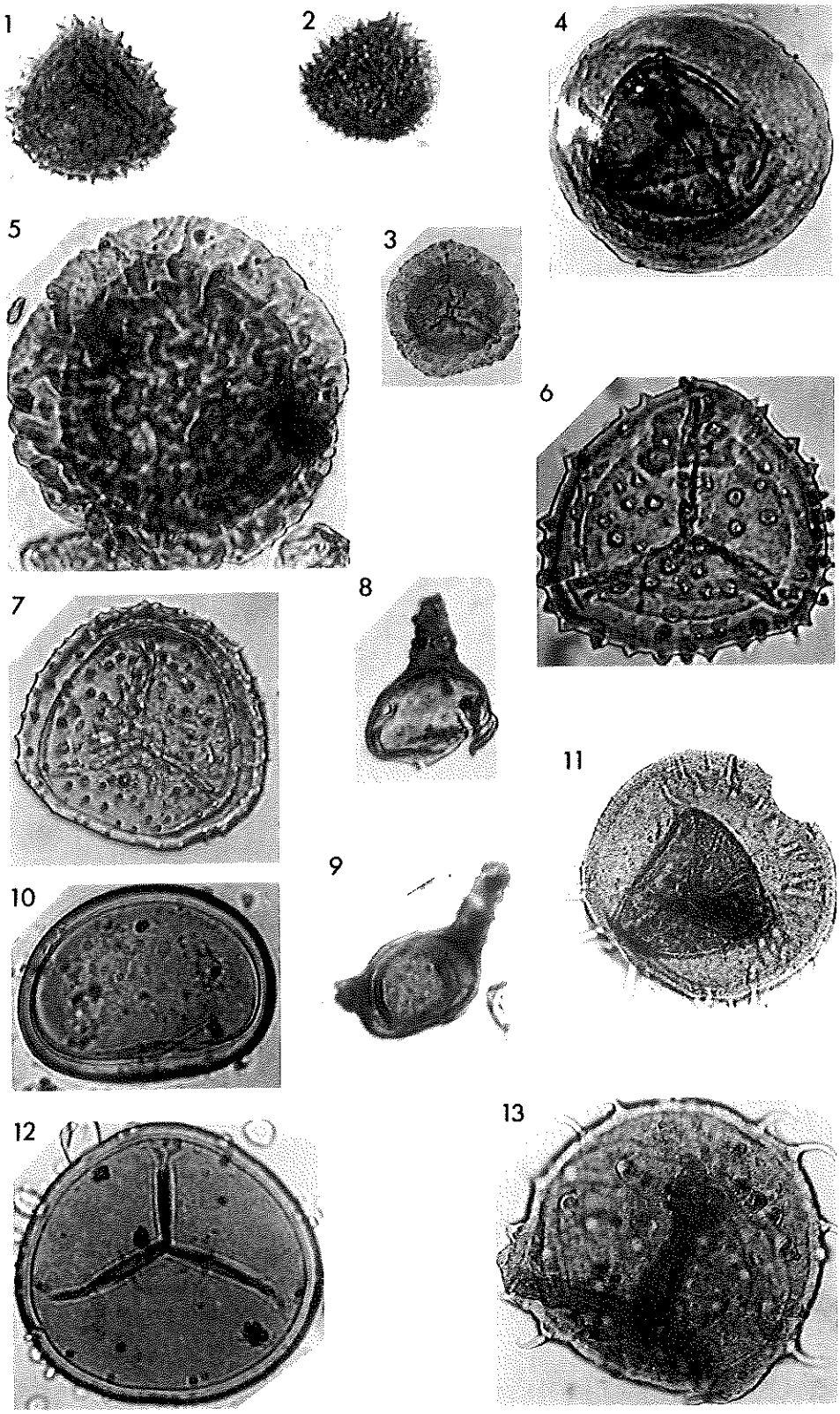
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PLATE 25

Diducites versabilis – Grandispora famenensis (VF) Zone
D. golubinicus (DG) Subzone

Fig. 1. — *Diducites versabilis* (KEDO) VAN VEEN
Pripyat Depression, Turov, 123, 230 m

2, 3. — *Grandispora famenensis* (NAUMOVA) STREEL
2. Pripyat Depression, Turov, 115, 267 m
3. Volga Basin near Volgograd, Orlinovskaja, 3, 1072-1079 m

4-6. — *Discernisporites golubinicus* (NAZARENKO) AVKH.
4. Volga Basin near Volgograd, Orlinovskaja, 3, 1072-1079 m
5. Pripyat Depression, Starobin, 239, 367 m
6. Pripyat Depression, Petricov, 269, 637 m

7. — *Grandispora famenensis* (NAUMOVA) STREEL var. *minutus* NEKR.
Pripyat Depression, Petricov, 269, 666 m

8. — *Grandispora gracilis* (KEDO) STREEL
Pripyat Depression, Petricov, 269, 637 m

9. — *Diducites poljessicus* (KEDO) VAN VEEN
Pripyat Depression, Turov, 115, 105 m

10. — *Retispora lepidophyta* (KEDO) PLAYFORD var. *macroreticulata* KEDO
Pripyat Depression, Zhitkovitchy, 02, 110,7 m

11. — *Diducites commutatus* (NAUMOVA) AVKH.
Pripyat Depression, Turov, 115, 289 m

12. — *Laevigatosporites ovalis* KOSANKE
Pripyat Depression, Turov, 115, 289 m

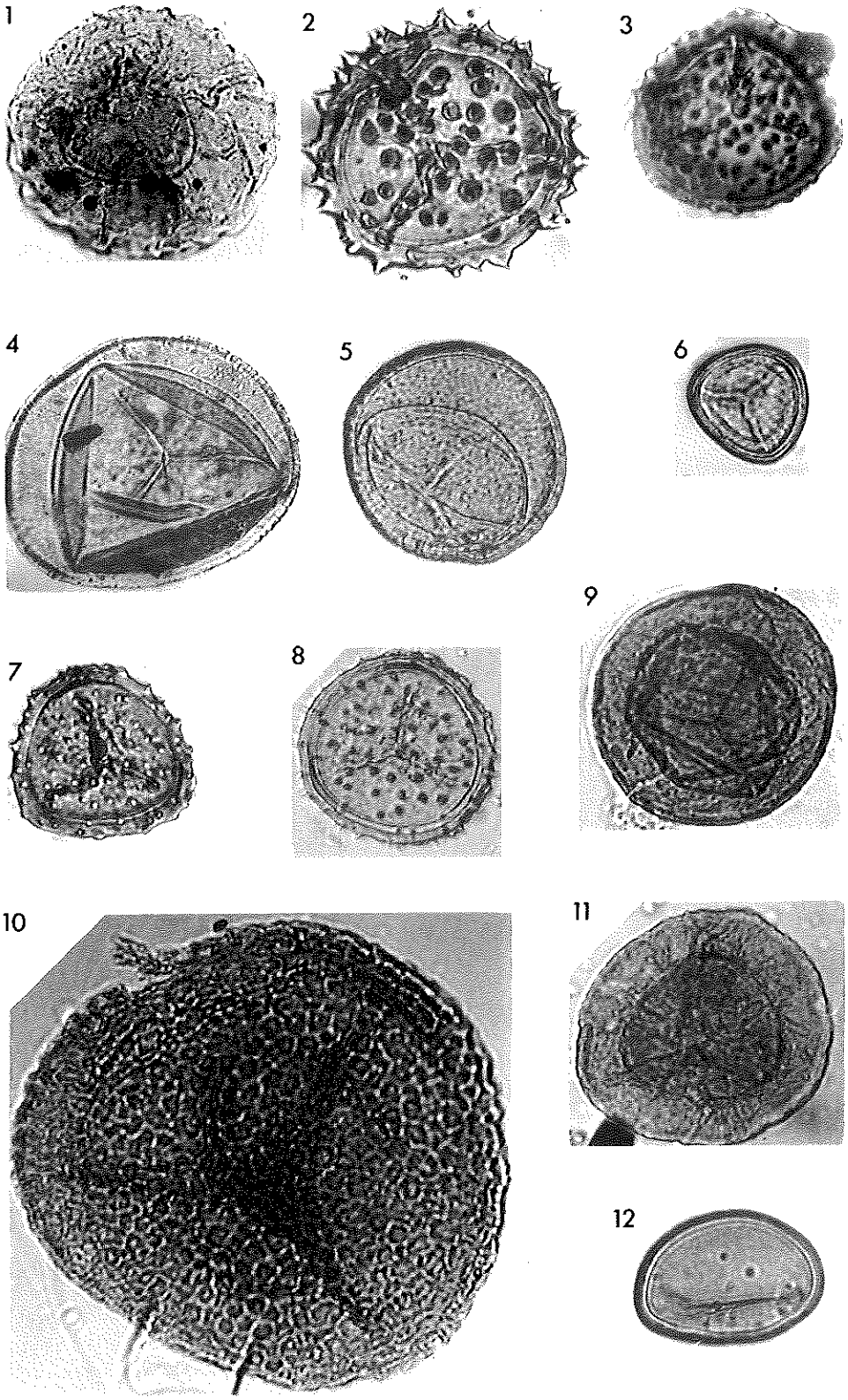
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PLATE 26

Diducites versabilis – Grandispora famenensis (VF) Zone

S. papulosus (SP) Subzone

Fig. 1. — *Diducites versabilis* (KEDO) VAN VEEN
Pripyat Depression, Kn. Bor, 76, 238,9-243,8 m

2. — *Spelaeotriletes papulosus* (SENNOVA) AVKH.
Timan-Pechora Province, Velikovisochnaja, 55, 1201 m

3. — *Grandispora distinctus* (NAUMOVA) AVKH.
Pripyat Depression, Starobin, 239, 239 m

4. — *Endoculeospora setacea* (KEDO) AVKH. & HIGGS
Pripyat Depression, Turov, 123, 177 m

5. — *Knoxisporites dedaleus* (NAUMOVA) MOREAU-BENOIT
Pripyat Depression, Lelchitsy, 345, 608 m

6. — *Grandispora facilis* (KEDO)
Pripyat Depression, Starobin, 239, 290 m

7. — *Grandispora lupata* TURNAU
Pripyat Depression, Svetlogorsk, 625, 659 m

8. — *Discernisporites golubinicus* (NAZARENKO) AVKH.
Pripyat Depression, Starobin, 269, 764 m

9. — *Auroraspora varia* (NAUMOVA) AHMED
Pripyat Depression, Sharpilovskaja, 1, 963 m

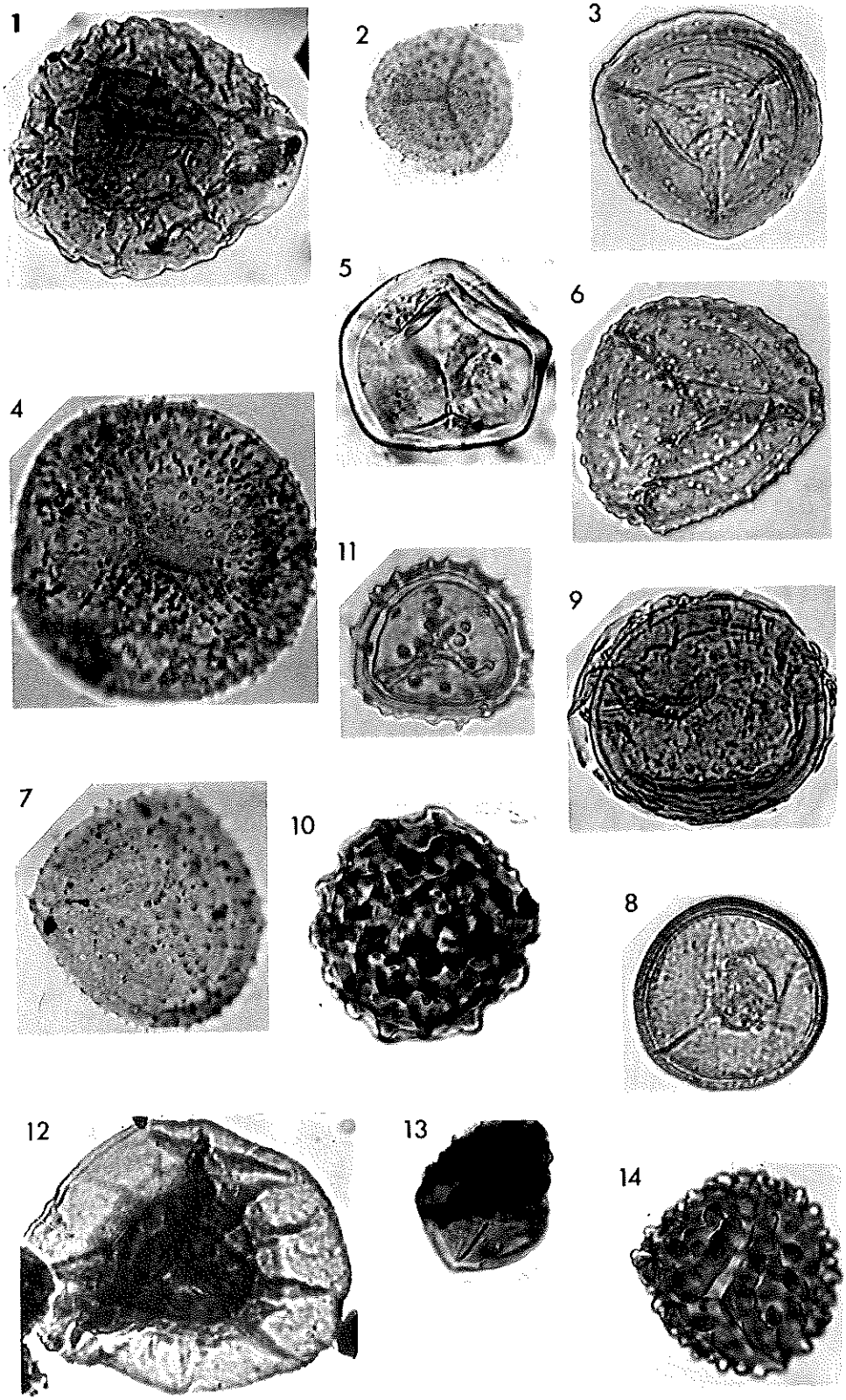
10. — *Convolutispora usitata* PLAYFORD
Pripyat Depression, Turov, 123, 175,8 m

11. — *Grandispora famenensis* (NAUMOVA) STREEL
Pripyat Depression, Petricov, 269, 637-641 m

12. — *Endosporites delectabilis* (NAZARENKO) MANTSUROVA
Volga Basin near Volgograd, Zimovsk, 15, 1443-1450 m

13. — *Cyrtospora cristifer* (LUBER) VAN DER ZWAN
Pripyat Depression, Turov, 123, 170 m

14. — *Lophozonotriletes proscurrus* KEDO
Pripyat Depression, Starobin, 756, 270 m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