Category:Palynological zonation

From Earthwise

Jump to navigation Jump to search

STAGE	ZONE			SUBZONE		BGS Dinoflagellate cyst zones
		Northern England	East Anglia		Northern England	
DANIAN						20
						19
MAASTRICHTIAN	*B. casimirovensis*					18
	B. junior					17
	B. occidentalis					16
	B. lanceolata s.l.					15
	B. mucronata s.l.					14
				Post *A. cretaceus*		13
	G. quadrata			*A. cretaceus*		
CAMPANIAN		*I. lingua*	'*Gonioteuthis* Zone'	*Hagenowia* horizon'		
				Abundant *O. pilula ? ?*	*?D. binodosus*	12
	O. pilula					
				E. depressula		11
	U. anglicus					10
	U. socialis					
SANTONIAN	*M. testudinarius*	Upper *H. rostrata*				
	M. coranguinum					9
CONIACIAN		Lower *H. rostrata*				
	M. cortestudinarium					8
	S. plana					7
TURONIAN	*T. lata*					6
						5
	Mytiloides spp.					4
	N. juddii	*S. gracile*				
	M. geslinianum					3
	C. guerangeri	*H. trecensis*				
	A. jukesbrownei					
	A. rhotomagense			*T. acutus*		
CENOMANIAN				*T. costatus*		2
	C. inerme					
	M. dixoni	*H. subglobosus*				
				M. saxbii		
	M. mantelli			*S. schluteri*		1
				N. carcitanense		

Overview

Palynomorphs from the Chalk Group of Europe are relatively well studied. The overwhelming majority of studies are on dinoflagellate cysts; spores and pollen are frequently minor components of Chalk Group palynomorph associations and have generally lower rates of biostratigraphical change (Srivastava, 1978). Due to the relatively high sea level stands during the Late Cretaceous, Cenomanian to Maastrichtian/Danian, spore and pollen floras are highly provincial. This is principally because there were few emergent areas at this time and these were separated by extensive seaways (Srivastava, 1978). Furthermore, the opening of the Atlantic and the evolution and radiation of the angiosperms also contributed to this marked provincialism, which commenced in the Aptian (Herngreen & Chlonova, 1982; Batten, 1984; 1996). It seems likely that the recently-evolved angiosperms at mid latitudes were geographically isolated in the Aptian and this led to isolation and separate evolutionary development. This scenario led to the development of seven separate Late Cretaceous phytogeoprovinces (Herngreen, Kedves *et al*., 1996). The UK lies at the boundary of the circumpolar *Aquilaopollenites* and the European/eastern North American Normapolles phytogeoprovinces with the boundary being located approximately in the central North Sea (Batten, 1981). The English Chalk Group outcrop is all within the Normapolles phytogeoprovince, however Northern Ireland and the isolated Hebridean occurrences lie close to the Normapolles- *Aquilaopollenites* phytogeoprovince boundary. Normapolles pollen grains are rare from England, however appear to be more prominent in the Chalk Group of France (Robaszynski *et al*., 1982a; 1985). Consequently miospores are not considered further in this account. Dinoflagellate cysts, however, are ubiquitous and diverse in marine Upper Cretaceous and Danian strata worldwide and there is an extensive literature on this subject. Furthermore, many taxa have restricted stratigraphical ranges. Unsurprisingly, northwest Europe is the region which has been most intensively researched; the majority of the stage stratotypes are located in France. The literature on Late Cretaceous dinoflagellate cysts is briefly reviewed and a biostratigraphical scheme which is applicable to the Chalk Group of onshore and offshore UK is outlined.

The base of the Chalk Group lies at the Lower/Upper Cretaceous boundary in onshore England, Northern Ireland and Scotland and offshore in the southern and central North Sea (Rawson *et al*., 1978; Johnson & Lott, 1993). Onshore, the youngest Chalk Group strata are Lower Maastrichtian and are separated from overlying Palaeocene strata by a major hiatus. Maastrichtian strata are present in the southern North Sea; and, in the central North Sea, the Outer Moray Firth and the Beryl Embayment/South Viking Graben the Chalk Group (Ekofisk Formation) extends into the Danian (Palaeocene). The Chalk Group in the northern North Sea passes laterally into the fine grained siliciclastic strata of the Shetland Group (Johnson & Lott, 1993). Recent publications on the lithostratigraphical nomenclature of the Chalk Group of the onshore UK include Mortimore (1986), Robinson, (1986), Bristow *et al*. (1997) and Rawson *et al*. (2001).

A summary of the history of study of Cretaceous dinoflagellate cysts in the UK was given by Costa & Davey (1992) and in Wilkinson *et al*. (1993). Fossil dinoflagellates were first recognised by Christian Gottfried Ehrenberg who published a series of descriptive works on the Upper Cretaceous of Germany and Poland (e.g. Ehrenberg, 1838). Research in Germany and France was continued by Otto Wetzel and Georges Deflandre respectively (e.g. Wetzel, 1933; Deflandre, 1937). Ehrenberg, Deflandre and Wetzel all worked on thin, translucent flakes of flint because mineral acid digestion techniques had not been developed. All these early works were largely taxonomic; biostratigraphical research was not initiated until the late 1960s. Clarke & Verdier (1967) was a pioneering work on the Cenomanian to Campanian dinoflagellate cyst taxonomy and biostratigraphy of all Chalk Group lithologies of the Isle of Wight. These authors found that relatively large volumes of Chalk Group sediment are required to obtain workable assemblages (see also Wilson, 1971a). Other publications on the dinoflagellate cyst floras from the Chalk Group of the UK include Davey (1969; 1970), Tocher

& Jarvis (1987), Jarvis, Carson, Cooper *et al*. (1988), Jarvis, Carson, Hart *et al*. (1988), Marshall & Batten (1988), Packer *et al*., (1989), Paul *et al*. (1994), FitzPatrick (1995; 1996), Dodsworth (1996; 2000) and Wood *et al*. (1997). Unpublished theses on this theme comprise Marshall (1983), Duane (1992) and FitzPatrick (1992). The majority of work on the palynology of the Chalk Group in the UK is on the Cenomanian and Turonian Stages. Major works on the Upper Cretaceous palynology of continental Europe are Foucher (1971; 1975; 1976; 1979; 1980; 1981; 1983), Wilson (1971b), Corradini (1972), Kjellström (1973), Foucher & Taugourdeau (1975), Foucher & Robaszynski (1977), Hansen (1977; 1978), Robaszynski *et al*. (1982a, b; 1985), Neumann & Platel (1983), Herngreen *et al*. (1986; 1998), Marheinecke (1986; 1992), Prössl (1990), Schiøler (1992), Schiøler & Wilson (1993), Slimani (1994; 1996), Tocher & Jarvis (1994a, b), Brinkhuis & Schiøler (1996), Herngreen, Eillebrecht *et al*. (1996), Roncaglia & Corradini (1997a, b) and Schiøler *et al*. (1997). Wilson (1974) is a well-distributed thesis on the late Campanian and Maastrichtian of The Netherlands and Denmark; see also Hultberg (1985). As in the UK, there are several continental European studies on the Cenomanian and Turonian; there has also been significant research on the Maastrichtian Stage.

Due to the planktonic nature of the parent dinoflagellate cells and the high relative sea levels during the Late Cretaceous and Danian, the majority of dinoflagellate cyst species from this interval have wide geographical distributions. However, some provinciality does appear to have operated in Europe at during this interval. For example, some species appear to be confined to northern Europe, and are presumed to have been climatically (latitudinally) controlled. These differences appear to have been most acute in the latest Late Cretaceous, particularly the Maastrichtian. This may be due to steadily falling eustatic levels from the Turonian to the Maastrichtian (Haq *et al*., 1987). However, this also could be because many studies have been published on the Maastrichtian Stage in both northern and southern Europe (e.g. Schiøler & Wilson, 1993; Roncaglia & Corradini, 1997a, b). This Late Cretaceous provincialism has never been comprehensively evaluated.

Dinoflagellate cyst biozonation of the Chalk Group of the UK

The following scheme of 20 dinoflagellate cyst biozones has been formulated using a compilation of the existing European literature (see section 1). There are several published dinoflagellate cyst biozonations for the Cenomanian to Maastrichtian interval of the Northern Hemisphere. For example, Aurisano (1989) is a zonal scheme for the Upper Cretaceous of the eastern USA. Others pertain to the Arctic (Ilyina *et al*., 1994, Nøhr-Hansen, 1996 and Lentin, unpublished). The Lentin (unpublished) zonation was illustrated by Stover *et al*. (1996, fig. 23A), but has never been formally defined. The major Northern European Late Cretaceous dinoflagellate cyst biozonations are those of Clarke & Verdier (1967), Foucher (1980) and Kirsch (1991). None of these schemes, however, include all of the Upper Cretaceous and the constituent zones are relatively broad.

The biozones are all interval zones of accepted usage, and are based upon reliable dinoflagellate cyst First Appearance Datums (FADs or range bases) and Last Appearance Datums (LADs or range tops). The biozones are numbered 1 (earliest Cenomanian) to 20 (late Danian). For each biozone, the index taxon is the species which defines the top of the interval. These biozones are all considered to be consistently recognisable as they are based upon widespread, well known and relatively common taxa. It is possible to achieve greater biostratigraphical precision using other known datums. However these, and other accessory bioevents are not used to define zones in this scheme. The zones herein are all correlated to the standard macrofossil zonation, rather than directly to the standard Chalk Group lithostratigraphy of the UK. It is clear from the literature that local changes in dinoflagellate cyst floras are stratigraphically useful in distinguishing different lithostratigraphical units. These bioevents, which significantly refine this scheme, can be related to individual marl bands, flint bands and macrofossil-rich beds.

In the following account the BGS dinoflagellate cyst biozones of the Chalk Group are systematically described from oldest (Chalk Biozone 1) to youngest (Chalk Biozone 20). Alternatively, for information about a particular zone, select it from the summary table (summary correlation of dinoflagellate cyst and macrofaunal zones).

Pages in category ‘Palynological zonation’

The following 20 pages are in this category, out of 20 total.

- Chalk Biozone 1 - Ovoidinium verrucosum subsp. verrucosum
- Chalk Biozone 2 - Epelidosphaeridia spinosa
- Chalk Biozone 3 - Wrevittia cassidata
- Chalk Biozone 4 - Litosphaeridium siphoniphorum
- Chalk Biozone 5 - Florentinia
- Chalk Biozone 6 - Raetiaedinium truncigerum
- Chalk Biozone 7 - Stephodinium coronatum
- Chalk Biozone 8 - Florentinia deanei
- Chalk Biozone 9 - Endoscrinium campanula
- Chalk Biozone 10 - Cannosphaeropsis utinensis
- Chalk Biozone 11 - Cassiculosphaeridia reticulata
- Chalk Biozone 12 - Callaiosphaeridium asymmetricum
- Chalk Biozone 13 - Areoligera senonensis
- Chalk Biozone 14 - Palaeohystrichophora infusorioides
- Chalk Biozone 15 - Neoeurysphaeridium glabrum
- Chalk Biozone 16 - Alterbidinium acutulum
- Chalk Biozone 17 - Triblastula utinensis
- Chalk Biozone 18 - Palynodinium grallator
- Chalk Biozone 19 - Senoniasphaera inornata
- Chalk Biozone 20 - Tectatodinium rugulatum

Category:

- Biostratigraphy of the Chalk Group

Navigation menu

Personal tools

Namespaces

- Category
- Discussion

□

Variants

Views

- Read
- Edit
- View history
- PDF Export

□

More

Search

Search Go

Navigation

- Main page
- Recent changes
- Random page
- Help about MediaWiki

Tools

- What links here
- Related changes
- Special pages
- Permanent link
- Page information
- Browse properties

- This page was last modified on 30 September 2013, at 11:44.

- Privacy policy
- About Earthwise
- Disclaimers
- British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL
- Powered By MediaWiki Semantic MediaWiki